U.S. Department of Transportation
Federal Highway Administration

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NHI Course No. 15262

March 1994

INTERMODAL AND PUBLIC TRANSPORTATION MANAGEMENT SYSTEMS

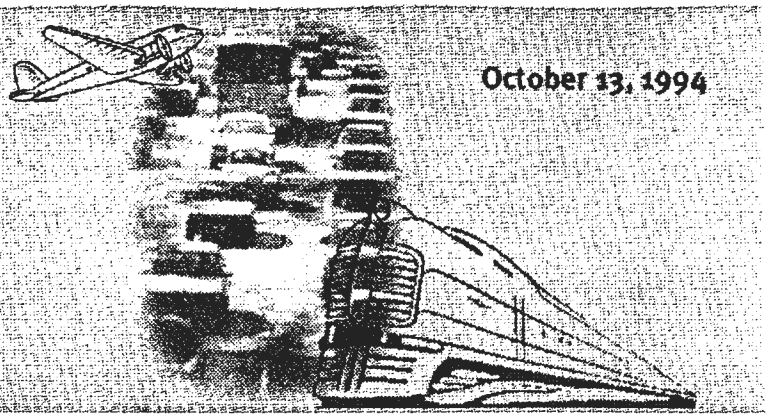
Training Course for Managers

Joint Presentation Of:
Federal Highway Administration
Federal Transit Administration

Participant Workbook

National Highway Institute

ISTEA Management Systems Workshop



October 13, 1994

JOINTLY SPONSORED BY SCAG/CALTRANS

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PROGRAM

8:00 - 8:30
Registration and Coffee

8:30 - 8:45
Introduction of course material: Course objectives; Schedule of activities: Participant introductions.

8:45 - 10:00
Participants will identify key issues they are facing in the implementation of the ISTEA-required management systems. These issues will become the focus of subsequent technical discussions.

10:00
Break

10:15 - 11:45
Organizing to Implement Management Systems in Your Agency: Issues that decision makers need to know to implement the management systems in their organization.

11:45 - 1:00
Lunch: Open discussion session

1:00 - 2:30
Introduction to the basic elements and performance measures of management systems

2:30 - 3:15
Identification and Evaluation of Strategies

3:15
Break

3:30 - 4:00
Implementation and Feedback

4:00 - 4:30
Summary and Discussion

4:45
Closing Remarks

SESSION 1

INTRODUCTION

INTRODUCTION

The Intermodal Surface Transportation Efficiency Act (ISTEA) provided many new challenges to transportation planning and decision making. One of these challenges is implementing a performance-based planning process based on the use of management systems. The purpose of this course is to introduce three of these systems: the congestion management system, the intermodal management system, and the public transportation management system.

The course is designed for managers who will be responsible for developing and using these three systems in the transportation planning and decision making process. The course is designed to provide participants with the following information:

- Understanding of Transportation System Performance
- Organizing Your Agency To Implement The Management Systems
- Developing Performance Measures
- Identification of Strategies
- Evaluation and Feedback

Notes:

systematic

COURSE OBJECTIVES

The ISTEA-mandated management systems are a major point of departure from the approach toward transportation planning that has occurred in most transportation agencies over the past decades. While some of the management systems, e.g., the pavement, bridge and safety management systems, have been used in many agencies for years, there has been little experience with the other required management systems, i.e., the congestion, intermodal, and public transportation management systems. The purpose of this course is thus to introduce the key concepts associated with these three management systems. In particular, the course is designed to answer many of the questions that managers might have in putting these systems in place in their organization.

After taking this course, it is expected that participants will have a good working knowledge of what these management systems are intended to accomplish; legislative and regulatory requirements; the basic elements of the systems; the interrelationship between the management systems, transportation systems plan and decision making; the steps needed to implement each system; and the resources that might be required.

The course objectives are intended to provide an understanding of the:

- Legislative and regulatory requirements for the management systems
- Basic elements of the three management systems
- Relationship among the management systems, and between the management systems, the transportation systems plan and decision making
- Types of strategies that could result from the management systems
- Steps necessary to implement the three systems

The following schedule presents the overall structure of the course. The intent of this course, however, is to make the material as useful to the participants as possible. The first session in the course therefore is intended to identify the key issues that the participants are facing in implementing the three management systems. From this discussion, the major topics to be covered in the remaining portions of the course will be determined. The sessions in the afternoon are intended to present a structured discussion of three key issues that are critical for the successful implementation of the management systems. If these topics are covered in the morning's session, substitute topics of interest to the participants will be presented.

COURSE OUTLINE AND SCHEDULE

8:30-8:45	Introduction	Introduction of course material; Course objectives; Schedule of activities; Participant introductions.
8:45 to 10:00	Identifying Key Issues	Participants will identify key issues they are facing in the implementation of the ISTEA-required management systems. These issues will become the focus of subsequent technical discussions. Some of the topics could include: - Importance of intermodal movement of people and goods - Characteristics/elements of such movements - Illustrations of transportation agency applications of intermodal, congestion, and public transit management systems and how they can meet the performance-based planning and decision-making needs of transportation agencies - Key lessons that one needs to keep in mind as the different management systems are being developed Appreciation of the interconnections of the transportation system and an understanding of what performance-based planning is (and what role management systems can play in such planning)
10:00 to 10:15	Break	
10:15 to 11:45	Organizing to Implement Management Systems in Your Agency	Issues that decision makers need to know to implement the management systems in their organization. - The basic requirements of the planning/management system regulations and the relationship to systems planning - The types of resources needed to develop a certifiable management system - The interrelationships among the six management systems and their importance in implementing a coordinated agency approach - Examples of how the management systems can be used in planning, decision making and programming - Basic elements of an organization-wide implementation perspective - Case studies of how some states have approached implementation

COURSE OUTLINE AND SCHEDULE

1:00-2:30	Basic Elements Performance Measures	- Introduction to the basic elements of management systems; Focus on the important role that performance or asset measures have in the three management systems under consideration. - Examples of performance measures for the congestion management and intermodal management systems and of the asset measures for the public transit management system. - Data required to implement these performance measures and typical data sources. - Identification of the potential use of these performance measures as they relate to the type of issues that can be addressed or the types of problems they can identify. - The types of measures used in an agency relates directly to the types of decisions that must be made by the agency decision makers.
2:30 to 3:15	Identification and Evaluation of Strategies	- Illustration of the different types of strategies that can be considered as part of the management systems. - Typology of strategies that can be considered for each management system. Strategies can satisfy more than one management system issue, and thus the need for interrelating the management systems and their outputs. Different types of analysis and evaluation techniques can be used in the evaluation of these strategies. - Relationship between the management systems process and systems planning as the basic point of departure for discussion of the types of strategies that are relevant to each management system application.
3:15 to 3:30	Break	
3:30 to 4:00	Implementation and Feedback	- Implementation aspects of the identified strategies for each of the management systems and the importance of feedback for monitoring strategy effectiveness and system performance.
4:00 to 4:30	Summary and Discussion	- Summary of the key points made during the course. - Requirements of ISTEA and the different means of accomplishing them. - Timeframe for response and possible sanctions. - Your reaction to course material and comments on your situation and what steps you need to take to implement, or enhance existing, management systems.

WHAT IS APPROPRIATE FOR YOUR PROCESS AND AGENCY?

SESSION 2

LEGISLATIVE AND REGULATORY BACKGROUND

LEGISLATIVE AND REGULATORY BACKGROUND

Of the many planning opportunities and challenges presented to transportation agencies inherent in ISTEA, the most important is likely to be the development and use of six management systems. These systems are intended to provide the information on the condition and performance of the existing and future transportation systems that can be used by decision makers to determine the most cost effective investment strategies. In addition, the ISTEA requires that the needs identified by these management systems be considered in the development of statewide transportation plans and improvement programs.

The role of the management systems is thus to develop the information and the strategies to improve the performance of the existing and future transportation systems and to provide input to the planning processes for consideration at the systems level.

The purpose of this session is to provide an overview of the legislative and regulatory background for the ISTEA management systems. This background is a critical point-of-departure for understanding the structure and use of these systems.

Notes:

Common Characteristics...

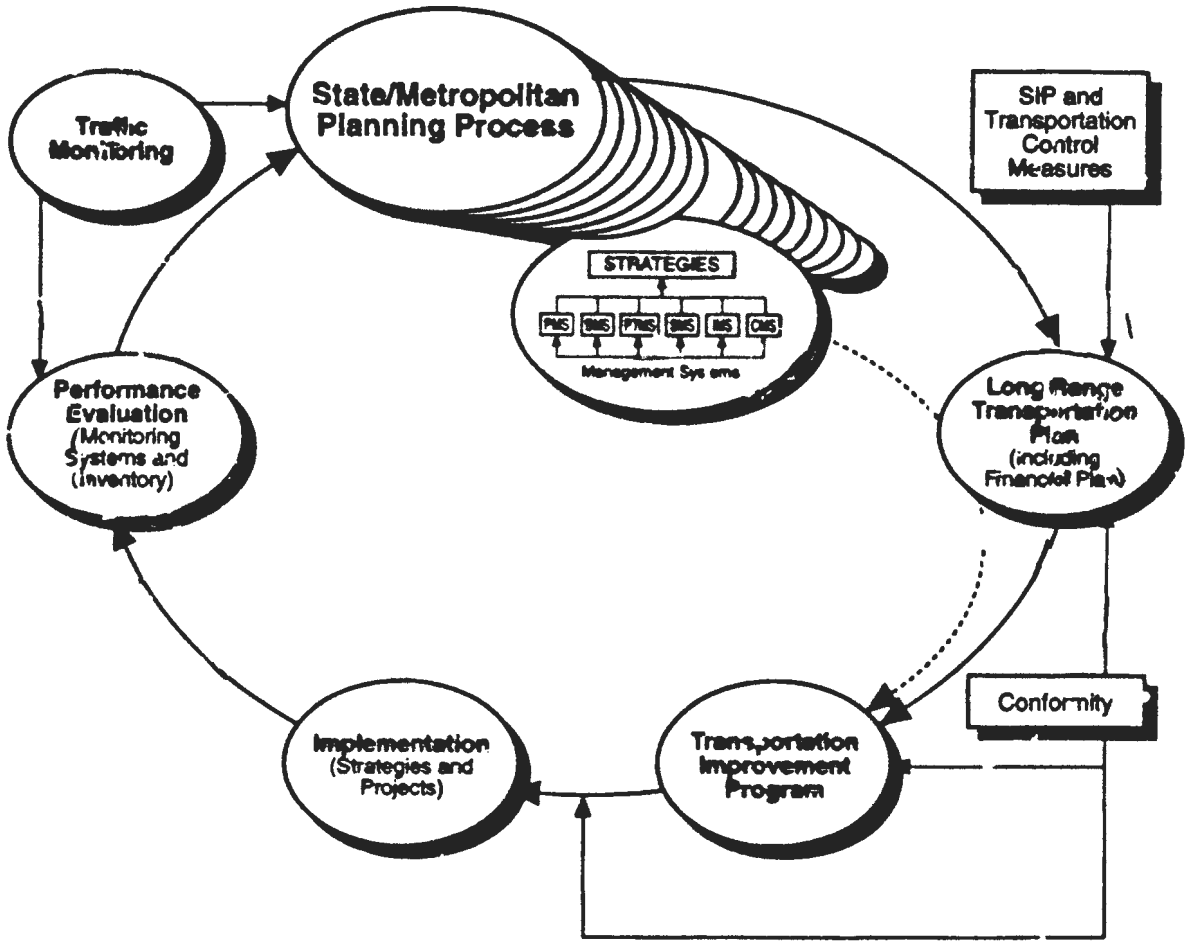
- Tailored to meet State, regional, or local goals, policies and resources.
- States responsible for having procedures for coordination of development, establishment, implementation, and operation of management systems.

  --Oversight process for adequate resources and target dates met

  --Coordinated data use

  --Issues of overlap among management systems

- State will cooperate with MPO's, local officials, affected agencies and others having responsibility for operation of affected transportation systems or facilities. State may enter into agreements to develop, establish, and implement management systems.
- Results shall be considered in development of metropolitan and statewide transportation plans and improvement programs and in making project decisions.
- Must include appropriate means to evaluate the effectiveness of implemented actions developed through use of that system.
- Effectiveness of the management systems in enhancing transportation investment decisions and improving overall efficiency of the State's transportation systems shall be evaluated periodically, preferably as part of the metropolitan and statewide planning processes.

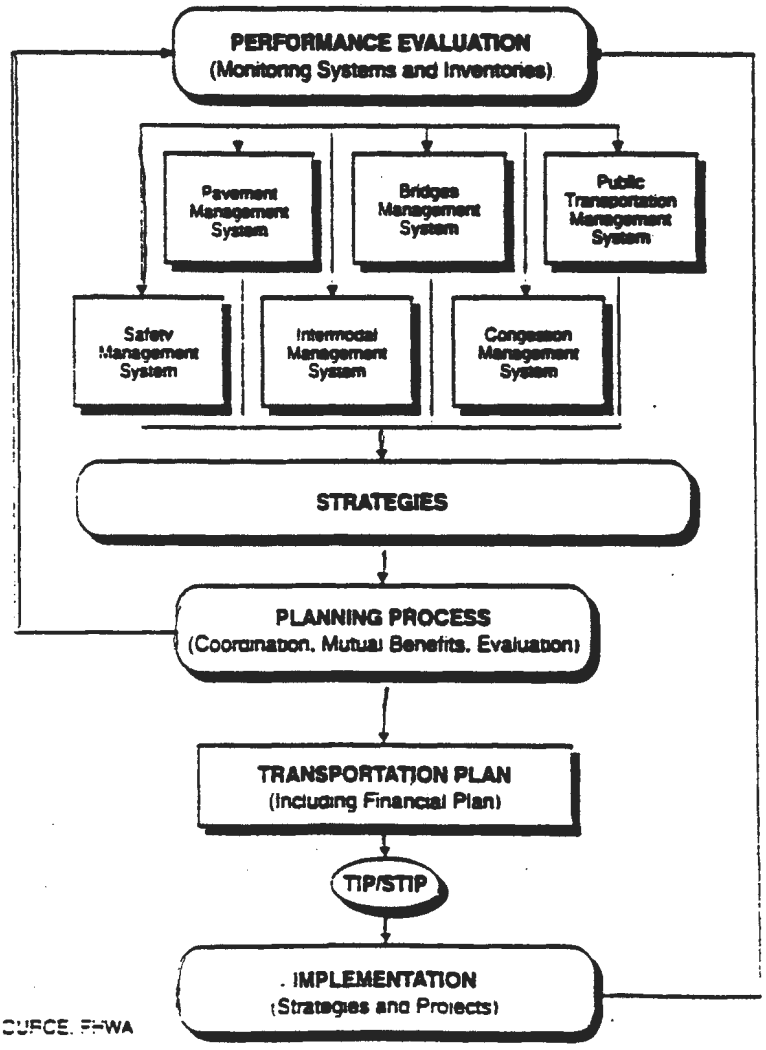

State/Metropolitan Planning Process
Traffic Monitoring
SIP and Transportation Control Measures
STRATEGIES
PMS
SMS
PTMS
BMS
IMS
CMS
Management Systems
Performance Evaluation (Monitoring Systems and Inventory)
Long Range Transportation Plan (including Financial Plan)
Conformity
Implementation (Strategies and Projects)
Transportation Improvement Program

COMMON ELEMENTS

- Identification of Performance/Condition Measures
- Data Collection and Analysis
- Determination of Needs
- Evaluation of Effectiveness of Strategies and Actions

o DEFINE NETWORK

POTENTIAL RELATIONSHIP OF MANAGEMENT SYSTEMS TO THE PLANNING PROCESS



SOURCE: FHWA

INTERMODAL MANAGEMENT SYSTEM (IMS)

The Intermodal Management System (IMS) is a systematic process that provides, on a continuing basis, efficient, safe, and convenient movement of people and goods through the integration of transportation facilities and systems, and that improves the coordination in planning, and implementation of air, water, and various land-based transportation facilities and systems. The IMS will be a challenge to many State DOT's in that such a management system has never before been defined or used at the State level, and that many of the IMS elements, for example, data collection, relies on data sources that could be difficult to obtain. As is true for the CMS, the IMS considers the movement of both people and goods. And because of close interrelationships among the three, the development of the IMS is to be coordinated with the development of the PTMS and CMS.

The Intermodal Management System (IMS) is a systematic process of, 1) identifying key linkages between one or more modes of transportation, where the performance or use of one mode will affect another, 2) defining strategies for improving the effectiveness of these modal interactions, and 3) evaluating and implementing these strategies to enhance the overall performance of the transportation system.

A systematic process of:

- Identifying key linkages between one or more modes of transportation, where the performance or use of one mode will affect another,
- Defining strategies for improving the effectiveness of these modal interactions, and
- Evaluating and implementing these strategies to enhance the overall performance of the transportation system.

IMS Components

Identification of Intermodal Facilities

Identification of Performance Measures

Data Collection and System Monitoring

System and Facility Efficiency Evaluation

Strategy and Action Identification and Evaluation

Intermodal Facility

- Highway access to terminals, ports, and airports
- Trucking terminals
- Rail terminals
- Transit stations
- Park and ride lots

Intermodal System

- Transportation network
- Public and private infrastructure
- Moving people and goods
- Using various combinations of modes

STATE DOT AND MPO INTERMODAL PLANNING ISSUES

Physical Limitations

- Structural vertical clearance for doublestacking and railroad electrification.
- Structural integrity and remaining pavement life of highway access to intermodal facilities.
- Bridge weight restrictions.
- Horizontal radii limiting truck movements to intermodal facilities.
- Limited pedestrian crossings of major arterials and limited access facilities.

Accessibility

- Accessibility time and cost to intermodal facilities.
- Accessibility to bike and trail facilities.
- Designated truck routes.

Transferability and Coordination

- Movement interference between modes at highway-railroad crossings.
- Movement interference between modes at highway-waterway crossings.
- Congestion and delays created by drayage.
- Passenger transfer delays between modes.
- Highway-ferry boat transfer delays.

Delivery and Collection

- Passenger feeder systems to intermodal facilities.
- Land-side access to airports and harbors.
- Freight delivery at major centers of activity.
- Truck delivery and loading interference with street traffic.
- Peak and off-peak delivery of freight.
- Availability of park and ride lots.

Safety

- Highway-Railroad crossing safety.
- Bicycle & Pedestrian Safety.
- Hazardous materials shipment.

Legal & Regulatory

- User fees and subsidization of transportation modes.
- Truck weight limitations.
- Liability of freight rail lines for transit usage.
- Truck route restrictions.
- State multimodal trust funds & funds eligibility.

Economics & Environmental

- Economic tradeoffs between modes and combinations of modes.
- Air, noise, and wetland impacts of intermodal facilities.
- Economic impact of railroad abandonment.

Compliance

October 1, 1994:

- Work Plan Developed
- Intermodal Facilities Inventoried
- Data Collection Begun

October 1, 1995:

- Performance Measures Established
- System Design Completed or Underway
- Full-Scale Data Collection Underway

October 1, 1996:

- IMS Fully Operational
- Develop Strategies to be Evaluated Within the Planning Process for Inclusion in the Transportation Plan and the TIP/STIP

CALIFORNIA IMS DEVELOPMENT

- Be developed in consultation with various agencies, the private sector and other interested parties

- Be integrated and/or compatible with the planning processes, data, methodologies and systems of state and regional agencies

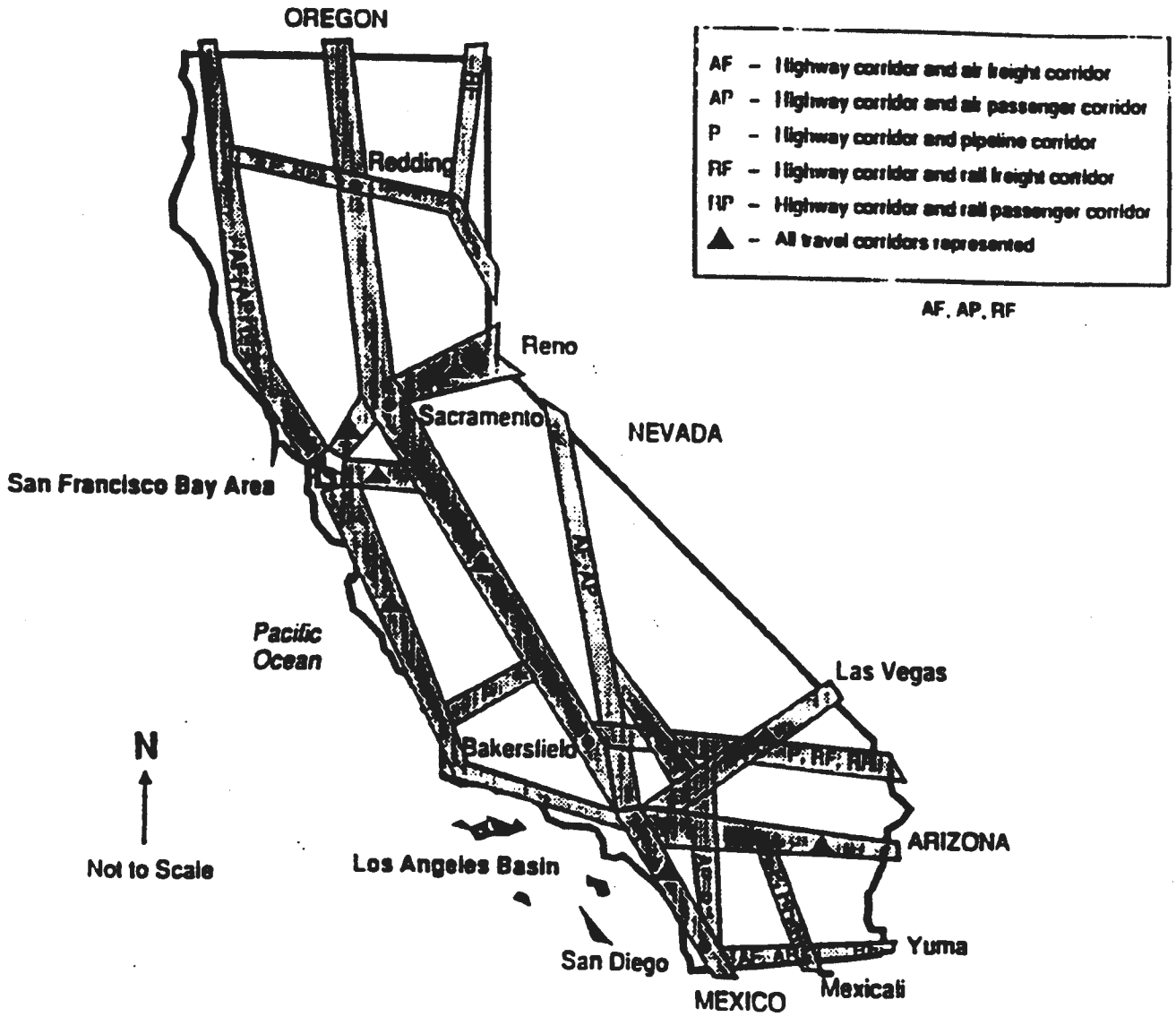
- Provide a mechanism for making corridor and system level improvement decisions:

  - quantifiable intermodal data
  - inventory
  - database
  - analysis methodology
  - forecasting capability
  - evaluation

- Provide information for inclusion in the California Transportation Plan

- Provide intermodal performance measurement indicators and information for monitoring purposes.

- Multimodal
- Volume
- Connectivity
- Interregional Travel
- Rural and Urban



TRANSPORTATION CORRIDORS OF STATEWIDE SIGNIFICANCE

CONGESTION MANAGEMENT SYSTEM

The Congestion Management System (CMS) is a systematic process that provides information on transportation system performance and alternative strategies to alleviate congestion and enhance mobility of persons and goods. It is important in this definition to note the emphasis both on alleviating congestion as well as on enhancing mobility. In addition, the CMS is intended to provide improvements for both the movement of people and goods movement.

Each of these observations has important implications in the way the CMS is established. For example, one of the critical tasks in establishing a CMS becomes deciding early on what measures of system performance will be used as a triggering mechanism to define system deficiencies--congestion measures, mobility measures, or both?.

A CMS will result in the identification and implementation of strategies that provide the most efficient use of existing and future transportation facilities in all areas of the State, including metropolitan and non-metropolitan areas where congestion is occurring or is expected to occur.

A systematic process of:

- Identifying and implementing strategies that provide the most efficient use of existing and future transportation facilities in all areas of a State...where congestion is occurring or expected to occur.
- Considering strategies that reduce single-occupant vehicle travel and improve existing transportation system efficiency.

SPECIAL CONSIDERATIONS....

For Planning...

- All transportation corridors or facilities with existing or potential recurring congestion shall be part of a continual assessment process.
- In transportation management areas (TMA's), those areas over 200,000 population, the CMS shall be part of the metropolitan planning process.
- Where addition of general purpose lanes will occur, incorporate special features into project that will facilitate future demand management and operational improvement strategies.
- CMS shall be developed in coordination with IMS and PTMS.

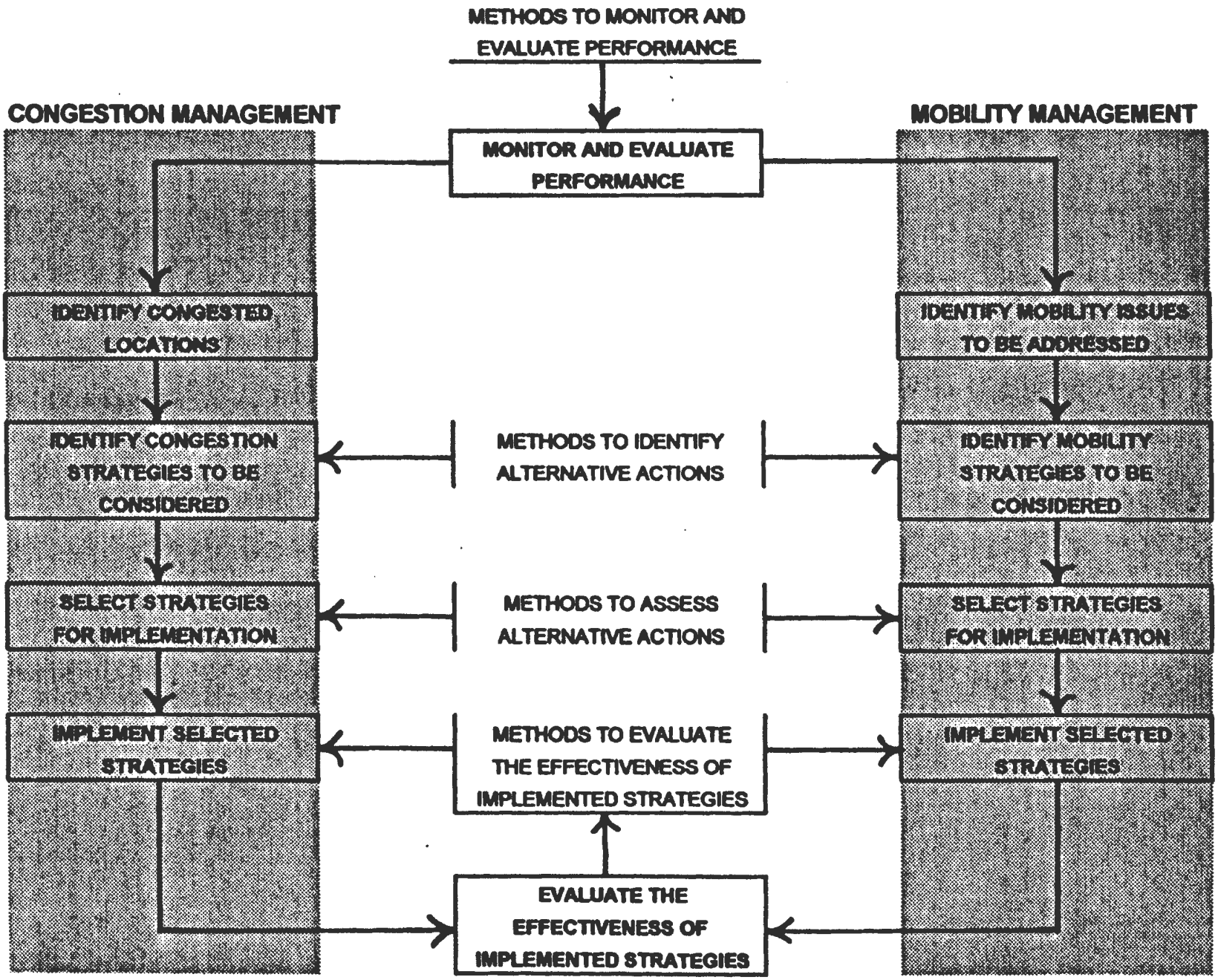
For Relationship to Air Quality...

- Entire metropolitan planning area to be included in the CMS for TMA's that are nonattainment for carbon monoxide and ozone.
- For carbon monoxide and ozone nonattainment areas, the CMS will provide appropriate levels of analysis for all reasonable travel demand reduction and operational management strategies where SOV capacity will be increased.
- Other TDM and operational management strategies appropriate for the corridor shall be identified through the CMS.
- CMS strategies in nonattainment areas shall be developed in coordination with the transportation control measures of the State Implementation Plan.

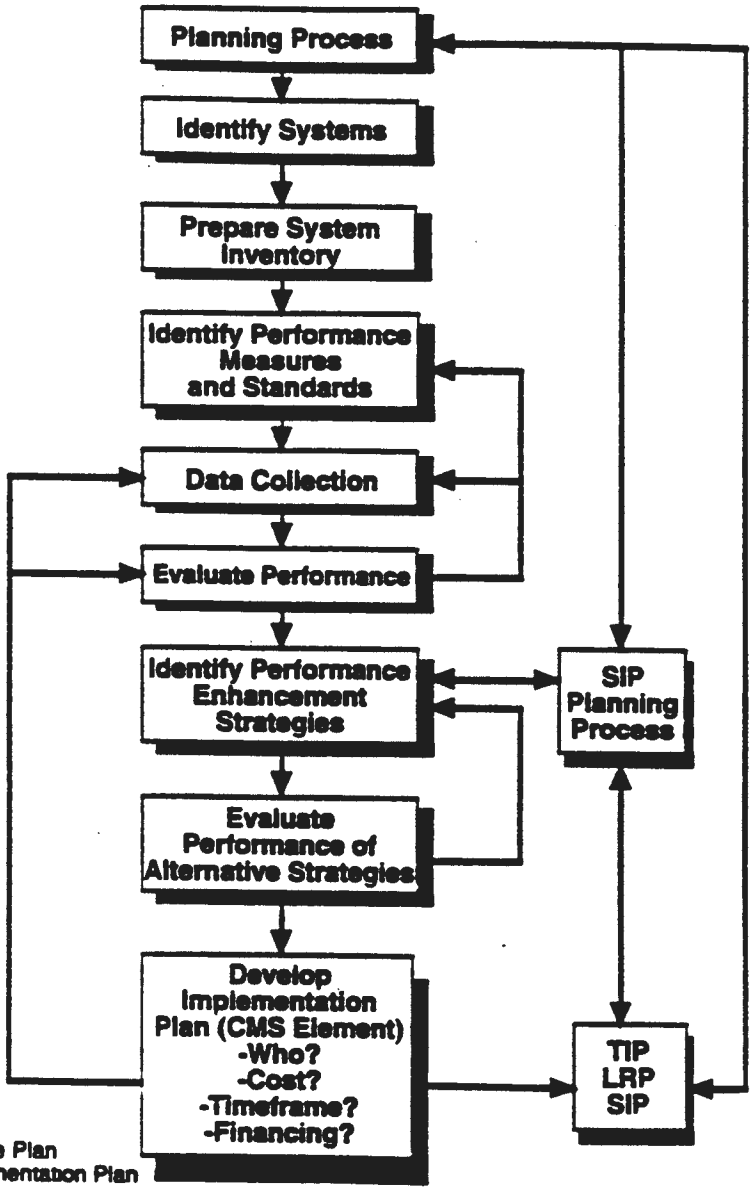
STRATEGIES

- Transportation demand management
- Traffic operational improvements
- High occupancy vehicle measures
- Public transit capital and operational improvements
- Nontraditional modes (e.g., bicycles and pedestrian facilities)
- Congestion pricing
- Growth management and activity center strategies
- Access management techniques
- Incident management
- Intelligent Vehicle-Highway System technologies
- Addition of general purpose lanes

FIGURE 1

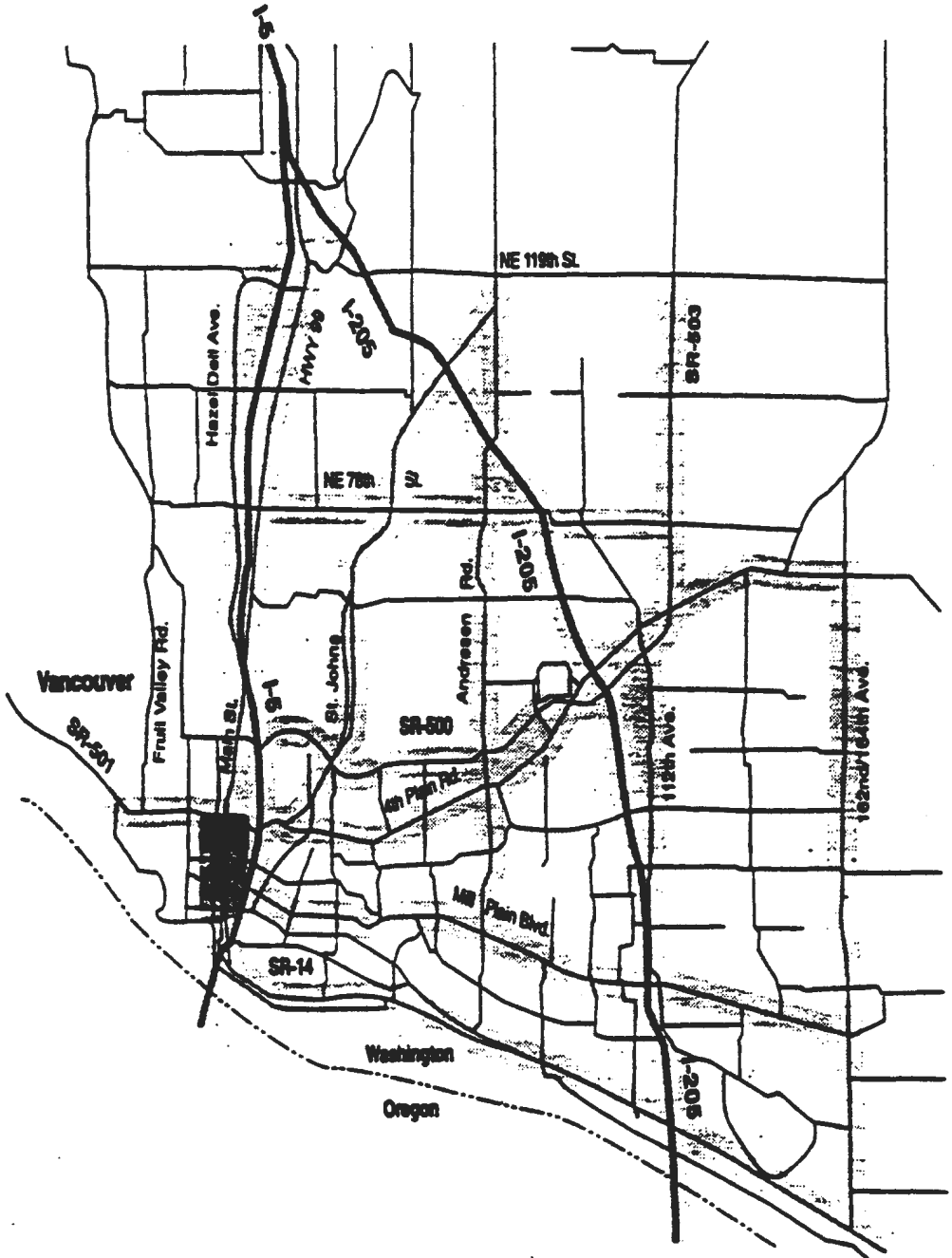

METHODS TO MONITOR AND EVALUATE PERFORMANCE
CONGESTION MANAGEMENT
MOBILITY MANAGEMENT
MONITOR AND EVALUATE PERFORMANCE
IDENTIFY CONGESTED LOCATIONS
IDENTIFY MOBILITY ISSUES TO BE ADDRESSED
IDENTIFY CONGESTION STRATEGIES TO BE CONSIDERED
METHODS TO IDENTIFY ALTERNATIVE ACTIONS
IDENTIFY MOBILITY STRATEGIES TO BE CONSIDERED
SELECT STRATEGIES FOR IMPLEMENTATION
METHODS TO ASSESS ALTERNATIVE ACTIONS
SELECT STRATEGIES FOR IMPLEMENTATION
IMPLEMENT SELECTED STRATEGIES
METHODS TO EVALUATE THE EFFECTIVENESS OF IMPLEMENTED STRATEGIES
IMPLEMENT SELECTED STRATEGIES
EVALUATE THE EFFECTIVENESS OF IMPLEMENTED STRATEGIES

EXAMPLE OF CONGESTION MANAGEMENT SYSTEMS APPROACH (Vancouver, WA)



LRP - Long Range Plan
SIP - State Implementation Plan

Source: Congestion Management Systems: Workshop Proceedings, FHWA.



RTC Congestion Management System
Major Transportation Corridors

RTC CONGESTION MANAGEMENT SYSTEM
CORRIDOR CONGESTION RATIO - INDEX RELATIONSHIP

Congestion Index	Congestion Ratio
1	<0.60
2	0.60< X <0.70
3	0.70< X <0.80
4	0.80< X <0.90
5	0.90< X <1.00
6	> 1.0

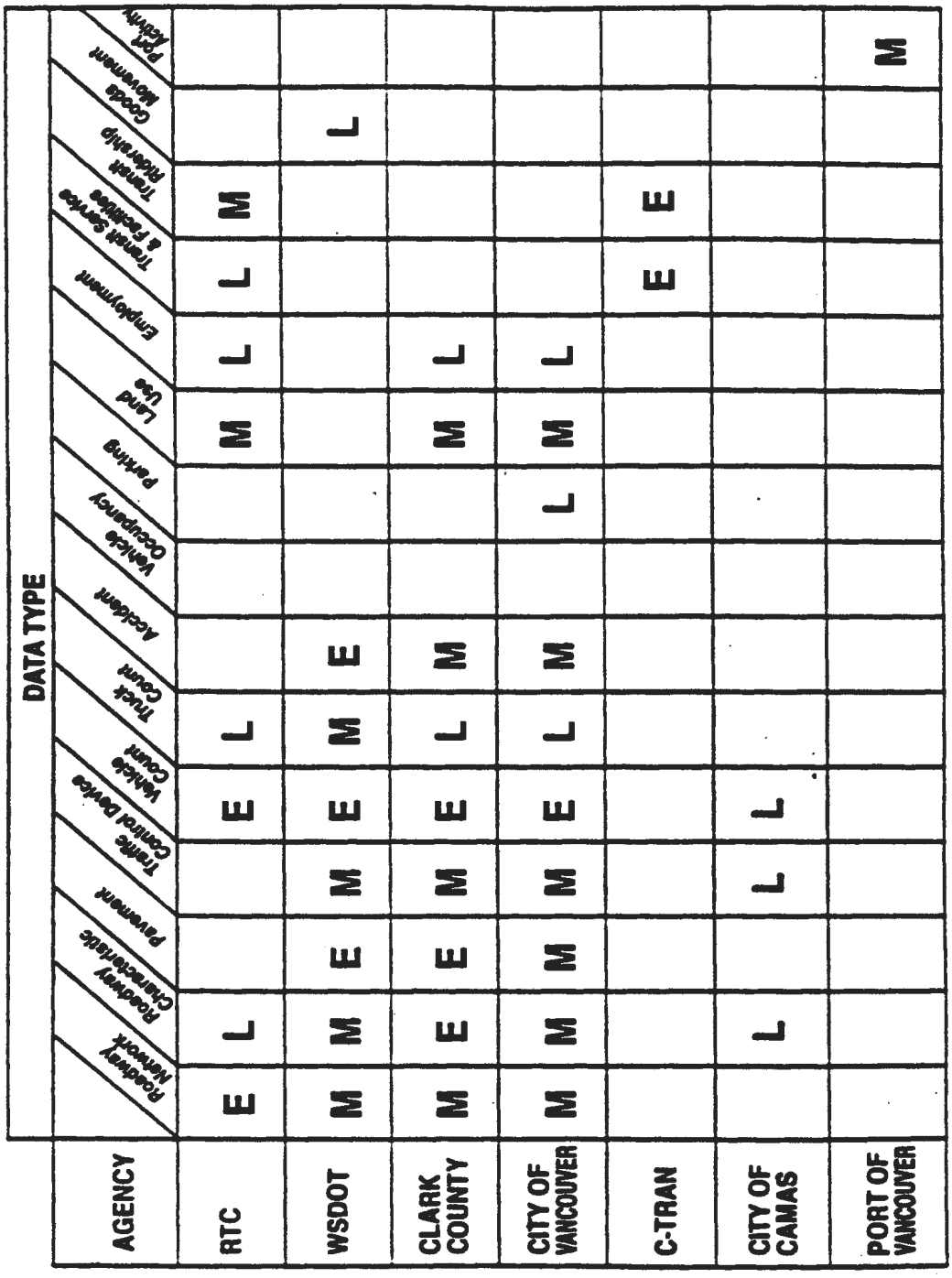
RTC CONGESTION MANAGEMENT SYSTEM
TRANSIT/TDM PRIORITY

Category/Criteria	Threshold
1. Service (supply)	
Transit service level	transit capacity >= 5% of roadway capacity
HOV lane	yes or no
Exclusive ROW transit service	yes or no
2. Use (demand)	
Average vehicle occupancy	AVO >= <regional average - to be determined>
Transit trips	>= 5% of all person trips
3. Potential	
Planned HOV lane	yes or no
HCT designation	yes or no
Planned exclusive ROW transit	yes or no
Land use characteristics	this is a subjective criteria that takes into account: current land use density, planned growth or development, employer concentration, forecasted demand and future connections

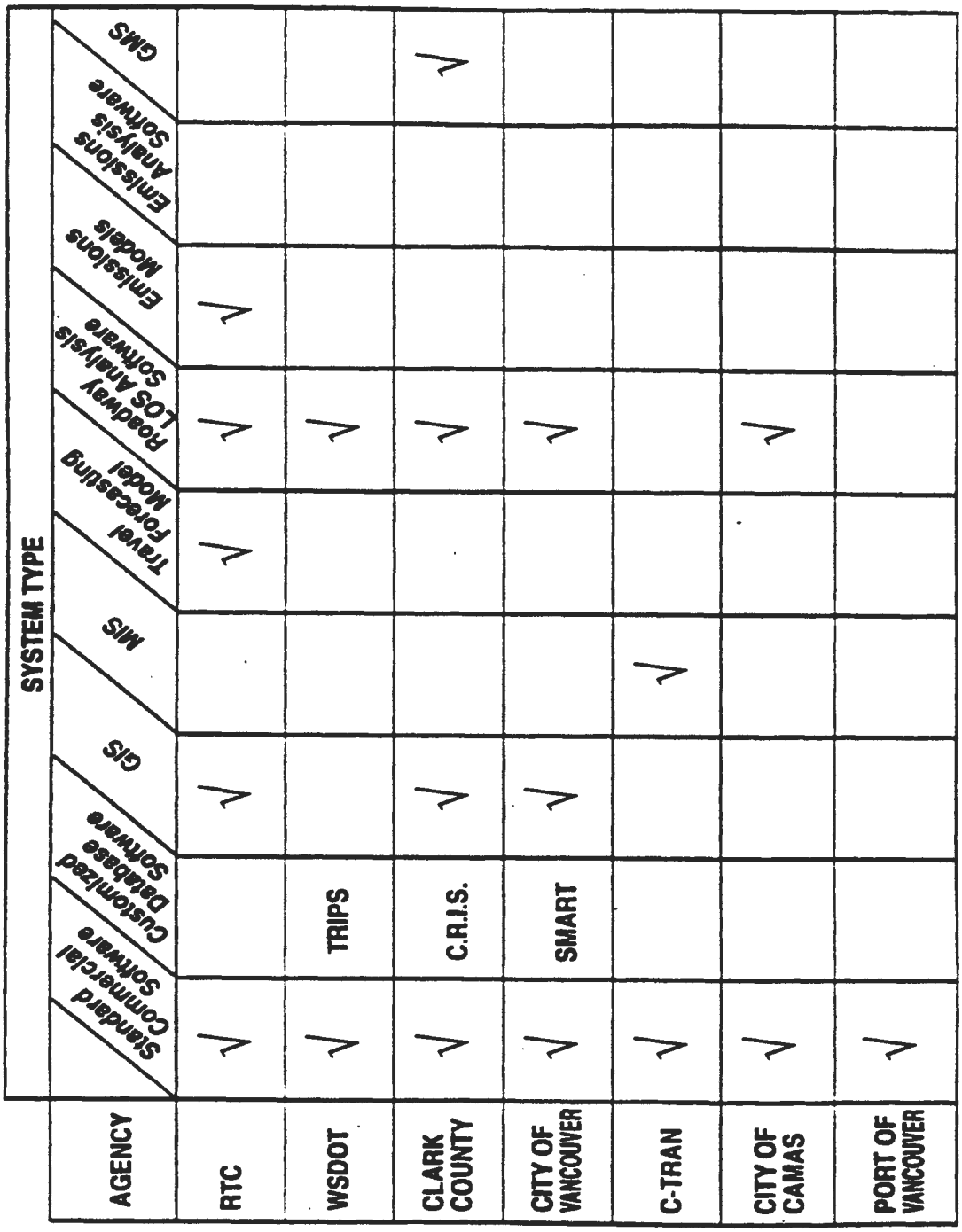
RTC CONGESTION MANAGEMENT SYSTEM
PERFORMANCE THRESHOLDS

Transit/TDM Priority	Corridor Performance Threshold
High	*
Medium	*
Low	*

* To be determined following evaluation of existing system



Data Inventory
Summary of Availability



AGENCY	Standard Commercial Software	Customized Database Software	GIS	MIS	Travel Forecasting Model	Roadway LOS Analysis Software	Emissions Models	Emissions Analysis Software	GMS
RTC	✓		✓		✓	✓	✓		
WSDOT	✓	TRIPS				✓			
CLARK COUNTY	✓	C.R.I.S.	✓			✓			✓
CITY OF VANCOUVER	✓	SMART	✓			✓			
C-TRAN	✓			✓					
CITY OF CAMAS	✓					✓			
PORT OF VANCOUVER	✓								

SYSTEM TYPE

Computer-Based System Inventory
Summary of Availability

Compliance

October 1, 1994:

- Work Plan Developed
- Most Critical Areas Identified
- Data Collection Initiated

October 1, 1995:

- In Nonattainment Areas, Fully Operational CMS
- Shall Provide Projects/Programs For Plans and Programs

- In All Other Areas, System Design Completed or Underway
- Full-Scale Data Collection Underway

October 1, 1996:

- CMS Fully Operational
- Develop Strategies to be Evaluated Within the Planning Process for Inclusion in the Transportation Plan and the TIP/STIP

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Public Transportation Management System (PTMS)

The Public Transportation Management System (PTMS) is a systematic process that collects and analyzes information on the condition and cost of transit assets on a continual basis. Transit assets are defined as public transportation facilities such as maintenance barns, rail stations, equipment, rolling stock, etc. The PTMS can be developed to provide input into the strategic identification and timing of capital investments, provide the most cost-effective set of strategies given limited budgets, and gain a better understanding of the tradeoffs between capital and maintenance decisions.

The purpose of the PTMS is thus to provide decisionmakers with the information to select cost effective strategies for providing and maintaining transit assets in a serviceable condition.

Establishing the PTMS will require close cooperation with the transit operators in the State. As was the case for the CMS and the IMS, the development of the PTMS shall be coordinated with these other management systems.

A systematic process that results in:

- A comprehensive inventory of a State's rural and urban transit facilities and equipment.
- The means to assess current and future conditions and needs, identify statewide major asset deficiencies, and determine when and where to allocate funding to meet statewide goals and objectives for the provision of public transportation services.
- When coordinated with the IMS and CMS, the means to generate strategies for consideration in statewide and metropolitan transportation planning processes.

And at State discretion...

- A mechanism for developing maintenance and replacement policies
- A decisionmaking mechanism for allocation of statewide discretionary funding (e.g., Flexible Funds, Sections 16 and 18, Section 9 apportionment)

Compliance

October 1, 1994:
- Work Plan Developed

October 1, 1995:
- Condition Measures Established
- Data System Structure Established
- Data Collection Underway

October 1, 1996:
- PTMS Fully Operational
- Develop Strategies to be Evaluated Within the Planning Process for Inclusion in the Transportation Plan and the TIP/STIP

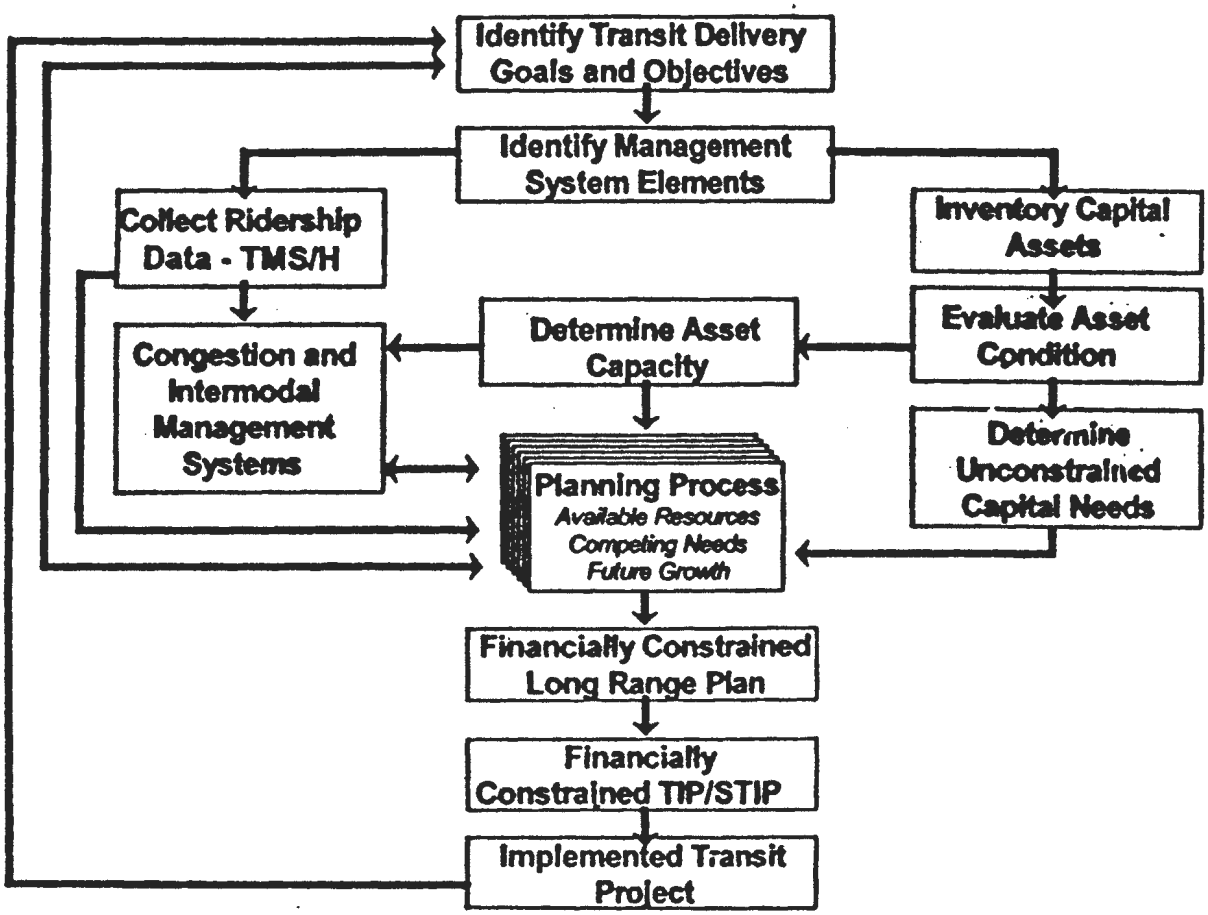
Compliance

October 1, 1994:
- Work Plan Developed

October 1, 1995:
- Condition Measures Established
- Data System Structure Established
- Data Collection Underway

October 1, 1996:
- PTMS Fully Operational
- Shall Provide Projects/Programs For Plans and Programs

Figure 1 - PTMS and Transportation Planning



Attachment A

Standards and Measures proposed for Evaluating the Condition of Transit Assets

	Asset Type	Measures	Standards
1	Rolling stock	Age, miles, safety, efficiency, reliability, capacity	Will vary by type of vehicle, from 40 years, 1,000,000 miles for rail cars to 5 years, 100,000 miles for automobiles. Safety, efficiency, and reliability standards will be established later. The capacity standard, in terms of projected ridership, will vary according to type of vehicle. Manufacturer's rated seating and standing capacity will be used.
	Buildings	Age, safety, efficiency, capacity	Standard will be 40 years, adjusted for safety, efficiency.
3	Appurtenances	Age, safety, efficiency, reliability, capacity	Standards will vary with type of appurtenance, will be established in accordance with industry/manufacturers expected useful life, and adjusted for safety, efficiency, reliability and capacity.
4.	Essential system	Age, safety, efficiency, reliability, obsolescence	Standards vary with type of system , will be established in accordance with industry/manufacturers expected useful life, and adjusted for safety, efficiency, reliability and obsolescence.
5	Street furniture	Age, safety, efficiency, reliability	Standards will be established in accordance with manufacturers expected useful life, and adjusted for safety, efficiency, and reliability.
6	Street assets	Age, safety, efficiency , capacity.	Standard will be 20 years, adjusted for safety and efficiency.

BUS REPLACEMENT SCHEDULE FOR ATHENS TRANSIT SYSTEM

BUS MODEL	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1976	10	9	8	7	5	4	2	1				
1989	11	11	11	11	11	11	11	10	9	6	3	
1993	4	4	4	4	4	4	4	4	4	4	4	4
1994		1	1	1	1	1	1	1	1	1	1	1
1995			1	1	1	1	1	1	1	1	1	1
1996				1	1	1	1	1	1	1	1	1
1997					2	2	2	2	2	2	2	2
1998						1	1	1	1	1	1	1
1999							3	3	3	3	3	3
2000								2	2	2	2	2
2001									2	2	2	2
2002										3	3	3
2003											4	4
2004												3
TOTAL VEHICLES	25	25	25	25	25	25	26	26	26	26	27	27
PEAK USAGE	19	19	20	20	20	20	21	21	21	21	21	21
SPARES	6	6	5	5	5	5	5	5	5	5	6	6
SPARE RATIO	32%	32%	25%	25%	25%	25%	24%	24%	24%	24%	29%	29%
VEHICLES RETIRED	2	1	1	1	2	1	2	2	2	3	3	3
VEHICLES PURCHASED	4	1	1	1	2	1	3	2	2	3	4	3

STATE EXAMPLES

- *WISCONSIN*

  Three major categories of assets:

  --Rolling Stock Depending on Size of System: (individual vehicles for small systems and classification for larger systems)

  --Facilities: Physical Structures

  --Equipment: $5,000 per unit cost

- *MINNESOTA*

  Condition Criteria of Vehicle Used for Ranking

  --Formula Weights (50% annual mileage; 25% age; and 25% body chassis rating)

  --Involving All Carriers With Vehicles Over 15 Passengers

- *FLORIDA*

Assets To Be Included

--Rolling Stock (Revenue and Non Revenue Vehicles)
--Buildings
--Essential Systems (fare collection systems and computer systems)
--Street Furniture and Assets

Standards and Measures for Evaluation

OREGON PUBLIC TRANSPORTATION PLAN

1. Description and Inventory
   - Inventory service and providers
   - Describe current service levels
   - Review/describe state/federal policies/guidelines

2. Public Transportation Management System
   - Inventory
   - Condition survey
   - Deterioration model
   - Action, cost model
   - Performance measures
   - Project selection criteria
   - Cost and personnel estimate

3. Vision and Goals
   - Review OTP, Benchmarks,
   - Transportation Planning Rule
   - Review current system characteristics, conditions
   - Stakeholder interviews
   - Gallop Survey

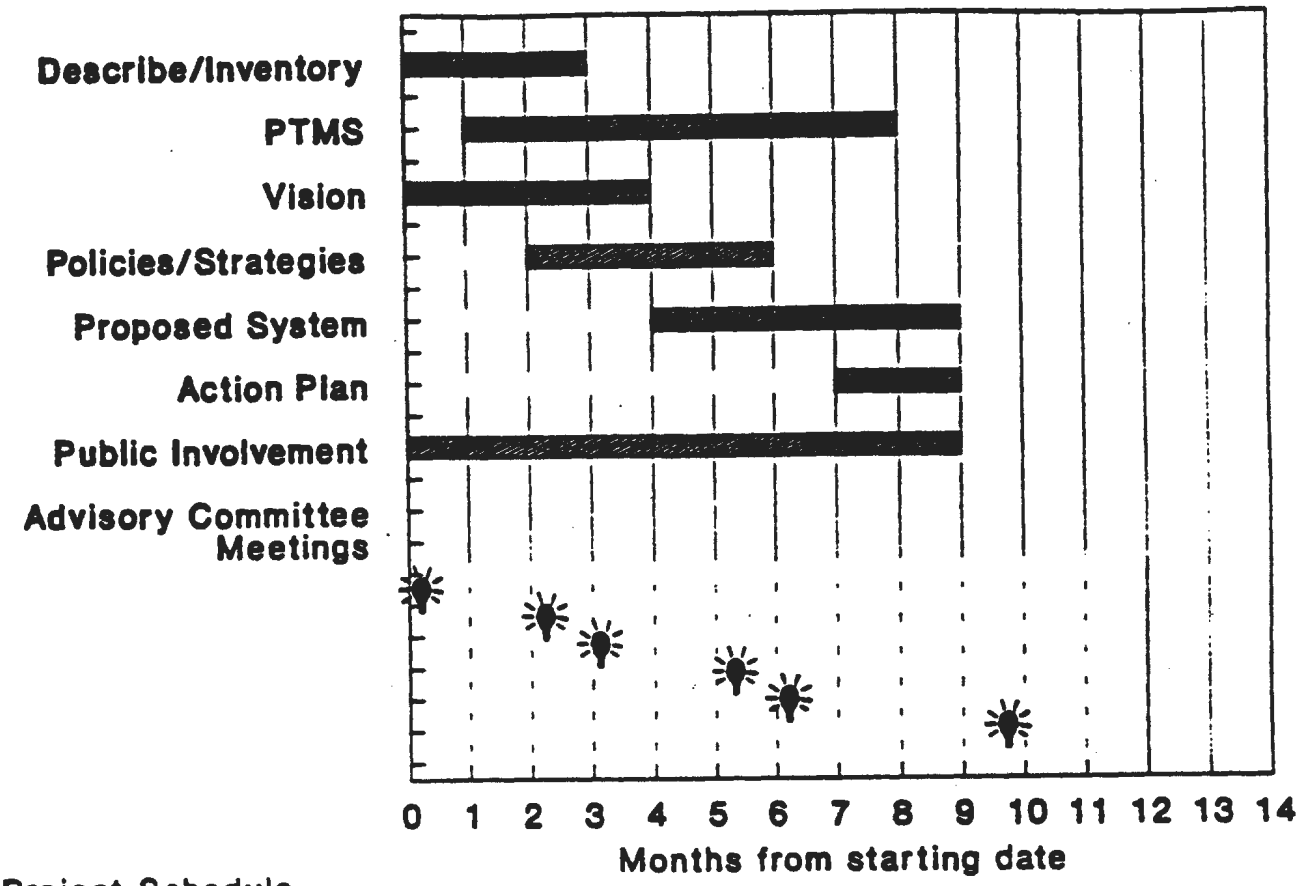
4. Policies and Strategies
   - Review OTP
   - Forecast future ridership
   - System-wide issues
   - Urban issues
   - Intercity issues
   - Rural issues

5. Proposed System
   - Management and coordination roles
   - Performance measures
   - Level of service standards
   - Needs assessment
   - Evaluate alternatives
   - Develop proposed system

6. Action Plans
   - Priorities
   - ODOT, local agency roles
   - Strategies, actions, projects
   - Financing requirements and plan

7. Public Participation Process
   - Design process
   - Advisory Committee
   - Planning Task Force
   - Transportation providers, local governments
   - Public meetings, newsletters, and surveys

OREGON DOT PROJECT SCHEDULE



Project Schedule

MICHIGAN DOT PTMS DEVELOPMENT

PTMS Goals

- Maintain and improve the quality of public transportation services statewide.
- Collect and systematically evaluate asset data.
- Support efforts to maximize available federal/state/local funding resources to improve public transportation services.
- Support the decision process for selecting and providing cost effective rolling stock, facilities, and equipment.
- Meet and exceed ISTEA management system requirements.
- Full integration with all management systems and planning process.
- Statewide electronic communication network including MDOT, transit agencies, and MPOs.

SANCTIONS

Sanctions imposed if:

- State fails to certify annually
- Federal agencies determine that any management system is not being implemented

Sanction:

- Withhold up to 10 percent per year of Federal funds apportioned to the State under Title 23 U.S.C. and to any recipient of assistance under the Federal Transit Act
- May be imposed Statewide, by subarea, for specific categories of funds or types of projects or for specific recipients of funds under the Federal Transit Act

WORK PLAN

- Describes Systems
- Identifies Major Activities
- Assigns Responsibilities
- Schedule

SUMMARY

- DECISION SUPPORT SYSTEMS
- DIFFERENT STRUCTURES FOR DIFFERENT ENVIRONMENTS
- COMPLIANCE SCHEDULE

SESSION 3

ORGANIZING TO IMPLEMENT MANAGEMENT SYSTEMS

ORGANIZING TO IMPLEMENT MANAGEMENT SYSTEMS

The ISTEA management systems are intended to be decision support systems, feeding information into the systems planning and investment decision making processes. As such, these management systems need to be designed to fit into the decision making structure and information flow and use in the organization. In many ways, the management systems represent a new way of doing business in the ISTEA era.

The purpose of this session is to provide an overview of the strategies that can be used to organize an agency for implementing the management systems. The session begins by identifying the key issues that will likely face the developers and users of the mangement systems and gives examples of how some states and MPO's are dealing with these issues.

Notes:

IMPLEMENTATION STRATEGY

- Pressure from the environment, internal or external, for change
- Strategic persons or parts of organization are "hurting"
- Some strategic people are willing to do a real diagnosis of the problem
- There is leadership (consultant, key staff man, new line executive)
- There is collaborative problem identification between line and staff people
- There is some willingness to take risks in trying new forms or relationships
- There is a realistic, long-term perspective
- There is a willingness to face the data of the situation and to work with it on changing the situation
- The system rewards people for the effort of changing and improvement, in addition to rewarding them for short-term results
- There are tangible intermediate results

---Warren Bennis

KEY ISSUES FOR AGENCY DECISIONMAKERS

- Overall Approach to Management Systems
- Relationship to Systems Planning
- Coordination/Integration Among Management Systems
- Public Involvement
- Appropriate Level of Effort

ALTERNATIVE APPROACHES

APPROACH 1

DATA
↓
DATA COLLECTION
↓
PERFORMANCE MEASURES
↓
DECISIONS

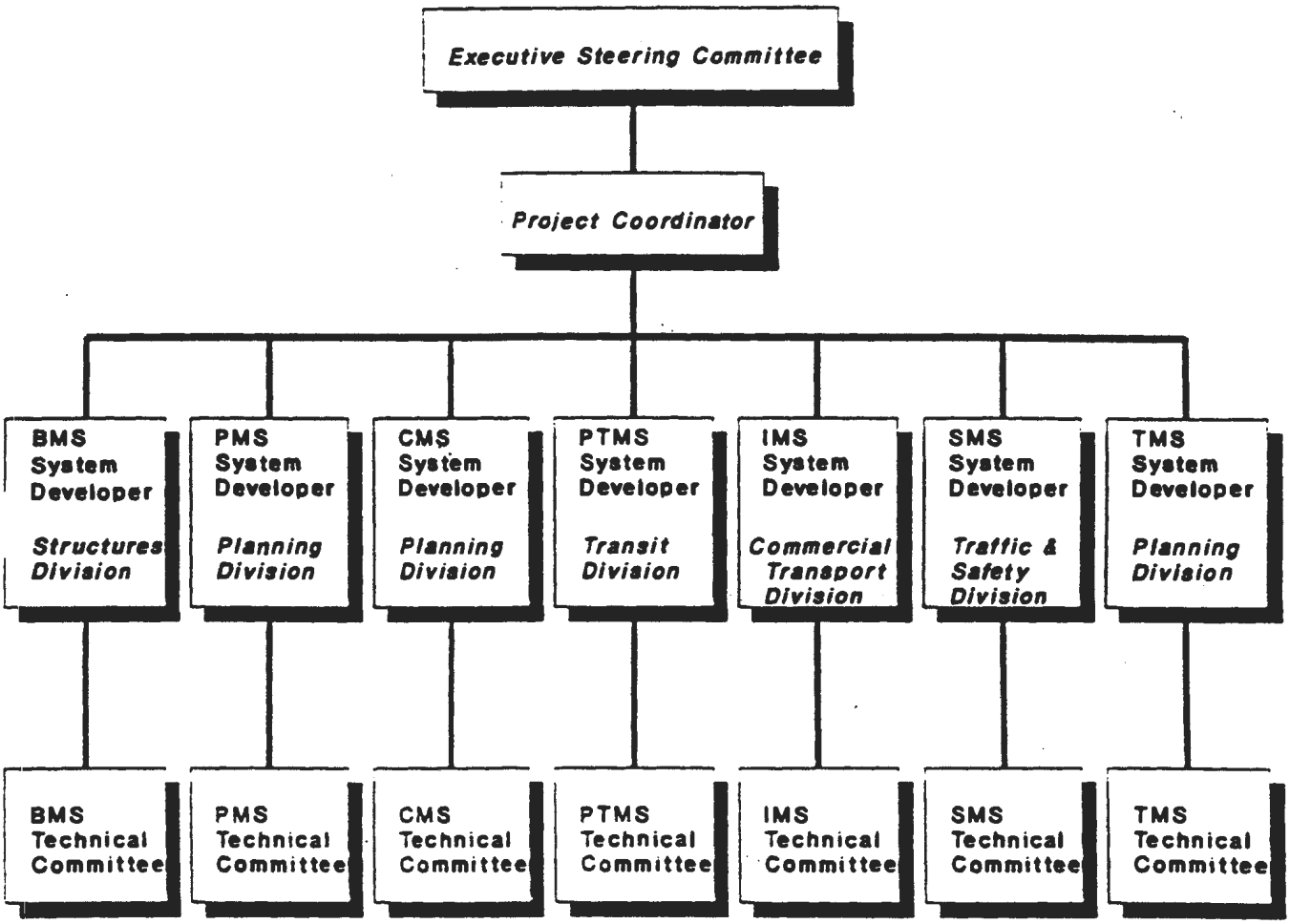
APPROACH 2

POLICIES/PROGRAMS
↓
DECISIONS
↓
INFORMATION
↓
PERFORMANCE MEASURES
↓
DATA
↓
DATA COLLECTION

APPROACH 3

POLICIES/PROGRAMS
↓
DECISIONS → CUSTOMERS
↓
INFORMATION
↓
PERFORMANCE MEASURES ← CUSTOMERS
↓
DATA
↓
DATA COLLECTION

NEW YORK'S MANAGEMENT APPROACH



CMS COMMITTEE RESPONSIBILITIES (FLORIDA)

Subcommittee 1: Overall Direction Setting for CMS Program

Issues

1. Define where we want to go with program and how to get there
2. Define precisely the goals and purpose of the CMS Task Team
3. Define what requirements (reports, reporting procedures) are needed to comply with FHWA/FTA regulations
4. Emphasis of CMS designed for project implementation or provide information
5. Define outputs of CMSs; which outputs are needed for other management systems
6. Define congestion (note overlap with Subcommittee 4)
7. Should "mobility" or "congestion" be the focal point of CMS?
8. Define where congestion exists (reoccurring and incident; note overlap with Subcommittee 4)
9. Define needs
10. How do CMS's fit in with the existing MPO long range process?
11. How do CMS's fit in with FDOT's existing planning process?
12. Determine what level of flexibility to allow
13. Relationship with air quality?
14. Relationship of other management systems with CMS?
15. What roads/system to address (FIHS, all state roads, all regionally significant roads, all roads in MPO long range model)?
16. What areas to cover (which MPO boundary)?
17. What training, symposium, technical assistance is desired?

Subcommittee 2: Relationships among the State CMS, MPO CMSs, and Local Government Concurrency Management Systems

1. Can an MPO CMS be the summation of local government concurrency management systems?

2. What is the relationship of the MPO CMS and local government concurrency management systems?

3. What is the relationship of the state CMS and MPO CMSs?

4. Can the state CMS be the summation of MPO CMSs and local government concurrency management systems?

5. Do we need a state CMS?

6. Should a statewide LOS determination process be established for a total system comparison and for a consistent calculation process throughout the state (note overlap with Subcommittee 3)?

7. What should FDOT be reporting to the Legislature on the status of the SHS (note overlap with Subcommittee 3)?

8. Relationship of long range plans and corridor planning analyses (note overlap with Subcommittee 2)?

9. Drafting of Florida legislation to bring about compatibility of CMSs and concurrency management systems (note overlap with Subcommittee 5)

10. What role do the RPC's play in CMS?

11. How does CMS relate to the current MPO planning processes?

Subcommittee 3: Data Bases and Statewide Reporting of LOS/Congestion

Issues

1. How do the data needs for concurrency management systems relate to MPO and state CMSs, highway performance monitoring system, and to what FDOT reports to the Legislature?

2. How do we make maximum use of existing data bases?

3. What changes to RCI are needed?

4. Should a statewide LOS determination process be established for a total system comparison and for a consistent calculation process throughout the state (note overlap with Subcommittee 2)?

5. What should FDOT be reporting to the Legislature on the status of the SHS (note overlap with Subcommittee 2)?

6. How do CMS data needs relate to the Traffic Monitoring System?

7. How will additional data be collected?

Subcommittee 4: Corridor Analyses and Measurement Techniques

Issues

1. Define congestion (note overlap with Subcommittee 1)
2. Define where congestion exists (reoccurring and incident) (note overlap with Subcommittee 1)
3. Definition and development of acceptable levels of transportation performance
4. Identification of measures to reduce congestion (reoccurring and incident)
5. Identification of costs and effectiveness of possible strategies
6. Identification of which corridors to address
7. Identification of planning analysis tools to address congestion
8. Relationship of long range plans and corridor planning analysis (note overlap with Subcommittee 2)
9. Should FDOT develop a "congestion" decision support system?
10. Is there a triggering device for defining congestion (e.g., highway LOS)?

Subcommittee 5: Management and FDOT Implementation

Issues

1. Development of FDOT procedures
2. Integrating CMS into the work program instructions and production
3. Drafting of Florida legislation to bring about compatibility of CMS's and concurrency management
4. Coordination of District ISTEA consultants with Systems Planning efforts
5. Which planning office should maintain FDOT's CMS?
6. How will CMS be certified annually?

PROVIDING DIRECTION

FLORIDA'S PRINCIPLES

Principle 1: The management systems should provide support to resource allocation decisions.

Principle 2: The results of the management systems should provide input into programming and budgeting decisions.

Principle 3: The results of the management systems should provide input into long range planning and policy development.

Principle 4: The development of the management systems should be based on a "value added" approach.

Principle 5: The performance measures for each management system should be targeted on the most important information needs of the Department.

Principle 6: The management systems should interface where appropriate to provide the best information to Department decision makers, and to assure the most efficient operation of the management systems.

Principle 7: The management systems need to be developed in a way that allows public (broadly defined) input and awareness of the specific nature and purpose of the management systems.

RELATIONSHIP TO SYSTEMS PLANNING

Statewide Transportation Planning Process shall consider....

- The transportation needs identified through the management systems;
- Strategies for incorporating bicycle transportation facilities and pedestrian walkways in appropriate projects;
- International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, and historic sites, and military installations;
- Any metropolitan area plan;
- Transportation system management and investment strategies designed to make the most efficient use of existing transportation facilities;
- Methods to reduce traffic congestion and to prevent traffic congestion from developing in areas where it does not yet occur, including methods which reduce motor vehicle travel, particularly single-occupant motor vehicle travel;
- Methods to expand and enhance appropriate transit services and to increase the use of such services;
- Long range needs of the State transportation system for movement of persons and goods;
- Methods to enhance the efficient movement of commercial motor vehicles;

Metropolitan Transportation Planning Process shall consider....

- The need to relieve congestion and prevent congestion from occurring where it does not yet occur including:

  -- The consideration of congestion management strategies or actions which improve the mobility of people and goods in all phases of the planning process; and

  -- In TMA's, a congestion management system that provides for effective management of new and existing transportation facilities through the use of travel demand reduction and operation management strategies;

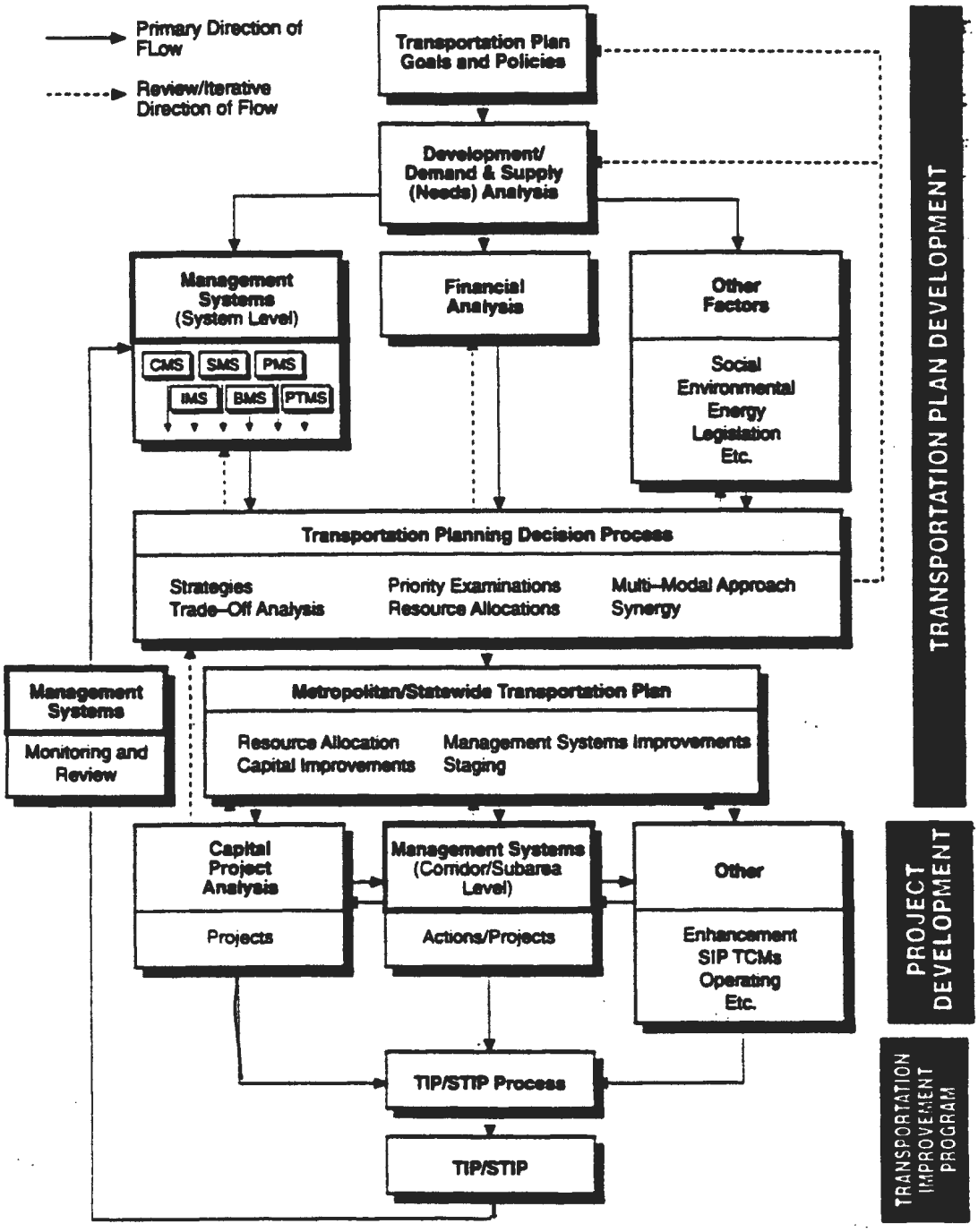
- International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, and historic sites, and military installations;

- The likely effect of transportation policy decisions on land use and development;

- Transportation needs identified through the use of management systems

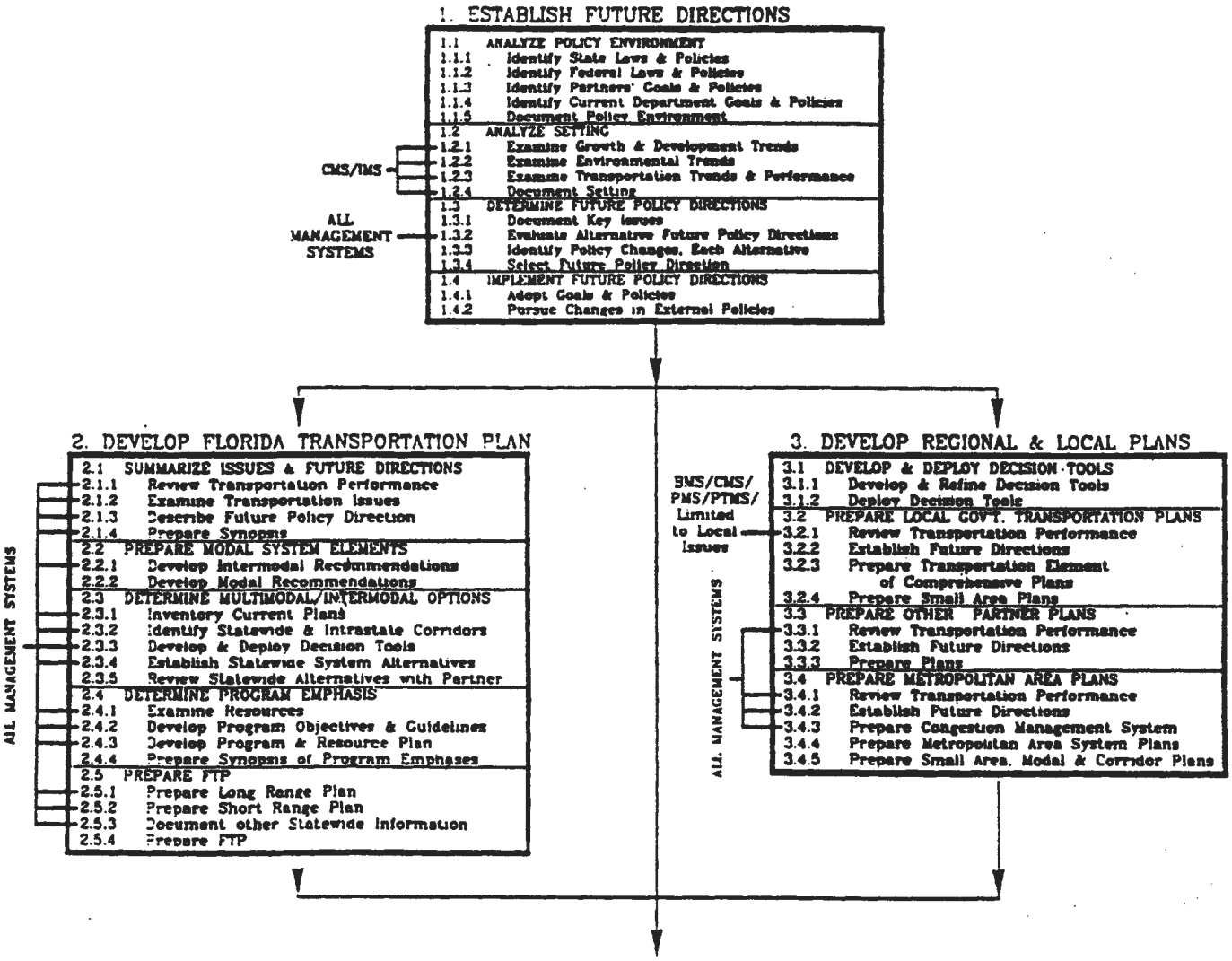
- Methods to expand and enhance appropriate transit services and to increase the use of such services;

RELATIONSHIP BETWEEN MANAGEMENT SYSTEMS AND PLANNING (COLORADO)

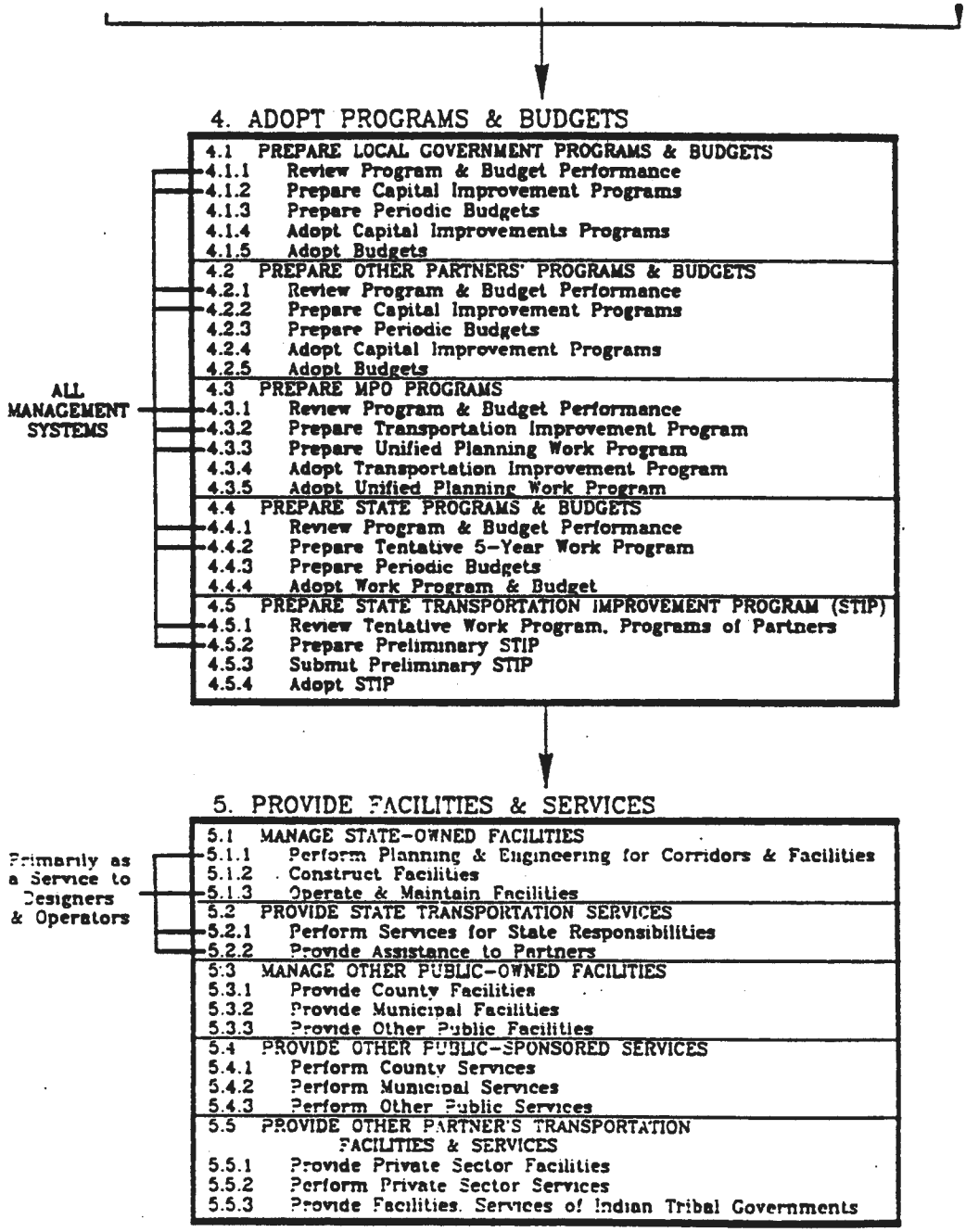


SOURCE: CDOT, DRCOG, PPACG, and the Steering Committee

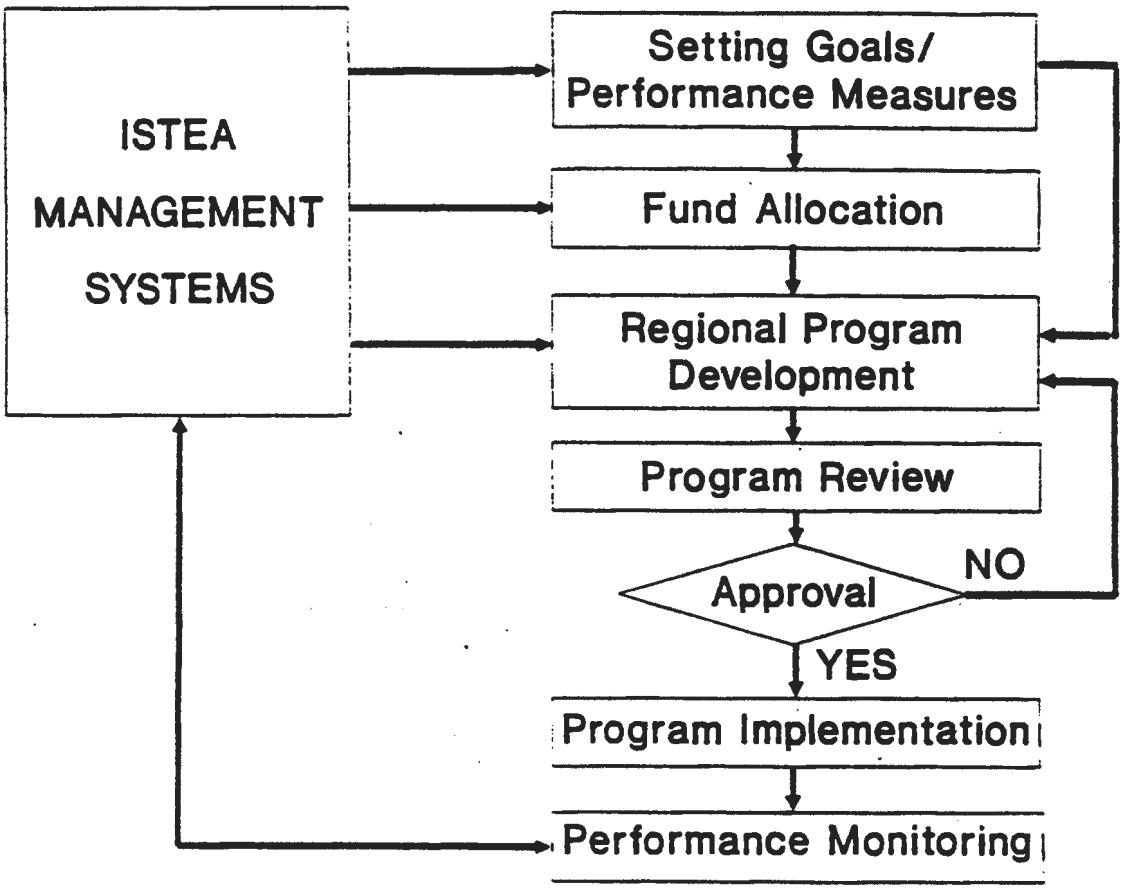
RELATIONSHIP BETWEEN MANAGEMENT SYSTEMS AND PLANNING (FLORIDA)



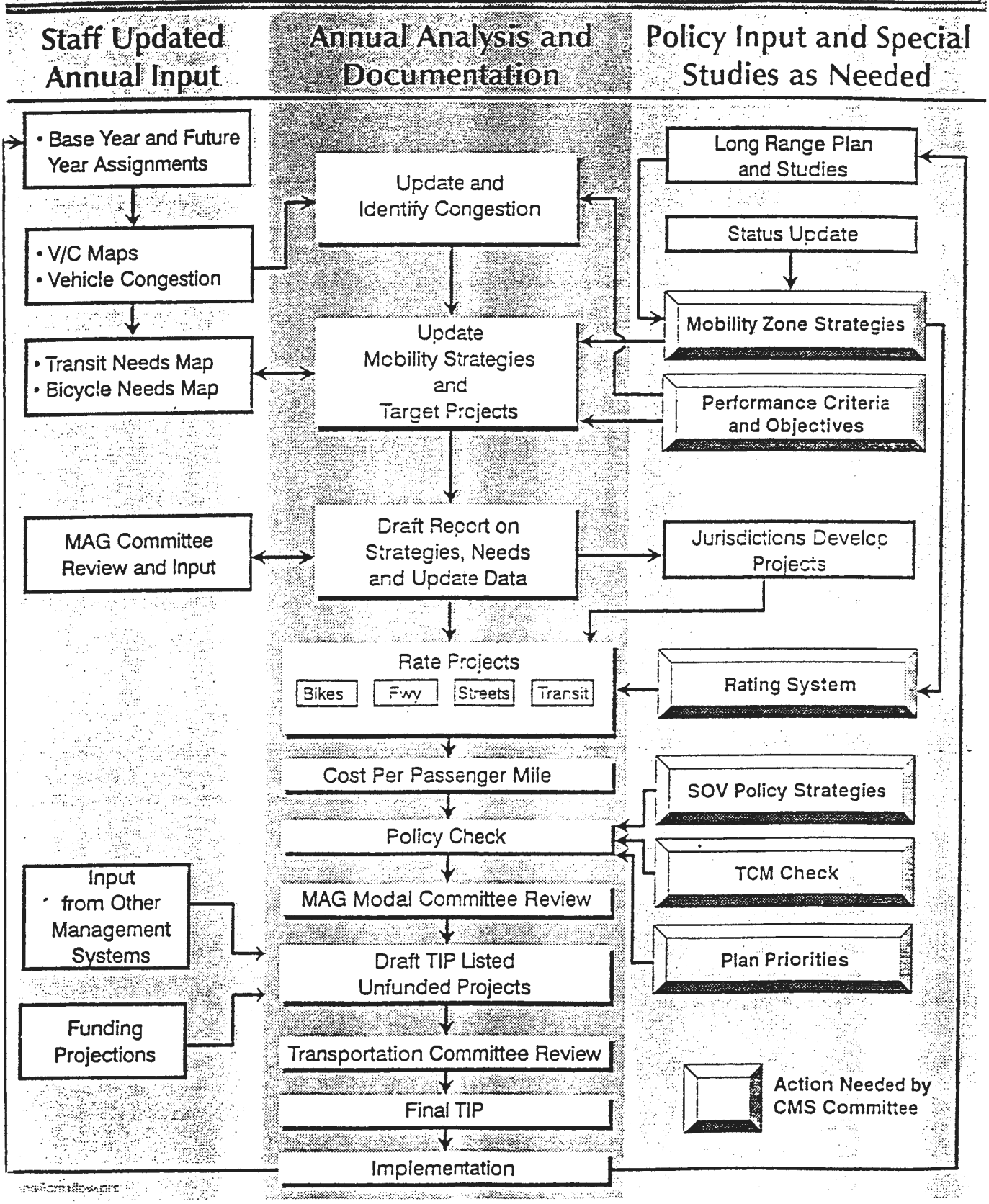
RELATIONSHIP BETWEEN MANAGEMENT SYSTEMS AND PLANNING (FLORIDA)



RELATIONSHIP BETWEEN MANAGEMENT SYSTEMS AND PLANNING (NEW YORK)



MAG CONGESTION MANAGEMENT SYSTEM



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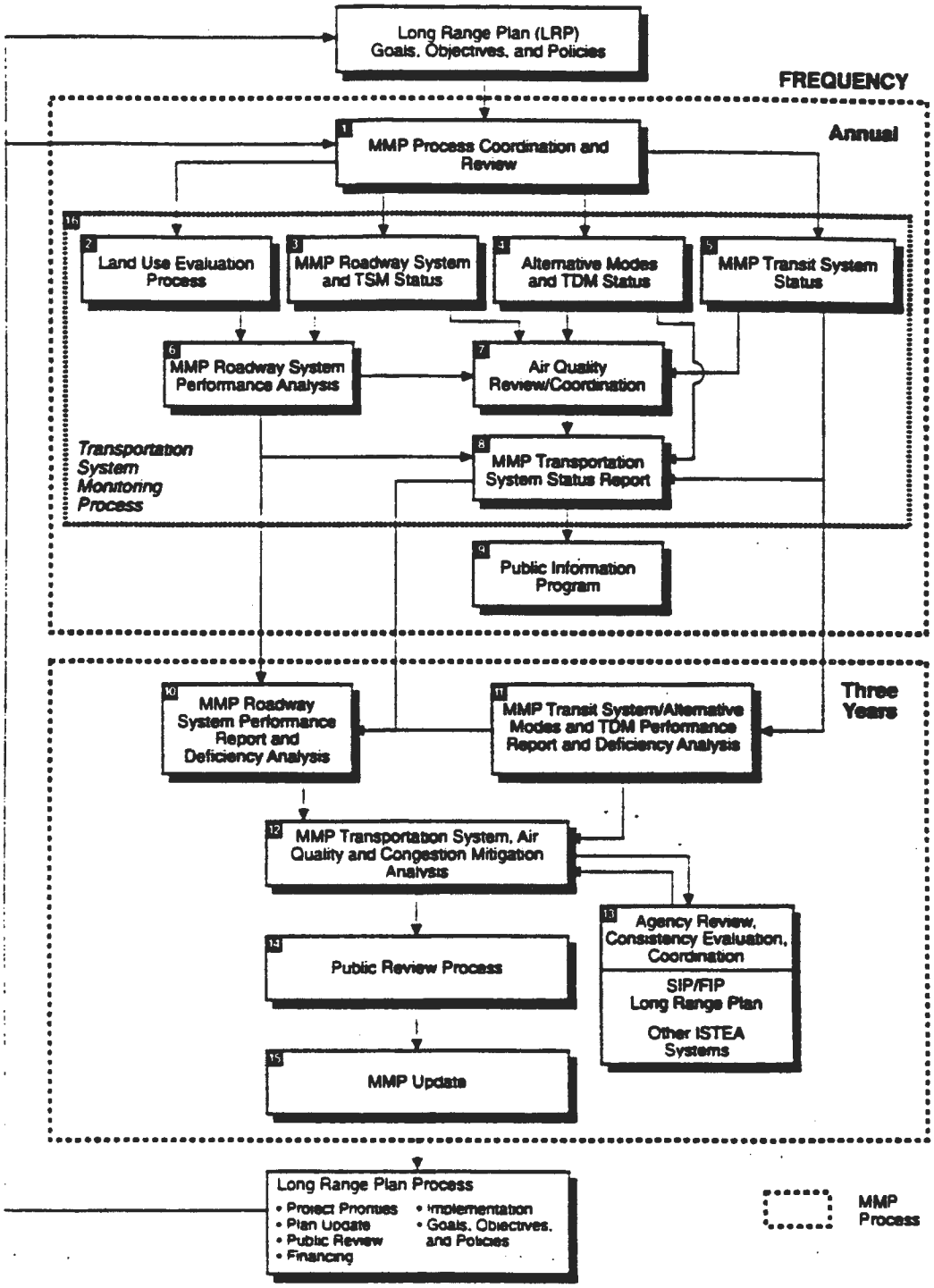
RELATIONSHIP BETWEEN MANAGEMENT SYSTEMS AND PLANNING (TUCSON, ARIZONA)



SOURCE: Pima Association of Governments

ACCESS OHIO GOALS

GOAL #1 SYSTEM PRESERVATION AND MANAGEMENT

Preserve and manage Ohio's existing multi-modal transportation system and resources more effectively and efficiently.

GOAL #2 ECONOMIC DEVELOPMENT AND QUALITY OF LIFE

Enhance Ohio's comparative economic advantage and quality of life, and promote the expansion and diversity of Ohio's economy, by creating and maintaining a safe, convenient, and efficient multi-modal transportation system that is sensitive to regional differences and is socially and environmentally responsible.

GOAL #3 COOPERATIVE PLANNING PROCESS AND TRANSPORTATION EFFICIENCY

Use a cooperative planning process to develop an effective and efficient transportation system and organizational decision-making process through the use of system management programs and public participation.

GOAL #4 TRANSPORTATION SAFETY

Improve the safety of Ohio's transportation resources by ensuring that the safety and well-being of customers are primary considerations in the design, development, and operation of the state's transportation investments.

GOAL #5 FUNDING

Seek stable revenues for the preservation and maintenance of existing facilities and services, plus the provision for new facilities and services that meet Ohio's transportation needs, and support efforts to develop new and innovative approaches to transportation funding.

MANAGEMENT SYSTEMS IN OHIO'S OBJECTIVES

GOAL #1: SYSTEM PRESERVATION AND MANAGEMENT

POLICY STATEMENT A: Preserve and maintain the existing transportation infrastructure in good, safe, and usable condition.

Initiatives

(1) **Increase the carrying capacity of Ohio's existing highway system by applying advanced technologies and management methods to improve traffic flow; reduce congestion; and promote energy conservation, safety, and convenience.**

a. Coordinate efforts to develop an Ohio Congestion Management System that will meet Federal requirements while addressing local needs to alleviate traffic congestion

(2) **Systematically replace, rehabilitate and improve highway infrastructure through a stablized ODOT annual highway construction program with a 1992 base of $760 million, and with growth to reflect the effects of inflation over the long-range plan.**

a. Enhance ODOT's pavement management system to meet Federal requirements and to address local needs

b Expand ODOT's bridge management system to meet the most current Federal standards

GOAL #2: ECONOMIC DEVELOPMENT AND QUALITY OF LIFE

POLICY STATEMENT A: Develop and use a system management process.

Initiatives:

(1) **Coordinate cooperative efforts by ODOT, ohio's MPOs, and transit systems to design and implement a Public Transportation Facilities and Equipment Management System (PTMS).**

a. Provide leadership and resources in working with all transit systems throughout Ohio to develop a flexible, but standardized, PTMS for asset management

b Maintain a centralized PTMS that can be used to identify and disseminate data regarding successful projects and innovative strategies.

(2) **Coordinate cooperative efforts by ODOT, Ohio's MPOs and affected agencies to implement a Congestion Management System (CMS).**

a. Define area boundaries for CMS efforts throughout Ohio

b Based on local needs, develop performance measures that are realistic and appropriate for Ohio

c. Refine data collection activities to support operation of CMS

d Enhance existing urban traffic forecasting models to perform multi-modal analyses and incorporate innovative features such as land use forecasting

e. Analyze historical CMS efforts to monitor the success of individual projects and the process as a whole

POLICY STATEMENT D: Foster intergovernmental transportation partnerships by encouraging improved coordination among state and local entities within Ohio, and by working cooperatively with governments and transportation agencies outside the state.

Initiatives:

(1) **Design and carry out an Intermodal Management System (IMS)**

a. Identify the responsible actions and define roles of ODOT and MPOs

b Further identify the potential intermodal elements of plans and programs developed by ODOT for all modes managed by the department; require similar identification by MPOs

c. Establish and implement a project evaluation process and criteria for intermodal transportation planning and programming

d Define initial and long-range scope of intermodal efforts, as well as performance standards within the state

e. Identify existing sources of data and fill in gaps as necessary to create a centralized IMS database

GOAL #4: TRANSPORTATION SAFETY

POLICY STATEMENT A: Improve the design, construction and maintenance of new and existing transportation systems and facilities.

Initiatives:

(1) **Design and implement a Safety Management System (SMS) addressing surface transportation that will assist the state in reducing fatal injury and property damage accidents among system users.**

a. Pool and coordinate existing resources of the ODOT and the Ohio Department of Highway Safety to create a comprehensive SMS addressing the driver, roadway, vehicle, and emergency medical response

b Identify the lead agency and establish mechanisms for the most cost-effective, cooperative efforts to identify safety deficiencies and develop effective countermeasures

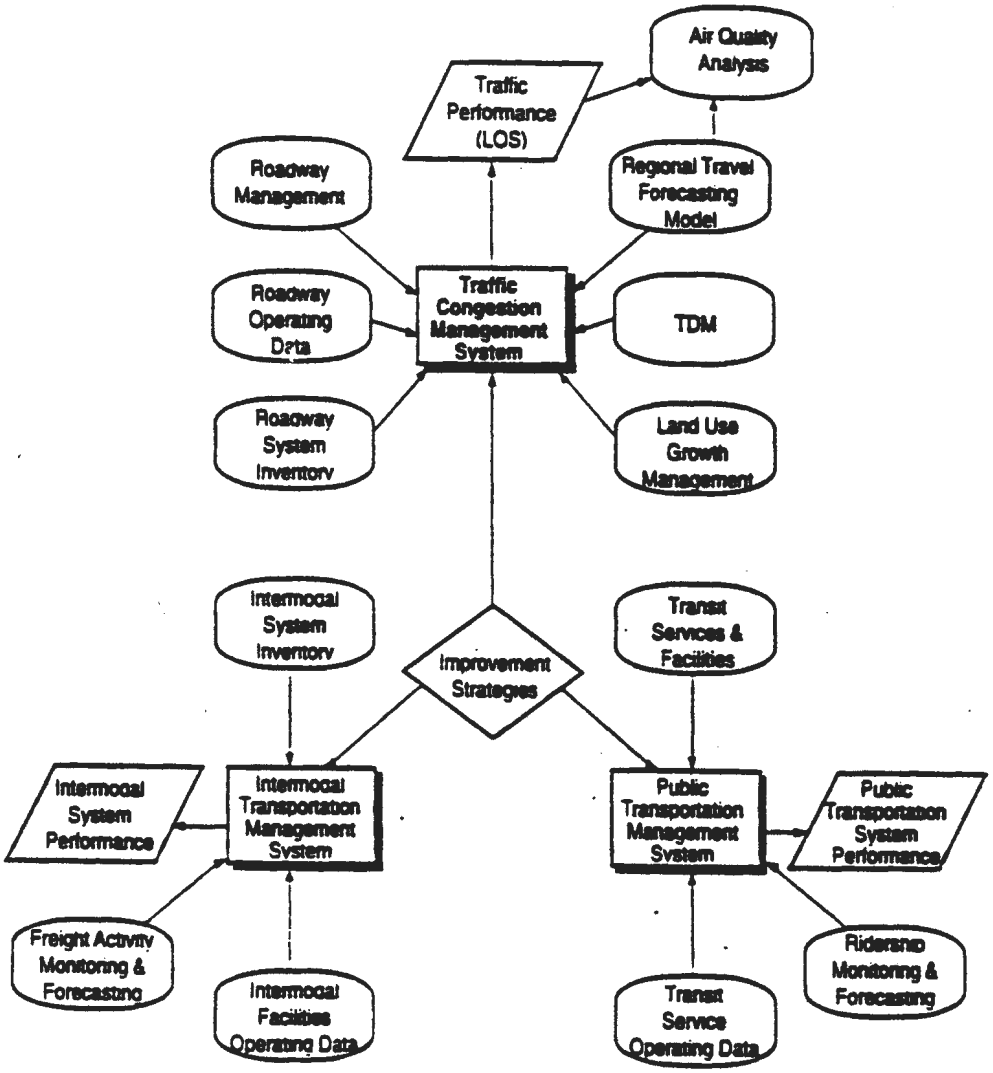
c. Establish measurable safety goals by system, area, and accident types

d Identify causes of past accidents and use team resources to implement countermeasures

COORDINATION/INTEGRATION AMONG MANAGEMENT SYSTEMS

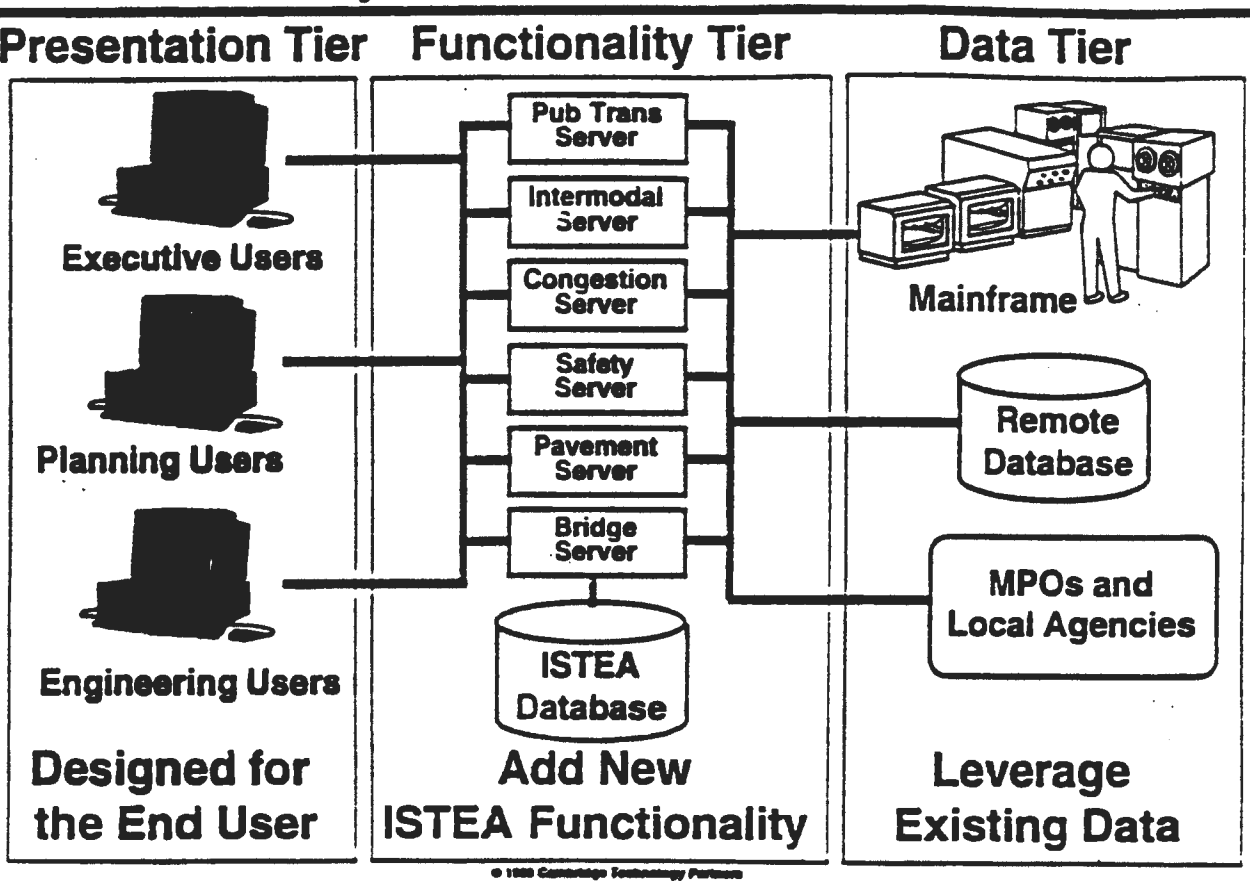
- GOALS/OBJECTIVES
- SYSTEM DEFINITIONS
- DATABASE MANAGEMENT/RELATIONAL DATABASE
- CROSS REFERENCING OF DATA
- SYSTEM USERS
- STRATEGIES/ACTIONS
- ANALYSIS TECHNIQUES

COORDINATION/INTEGRATION AMONG MANAGEMENT SYSTEMS



MICHIGAN'S SYSTEM ARCHITECTURE

Three Tier System Architecture



DATA COLLECTION MANAGEMENT PLAN

DATA	AGENCY	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Travel Surveys	MPO	•					•				
Parking Surveys	City DPW		•		•		•		•		•
Transit Counts	RTA	•	•	•	•	•	•	•	•	•	•
Highway Counts	SDOT	•	•	•	•	•	•	•	•	•	•
Attraction Surveys	MPO		•		•		•		•		•
Screenline Counts	MPO	•				•				•	
Freight Surveys	SDOT	•		•		•			•		
Corridor Counts	SDOT		•		•		•		•		•

PUBLIC INVOLVEMENT

- CMS, IMS, & PTMS ARE TO BE PART OF STATEWIDE AND METROPOLITAN TRANSPORTATION PLANNING

- PUBLIC INVOLVEMENT REQUIREMENTS:

"Public involvement processes shall be proactive and provide complete information, timely public notice, full public access to key decisions, and opportunities for early and continuing involvement...."

"Timely information ...to citizens, affected public agencies, representatives of transportation agency employees, private providers of transportation, other interested parties and segments of the community affected by transportation plans, programs, and projects...."

"...each State in cooperation with participating organizations (such as MPO's, Indian tribal governments, environmental, resource and permit agencies, public transit operators) shall provide a fully coordinated process including coordination of the following:

--Data analysis used in development of plans and programs with ...data analyses done as part of the establishment and maintenance of management systems...."

PERFORMANCE MEASURES

CMS

"....Since acceptable system performance may vary among local communities, performance measures shall be established cooperatively by State and affected MPO's or local officials in consultation with the operators of major modes of transportation in the coverage area."

IMS

"....Since the expectations and measurements of transportation quality of service vary between communities and industries, performance measures shall be established cooperatively at the State and local levels with private sector coordination, as appropriate."

PTMS

"....The measures and standards shall reflect State, metropolitan planning organization, and local transit operator goals and objectives for safety, efficiency, and reliability...."

ACCESS OHIO'S APPROACH

- LISTENING TO CUSTOMERS--ASK THE USERS, WHAT IS IMPORTANT TO THEM IN FREIGHT/PASSENGER MOVEMENT?

  --71 PUBLIC MEETINGS
  --16 MPO MEETINGS
  --SURVEY OF BUSINESSES AND FREIGHT COMPANIES

- ORGANIZATION--INVOLVEMENT OF PRIVATE INDUSTRY AND PUBLIC GROUPS

  --PRIVATE INDUSTRY GROUP FORMED

-Ohio Trucking	-Rail Passengers
-Public Transit	-MPO Representatives
-Assoc. of Railroads	-Airport Operators
-ODOT Representatives	-Water Port Operators

- ADOPTING GOALS AND OBJECTIVES

- ESTABLISH STANDARDS FOR PERFORMANCE

- DECISION-ORIENTED FOCUS--WHAT CAN BE MANAGED?

- INVENTORY

- STRATEGIC PLAN

WORK PLAN

- Describes Systems
- Identifies Major Activities
- Assigns Responsibilities
- Schedule

FUNDING ELIGIBILITY

- Policy vs Program Eligibility
- Eligible Projects
  --NHS
  --STP
  --CMAQ
  --Enhancement
- Other Funding Sources
- Specific Projects
  --Railroads
  --Intermodal Facilities
- Planning Eligibility
- Subsidization

STRATEGY FOR IMPLEMENTATION

- Establish Responsibilities
- Establish Coordination Mechanisms
- Establish Guidance Principles
- Establish Tasks
- Establish Timeline

SESSION 4

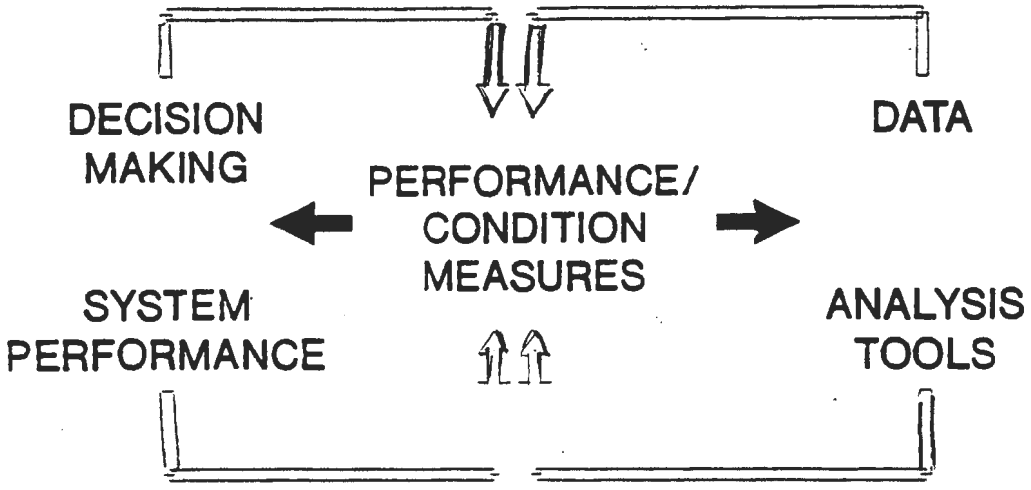
PERFORMANCE MEASURES

PERFORMANCE/CONDITION MEASURES

The identification of performance or condition measures is probably the most important task that must be undertaken in the development of management systems. Such measures are indicators of the transportation system's performance or condition compared to some locally accepted definition of what is acceptable. For example, a performance measure in a congestion management system would measure the extent to which congestion occurs on targeted portions of the transportation system, or the level to which the transportation system provides mobility or accessibility to the users of the system. Similarly, a condition measure in a PTMS would measure the condition of the targeted transit assets.

The reason why performance/condition measures are so important for the discussion on management systems is that in one sense they play such an important role in defining the type of information that will be provided to decision makers and the indication of system performance, while in another sense they define what data needs to be collected and the types of analysis tools that are needed to provide the required information.

The purpose of this section is to discuss the role that performance/condition measures play in effective use of the management systems, and provide examples of different types of performance measures that are being considered by transportation officials.



WHAT DOES THE INTERIM FINAL REGULATION SAY?

CMS

"Parameters shall be defined that will provide a measure of the extent of congestion and permit the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods. Since acceptable system performance may vary among local communities, performance measures shall be established cooperatively by State and affected MPO's or local officials in consultation with the operators of major modes of transportation in the coverage area."

IMS

"Parameters shall be identified that are suitable to measure and evaluate the efficiency of intermodal facilities and systems in moving people and goods from origin to destination. Parameters may include the total travel time, cost, and volumes for moving cargo and passengers, origins and destinations, capacity, accidents, ease of access, perceived quality, and the average time to transfer people or freight from one mode to another. Since the expectations and measurements of transportation quality of service vary between communities and industries, performance measures shall be established cooperatively at the State and local levels with private sector coordination, as appropriate."

PTMS

"Measures and standards suitable for evaluating the condition of the transit assets shall be developed. The measures and standards shall reflect State, metropolitan planning organization, and local transit operator goals and objectives for safety, efficiency, and reliability. The standards shall reflect the necessity to maintain transit assets in a good state of repair."

DIFFERENT WAYS OF CLASSIFYING PERFORMANCE MEASURES

A discussion of performance measures must necessarily begin with the identification of the target market.

For the *operators or owners* of the road system, there are clear operations-based measures which relate performance to traffic volume and speed characteristics, as well as system-based measures which relate traffic levels to system capacities.

For the *users* of the road system, there are different measures which reflect actual trip patterns and trip characteristics.

For *operations reporting*, the desired measures would rely on the traditional counts taken in every metropolitan area, e.g., traffic counts, screenline counts, toll counts, boarding counts for transit, etc.

For *systems monitoring*, the measures would need to identify both changes in breadth and depth of system performance, where breadth could be defined as the percent traffic affected and depth would be the total time (in minutes or hours) of delay. User-based monitoring would identify the differences between system measures and individual measures, such as changes in average travel times for specific origin-destination pairs taken within a context of known average trip lengths and mode split data for a metropolitan area.

In other words, there is a very big difference between system-oriented performance measures and user-oriented mobility performance measures. A good set of performance measures has the potential not only of improving the quality and consistency of public transportation policy, but also of improving public understanding of the congestion and mobility phenomena, leading to political support for policy improvements, and more balanced travel behavior by individual travelers.

SYSTEM PERFORMANCE ⟷ USER MOBILITY

SYSTEM/PERFORMANCE	Corridor	Area-wide/ Subarea	Forecastable
Time-Related Measures			
Average Travel Speed	●		
Average Travel Time	●		●
Average Travel Rate	●	●	●
Travel Time Contours		●	●
Origin-Destination Travel Time	●	●	
Percent Travel Time Under Delay Conditions	●	●	
Percent of Time Average Speed Below Threshold Value	●		
Volume Measures			
VMT/Lane Mile	●	●	
Traffic Volume	●	●	●
Congestion Indices			
Congestion Index	●	●**	
Roadway Congestion Index	●	●	●
TTI's Suggested Congestion Index	●	●	●
Excess Delay	●	●**	
Delay Measures			
Delay/Trip	●		
Delay/VMT	●		
Minute-miles of delay	●		
Delay due to construction/incidents	●		
Level-of-Service Measures			
Lane-miles at/of LOS "X"	●	●	
VHT/VMT at/of LOS "X"	●	●	
Predominant Intersection LOS	●		
Number of Congested Intersections	●		
Vehicle Occupancy/Ridership Measures			
Average Vehicle Ridership	●	●	
Persons/Vehicle	●	●	

**Weighted average

Source: Cambridge Systematics

EXAMPLES OF ROADWAY CONGESTION MEASURES

Area	Freeways	Principal Arterials
Alameda County, CA	Average speed < 35 mph for 15 min. or longer	LOS F using HCM Chapters 8 and 11
Los Angeles County, CA	LOS F using volume/ capacity ratio	LOS F using volume/capacity ratio (ICU Method)
San Diego Association of Governments	LOS E based on HCM Chapter 3	LOS E based on HCM Chapter 11
Chicago, IL	Presence detector occupied > 30% of time	Volume/capacity ratio equal to 1.0
Charlotte DOT, Charlotte, NC	N/A	v/c ≥ 0.95 severe congestion v/c ≥ 0.90 marginal congestion v/c ≥ 0.85 acceptable congestion
Seattle, WA	LOS F	LOS F using volume/capacity ratios and delay
Southwest Washington RTC	PM peak directional v/c > 0.90	PM peak directional v/c > 0.90
New York State DOT	LOS E based on v/c ratio	LOS E based on v/c ratio
North Carolina DOT	LOS D based on average speed and v/c ratio	LOS D based on average delay at intersections, and v/c ratio
Pima County, AZ	LOS D based on v/c ratio	LOS D - 2 hours (airport access) LOS E - 2 hours (CBD and university subareas) HCM Chap. 9 delay for intersections v/c ratio for segments

Sources: Pima Association of Governments (February 1993)

MOBILITY MEASURES

Mobility Index
Persons x Average Speed
Frequency of Transit Service
Travel Time (Origin-to-Destination)
Person Miles of Travel
Transit Hours Per Capita

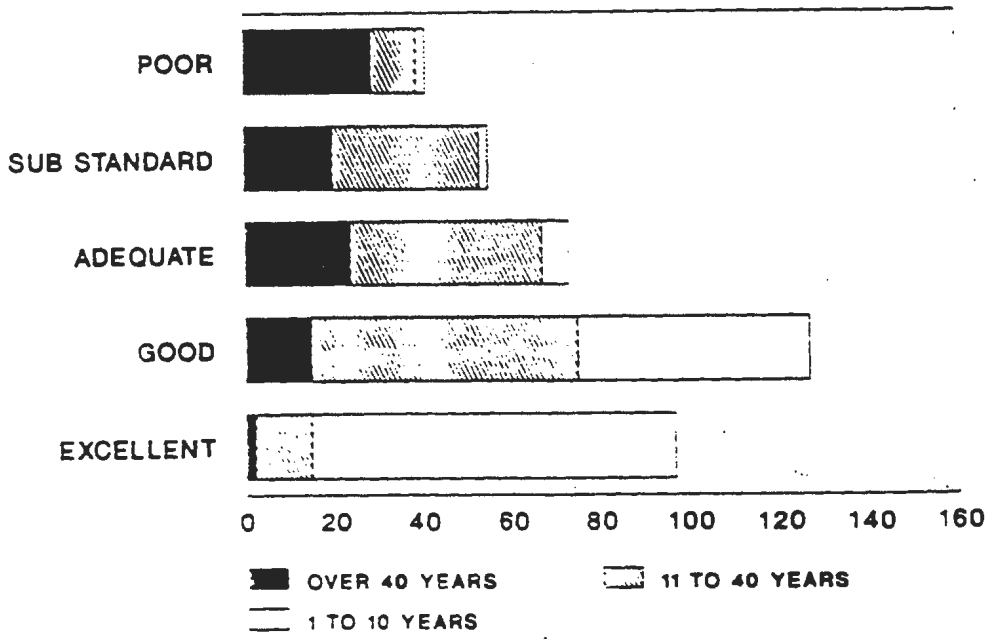
ACCESSIBILITY MEASURES

Population Served
Key Activity Centers Served
Route Spacing
TDM Program Coverage
Non-motorized Facilities Coverage
Percent Employees Within "x" Miles
Percent Employees Within "x" Minutes
Percent Low Income Within "x" Minutes of "y" Percent of Job Opportunities

CONDITION MEASURES

Condition Code	Category	General Definition
1	Bad	In sufficiently poor condition that continued use presents potential problems
2	Poor	Requires frequent major repairs (less than 6 months between major repairs)
3	Fair	Requires frequent minor repairs (less than 6 months between repairs) or infrequent major repairs (more than 6 months between major repairs)
4	Good	Elements are in good working order, requiring only nominal or infrequent minor repairs (greater than 6 months between minor repairs)
5	Excellent	Brand new, no major problems exist, only routine preventive maintenance

FACILITY CONDITION BREAKDOWN BY AGE



CRITERIA FOR SELECTING MEASURES

- Be measurable
- Have a clear and intuitive meaning, so that it is understandable to those who will use it and to non-transportation professionals
- Be acceptable and useful to transportation professionals
- Be comparable across time and between geographical areas (facilities, corridors, subareas, and metropolitan regions)
- Have a strong functional relationship to actual system operations, so that, once changes occur in system operations, changes to the system can readily be determined from it
- Be consistent with measures identified for other management systems
- Provide for the most cost-effective means of data collection
- Be theoretically and functionally related to other predictable measures (e.g. road performance characteristics) suggesting that it too might be forecasted with some success
- Where appropriate, provide for multiple indications of achievement of goals, e.g., reducing congestion and improving air quality
- Where appropriate, be based on statistically sound measurement techniques

Potential Performance Indicators . . .

CATEGORY	PERSON MOVEMENT MARKET	FREIGHT MOVEMENT MARKET
Mobility	• Mobility index $\left(\frac{PMT}{VMT} \times \text{avg. speed}\right)$ • V/C ratio (or LOS) • Lost time due to congestion (per trip or mile)	• Mobility index $\left(\frac{\text{Ton miles}}{\text{Veh. miles}} \times \text{avg. speed}\right)$ • Lost time (per trip or mile)
Financial	• AEC/person mile (owner cost) • User costs/person mile (user cost)	• AEC/ton mile • Average costs/ton mile (includes change in lost time)
Environmental	• Change in tons of pollution (or pollution/person mile) • Change in tons of green house gases (or green house gases/person mile) • Change in fuel consumption per person mile	• Change in tons of pollution (or pollution/ton mile) • Change in tons of green house gases (or green house gases/ton mile) • Change in fuel consumption per ton mile
Economic	• Jobs supported • GAP impacts • Economic costs of pollution, accidents, fatalities and lost time	• Jobs supported • GAP impacts • Economic costs of pollution, accidents, fatalities and lost time
Safety	• Accidents per person mile (or 1,000,000 person mile)	• Accidents per ton mile (or 1,000,000 ton mile)
Quality of Life	• Accessibility (choice of modes) for corridors and intermodal transfer facilities	
Other	• Person mile per capita, vehicle mile per capita, fuel consumption per capita	• Ton mile per capita, value per ton
Intermodal Transfer Facilities	• Person transfers per hour, average transfer time, capacity utilization (v/c) for access roads	• Tons transferred per hour, average transfer time, capacity utilization (v/c) for access roads

OHIO'S PERFORMANCE/STANDARD MEASURES

Category/Issue	Measure	Performance Standards	Rating
Transfer of bulk freight commodities between modes (individual measure by type of modal transfer)	Amount of time required to transfer bulk freight commodities between each type of mode (i.e. ship to rail, truck to rail, ship to truck, etc.)	< 5 minutes/ton <10 minutes/ton <15 minutes/ton >15 minutes/ton	100 50 25 0
Transfer of containerized freight between modes (individual measure by type of modal transfer)	Amount of time required to transfer containerized freight between each type of mode (i.e. ship to rail, truck to rail, ship to truck, etc.)	< 3 min./contnr. < 5 min./contnr. <10 min./contnr. >10 min./contnr.	100 50 25 0
Railroad/highway safety at grade crossings to ports, airport, intermodal facility or passenger terminal facilities	Accidents per Million Vehicles of Exposure (MVE)	< 2/MVE < 5/MVE < 8/MVE > 8/MVE	100 50 25 0
Park and Ride lots and parking lots at passenger terminal facilities	Volume to capacity ratio of parking spaces during peak periods	< 0.85 v/c ratio < 0.95 v/c ratio < 1.00 v/c ratio > 1.00 v/c ratio	100 50 25 0
Pedestrian access to passenger terminals including signage and an assessment of the extent of "seamlessness" of the facilities	Average walking time from parking facility to terminal platform or gate including time for review of signage	< 10 minutes < 15 minutes < 25 minutes > 25 minutes	100 50 25 0
Accessibility to and from major intermodal passenger terminals and major population and business centers	Travel time between terminal and the major activity centers	< 10 minutes < 20 minutes < 30 minutes > 30 minutes	100 50 25 0

INTERMODAL MANAGEMENT SYSTEM

PURPOSE: "Provide a basis for better integration ... al transportation facilities and services"

THROUGH:
> Connections;
> Choices;
> Coordination & Cooperation.

TO: "Deliver goods through better integrated and managed transportation facilities and systems to improve the coordination in planning and implementation of air, water, and the various land-based transportation systems."

VALUES: "We are concerned with the livability of people within Oregon due to impacts to our Economy, Air Quality, Congestion Management, Safety and Public Education through improved cooperation and strategic planning at State and local levels with private sector coordination."

OREGON BENCHMARKS: Improve Air Quality, Reduce Vehicle Miles Traveled, Reduce Peak Highway Congestion. Increase Access to Alternative Modes.

Key Elements	Weight	Key Result Area	Performance Measures
Cost		> Total shipping cost (producer to user)	> Cost Per Trip > Cost Per Ton Mile
Time		> Total time in transit (producer to user)	> Average Travel Time Per Trip
Accessibility/ Availability		> Shippers with reasonable access	> Capacity Restrictions > Average Transfer Time Between Modes > Perceived Deficiencies & Services Availability (Origin of goods to destination & alternative modes to ship)
Reliability		> Negative deviations of time & cost	> Delay Per VMT** > LOS for Intermodal Facilities (demonstrates transfer convenience) > Public Perception
Safety		> System disruption > Injury, death, property (product, equipment, infrastructure) loss	> Average Accident Caused Delay Per Trip > Average Accident Cost (property, injury, death) Per Trip > # Accidents (per trip, per year) > # Accidents Per VMT > (Some measure of public safety at terminals)

NOTES: Key Elements Apply to Local, Intercity, Interstate & International Levels.
Performance Measures Cover Land, Air & Water Intermodal Systems.
**VMT is commonly associated with truck travel, another form of measure may need to be developed.

PUBLIC TRANSPORTATION FACILITIES & EQUIPMENT MANAGEMENT SYSTEM

PURPOSE: "Manage & optimize transit facilities, equipment, and rolling stock in order to accommodate current and future ridership in a safe and reliable manner."

THROUGH:
> Identification & Inventory of Transit Facilities & Equipment;
> Identification of Transit Facilities & Equipment Conditions;
> Development of Useful Life Standards

TO: "Evaluate capital investment strategies to address current and future deficiencies in our Transit facilities and equipment in order to accommodate current and future ridership."

VALUES: "Improve the public transportation facilities & equipment with consideration to Public Investment, Population with Special Needs, and Air quality to be evaluated for incorporation into the metropolitan and statewide transportation plans and programs."

OREGON BENCHMARKS: Percentage of Oregonians living communities with daily scheduled intercity passenger bus, van, or rail services: Transit hours per capita per year in Oregon metropolitan areas, etc.

Key Elements	Performance Measures
Cost	> Annualized System Operating Cost > Annualized Improvements Cost
Investment	> Percent of Fleet Meeting Federal Replacement Guidelines > Percent Increase/Decrease in Transit Passenger Travel Miles vs. Dollars Invested in Rolling Stock > Facilities Condition Rating > Rolling Stock Condition Rating
Capacity	> % of Rolling Stock in Use vs. Total Rolling Stock Available (Spares Ratio)
Service Accessibility	> Percent of Fleet That's Accessible To Customers > Percent of Facilities That Meet ADA Standards > Number of Road Calls (Breakdowns) vs. Hours of Bus Service

AFFIC CONGESTION MANAGEMENT SYSTEM
rformance Measures

PURPOSE: "Develop, establish & implement on continuing basis, a CMS that identifies & assesses transportation system congestion & leads to implementation of strategies that provide efficient use of existing and future transportation facilities & enhance mobility of people and goods."

THROUGH:
> The identification of existing and future areas where congestion occurs or will occur;
> The identification of the causes of congestion;
> The evaluation of both traditional and non-traditional strategies for managing congestion.

TO: "Assess both user and non-user, internal and external effects of congestion, and to develop a plan to implement the most cost effective and reasonable multimodal strategies."

VALUES: "Enhance the mobility of people and goods through effective coordination between all levels of government and the private sector on land use, air quality and transportation planning decision."

OREGON BENCHMARKS: Air Quality, Percent of SOV's, Percentage of Access Oregon Highways built to handle traffic at a steady 55 mile-per-hour rate, etc.

Key Elements	Performance Measures
Travel Time	> Average Travel Time Meeting LOS Per Trip > Average Speed Within Peak Travel Times by Functional Classification
Delays	> Number of Delays Per Trip > Percent Incident Delays Per VMT > Annual Vehicle Delay Due to Recurring Congestion
User Cost	> Average User Cost Per Lane Mile Travelled
Capacity	> Volume of Traffic vs. Capacity of Functional Classification
Communication	> Customer Satisfaction Survey

EUGENE, OREGON'S PERFORMANCE MEASURES

Neighborhood	Composite Accessibility
Community	Composite Accessibility
Region	Composite Accessibility
Region	Number of Jobs Within "x" Minutes
Region	Number of Households Within "y" Minutes
Region & Beyond	Travel Time/Delay Volume/Capacity
Region & Beyond	LOS of Alternative Modes

FLORIDA'S IMS PERFORMANCE MEASURES

CAUSATIVE FACTORS	MEASURES
Utilization	Demand volumes/capacity usage
Accessibility	
--Convenience	Travel/dwell time to or at facility (minutes/hours)
--Modal Inventory	Number, type, service hours, headways, etc.
--Transfer/Coordination and Transfer Efficiency	Mode to mode (efficiency improvements)
--Modal Choice	Modal split-commodity/passenger volumes; O & D
Safety	Incidents per year

MONTGOMERY COUNTY'S MULTIMODAL MEASURES

Coverage	1.	% households within 1/4 mile of bus stops % households within 1/2 mile of rail stations
	2.	% jobs within 1/4 mile of bus stop % jobs within 1/2 mile of rail station
Frequency	1.	Average bus frequency
	2.	Average train frequency
Accessibility	1.	Ratio of sidewalk miles to street miles
	2.	Ratio of bikeway miles to street miles
	3.	Number of secure bicycle parking spaces
	4.	Number of park-and-ride spaces
Use	1.	% non-auto driver work origins
	2.	% non-auto driver work destinations
	3.	% walk/bike to Metro stations

$$ACI = \frac{\text{Sum } [(\text{volume/capacity})_i \times \text{VMT}_i]}{\text{Sum VMT}}$$

CALIFORNIA EXAMINATION OF PERFORMANCE MEASURES LINKAGE TO AIR QUALITY

Performance Measures Should:

- **Focus on multimodal mobility**
- **Measure should be applied county-wide**
- **Be based on existing data, and should be able to be implemented cost- effectively**
- **Easy for decision makers and the public to understand**
- **Relate to CMP/regional transportation/air quality objectives**
- **Demonstrate cause/effect of mobility improvements in relationship to emission reductions**
- **Allow flexibility**
- **Be proactive in addressing deficiencies**
- **Clearly define its relationship to modeling**

<u>Other ideas</u>

- **Allow different approaches for areas above and below 200,000**
- **Use LOS as trigger for deficiency plan development**

DEFINITION AND MEASUREMENT:	Measures relationship between volume and capacity on designated facilities. Recommend in definition: • Use all facilities above specified functional class, no exceptions; use links, not intersections. • Measure peak conditions, not daily. • Look at weighted system LOS as well as individual links
CONCERNS ADDRESSED:	
• Congestion	Reasonable method of gauging roadway congestion
• Air Quality	Inconsistent measure re. A/Q: Better LOS means better speed means lower emissions; however, if better LOS achieved through additional capacity, then VMT increases and A/Q may suffer.
• Mobility	Better LOS means higher speeds, but accessibility and travel time may not be improving because of land use dispersion.
• Multiple (non-SOV) Modes	Only reflects highway vehicular travel; greater use of higher occupancy modes could produce a better LOS, but effect is hard to discern.
• Consistency with Regional Goals	If regional goal is to limit growth in vehicle travel, may be in conflict.
ACCEPTANCE:	
• User Oriented	Addresses vehicle movement, not people. Does reflect driving conditions encountered.
• Understandable	LOS not inherently obvious, but broad use has resulted in reasonable level of public understanding.
• Objectivity	Objective, as long as consistently defined and applied.
COST/OPERATIONAL DIFFICULTY:	Easy because necessary analysis procedures and data sources well-established. Need volume information (from counts or forecasts) and respective capacities. Can get complex if intersection level of detail is included.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Is an informative measure, but alone doesn't present total picture. If used as a "monitoring" measure only, may signal problem when too late to repair. This concern can be removed through model forecasting of LOS. The threshold that is established is important.
• Local Accountability for Land Use	In near term. LOS can be aided through dispersed land use; may result in long term problems re. congestion solutions.
• Local Responsibility for Traffic	High as regards local problems, low as regards systemic problems.

MEASURE: Delay

DEFINITION AND MEASUREMENT:	Measured in minutes or hours of delay experienced by system users. For network of LOS facilities, compare travel time during congested period (peak) with uncongested (off-peak). Weight delay on each segment by volumes. This can be estimated through counts combined with travel time measurements, or models.
CONCERNS ADDRESSED:	
• Congestion	Good measure of congestion intensity on link or system, although doesn't give much insight as to cause.
• Air Quality	Tells about restricted flow and sub-optimal speeds, but doesn't address VMT reduction.
• Mobility	Good measure of ease/difficulty of personal (or goods) movement, but does not directly address accessibility.
• Multiple (non-SOV) Modes	As defined, only measures highway/vehicle travel. Could be expanded to include delay on transit also.
• Consistency with Regional Goals	Dispersed land use policies or capacity expansions could result in near-term delay reductions, but not be consistent with regional efficiency/air quality needs.
ACCEPTANCE:	
• User Oriented	Reflects time losses/savings to people, but is still oriented to vehicle users; could be measured for other modes
• Understandable	Fairly obvious meaning.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Can measure from manually-obtained data – don't require a model, though that can be a source. Can use floating car runs or license matching to determine travel times on designated facilities, peak vs. off-peak.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Not as diagnostic or scalable as LOS. Gives no insight to underlying land use and behavioral trends.
• Local Accountability for Land Use	As with LOS, delay can be aided by new capacity or dispersed land use.
• Local Responsibility for Traffic	Can't separate local contribution from external contributions.

MEASURE: Travel Time (Vehicle Only)

DEFINITION AND MEASUREMENT:	Measures travel time for traveler to move from one location to another. In this case, assumes measurement of time to travel from point to point in the designated network of facilities from which LOS is calculated. Must be evaluated relative to some datum or standard.
CONCERNS ADDRESSED:	
• Congestion	Lower travel time means less congestion, but must be related to distance context.
• Air Quality	Not a direct measure of pollution-causing congestion, or use of efficient modes.
• Mobility	Good measure of ease of movement for highway users; problem is that more capacity/dispersed land use can improve travel time in near term, but result in longer trip lengths and more travel time in the longer term.
• Multiple (non-SOV) Modes	This measure (vehicles only) focuses only on private vehicles.
• Consistency with Regional Goals	If regional goal is to limit growth in vehicle travel or manage land use, travel time improvements may be in conflict. It matters what modes are being used.
ACCEPTANCE:	
• User Oriented	Clearly reflects situation improvements to the traveler.
• Understandable	Fairly easy to understand, as long as basis well defined.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Can measure manually or with models. Manually, use floating car runs over specified facilities, or other techniques. With models, pick travel times off of data base for specified origin-destination pairs. Modest effort, but start up cost involved.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Has excellent potential but is not in popular use. Also, may show initial positive trends under capacity increase/land use dispersal programs which may lead to longer term degradation.
• Local Accountability for Land Use	Land use dispersal can lead to short term improvements in travel time.
• Local Responsibility for Traffic	Good measure of performance, but better at broadscale than highly localized scale. Can't control contributions from other jurisdictions.

MEASURE: Travel Time (All Motorized Modes)

DEFINITION AND SUREMENT:	Measures travel time not only for private vehicles, but also for transit and carpools. This becomes more complex because it is really more important to measure the reference trips from door to door, rather than just along a facility segment. Requires more complex measurements, and/or use of models. Must be evaluated relative to some datum or standard.
CONCERNS ADDRESSED:	
• Congestion	Lower travel time means less congestion/better service, but must be related to distance context.
• Air Quality	Not a direct measure of pollution-causing congestion, or use of efficient modes.
• Mobility	Good measure of ease of movement for travelers by all modes; capacity/dispersed land use conundrum encountered with vehicle travel time measure still applies for the most part.
• Multiple (non-SOV) Modes	Because this measure also includes transit and carpools, comparing their times gives insight into modal opportunities and investments.
• Consistency with Regional Goals	Travel time improvements – even if multimodally measured – may still mask near term slippage in management goals, though seeing relative improvements in alternative mode times would be a plus.
ACCEPTANCE:	
• User Oriented	Better than vehicle-only travel time, because reflects improvements in opportunities across modes.
• Understandable	Fairly easy to understand, as long as basis well defined.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	This may be more costly and complex than vehicle-only travel time. Would need to do comparative door-to-door measurements and distinguish among modes. For this would either have to use models, or invest in somewhat more intensive field data collection.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Has good characteristics, particularly as a multi-modal measure, but better at broad scale than highly localized scale.
• Local Accountability for Land Use	Again, land use dispersal can lead to short term improvements in travel time; however, having multiple modes measured gives insights as to whether modal treatments are in right direction.
• Local Responsibility for Traffic	As above.

MEASURE: Modal Split

DEFINITION AND MEASUREMENT:	Measures percent of people traveling by mode.
CONCERNS ADDRESSED:	
• Congestion	Not a measure of congestion.
• Air Quality	Good for air quality; measures percentage of people using alternative modes.
• Mobility	Limited value. May tell about traveler options, but doesn't tell about the quality of that service.
• Multiple (non-SOV) Modes	Directly indicates use of alternative modes. Quality of the experience of those modes is not known.
• Consistency with Regional Goals	Should not run counter to regional goals.
ACCEPTANCE:	
• User Oriented	Tells about travel beyond terms of the private vehicle, but does not reflect the quality of service or activity options.
• Understandable	Percentage of persons by mode is fairly easy to understand.
• Objectivity	Hard to distort measure, but depends on definition of what population is being measured.
COST/OPERATIONAL DIFFICULTY:	Not easy. Would have to perform surveys or use modeled estimates.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Good supporting trigger mechanism. Tells if shift in LOS is due to efficiency (greater use of higher-occupancy modes) or simply pushing the growth away. Not good as solo trigger measure.
• Local Accountability for Land Use	Useful but not free-standing measure to indicate whether land use patterns are integrated and being matched with travel alternatives.
• Local Responsibility for Traffic	Good barometer for traffic composition toward or away from more efficient modes; not as focused or all-encompassing as AVR or VMT per person trip.

MEASURE: Average Vehicle Occupancy

DEFINITION AND MEASUREMENT:	Measured as average number of occupants per private vehicle.
CONCERNS ADDRESSED:	
• Congestion	Poor measure of congestion, per se.
• Air Quality	Useful measure for air quality, since begins to demonstrate efficiency. Unfortunately, does not encompass transit and non-motorized modes.
• Mobility	Not a good measure of mobility.
• Multiple (non-SOV) Modes	Fair to good measure of use of other modes; limited in that does not incorporate transit or non-motorized.
• Consistency with Regional Goals	Generally would be consistent with regional efficiency and air quality goals; again, may be deficient in not including transit or non-motorized.
ACCEPTANCE:	
User Oriented	Goes beyond pure vehicle performance, but doesn't reflect quality of conditions to the user.
• Understandable	Easy to understand, except may be confusing in that transit use rates don't affect one way or the other.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Can measure from manually-obtained data, using roadside observations.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Useful supporting measure to LOS, because it helps to diagnose the nature of underlying problems, though there are more focused measures.
• Local Accountability for Land Use	Helps in land use accountability, because managed land use and higher occupancy levels should go hand in hand.
• Local Responsibility for Traffic	Helps in traffic accountability; lower occupancies generally equate to greater traffic.

DEFINITION AND MEASUREMENT:	Is similar to Average Vehicle Occupancy, but is more complete in that it encompasses all modes of travel. It measures total person trip movements relative to the number of vehicle trip movements to make those trips. Because it involves all travel and not just private vehicles, this measure cannot be made simply through roadside observations, but rather through work-end surveys or total travel system surveys. Work-end surveys (employee travel surveys) if incorporated as part of a TRO or ETRP requirement, could be an accurate and cost effective way to get this information. Systemwide surveys would be expensive, but models could be used.
CONCERNS ADDRESSED:	
• Congestion	Poor measure of congestion, per se.
• Air Quality	Good measure for air quality, since it demonstrates rates of use of higher occupancy and non-motorized modes.
• Mobility	Not a good measure of mobility because travel quality is not expressed.
• Multiple (non-SOV) Modes	Very good measure of use of alternatives modes.
• Consistency with Regional Goals	Generally should be consistent with regional efficiency and air quality goals.
ACCEPTANCE:	
• User Oriented	Goes beyond pure vehicle performance, but doesn't reflect quality of conditions to the user.
• Understandable	Relatively easy to understand with proper explanation.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Would be more data/cost intensive than vehicle occupancy. Best approach is to do work-end survey.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	A good supporting measure to LOS, because it helps to diagnose the nature of underlying conditions. Better than AVO because it encompasses all modes.
• Local Accountability for Land Use	Helps in land use accountability, because managed land use and higher transit utilization and occupancy levels should go hand in hand.
• Local Responsibility for Traffic	Useful in traffic accountability: lower occupancies and transit use generally equate to greater traffic.

MEASURE: Vehicle Miles of Travel (VMT)

DEFINITION AND SUREMENT:	Measures total vehicle travel on the highway system. Obtained by correlating vehicle counts on the designated LOS system of highways and multiplying by segment length.
CONCERNS ADDRESSED:	
• Congestion	Poor measure of congestion.
• Air Quality	Good measure for air quality, since VMT is direct component for emissions (also need vehicle trips and speeds).
• Mobility	Poor measure for mobility.
• Multiple (non-SOV) Modes	Poor measure for multi-modal use; describes only vehicle movements.
• Consistency with Regional Goals	Ties in well with regional measures of effectiveness.
ACCEPTANCE:	
• User Oriented	Means little to users.
• Understandable	Fairly easy to understand, as long as basis well defined.
• jectivity	As long as measurement rules are firm, OK.
T/OPERATIONAL DIFFICULTY:	Can measure manually or with models. Manually, correlate vehicle counts on LOS facilities with segment length. With models, can do more completely for system as a whole, and see distribution by functional class. Would not be substantially more difficult to calculate than LOS (use same basic information).
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Is a key component measure for air quality and system performance, but not particularly meaningful as a trigger mechanism.
• Local Accountability for Land Use	Land use dispersal can lead to increases in VMT, so it helps as a tracking measure. But there are better measures.
• Local Responsibility for Traffic	Fair measure of performance, good tracking measure: question meaning if cannot separate local from external traffic.

MEASURE: VMT per Person Trip

DEFINITION AND MEASUREMENT:	Measures the intensity of the traveling public's demand for vehicle travel. Measure tells how many vehicle miles of travel it takes to satisfy the population of person trips; because VMT is the scaling base, it is a better measure than AVR because it considers trip length. It is also a better measure than the more conventional PMT/VMT, which (because mileage is in the numerator and the denominator) cancels out the important effect of trip length in scaling travel demand.
CONCERNS ADDRESSED:	
• Congestion	Poor measure of congestion.
• Air Quality	Good measure for air quality because it relates vehicle use, mileage and trip length all in the same measure.
• Mobility	Fair measure for mobility. Tells about the extent of vehicle trip distance that people have to travel to satisfy their travel needs.
• Multiple (non-SOV) Modes	Good measure for multi-modal use; if alternate mode use is high, VMT per person will go down.
• Consistency with Regional Goals	Should be consistent with regional objectives.
ACCEPTANCE:	
• User Oriented	Means little to users. However, if VMT/trip were to go down, assuming travel time did not suffer, it would mean that people had to travel less to accomplish activities.
• Understandable	Not particularly intuitive on first inspection.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Would be fairly difficult to measure. Probably have to do with models.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Would be a good trigger since it captures demand, efficiency, mobility and multi-modal factors.
• Local Accountability for Land Use	Lower values of this measure would indicate responsible land use and transportation management decisions at work.
• Local Responsibility for Traffic	Good measure for traffic accountability; could address the local vs. external responsibility issue through routine manipulation of the model (given that a model would have to be used any way).

MEASURE: Person Throughput (P.T./Hr./Mile of Facility)

DEFINITION AND MEASUREMENT:	Measures efficiency of travel by showing how effectively an average mile of transportation facility capacity is in moving people. If the facility is either well-managed (TSM-type capacity enhancements) or carries a high percentage of transit/multi-occupant vehicle users, then throughput will be high. Throughput can be measured for just vehicles on a highway, or also for transit lines, or combinations.
CONCERNS ADDRESSED:	
• Congestion	Good measure of congestion. Reflects how many people the system is moving per unit of time, so higher values represent less congestion. Can overlook spot sources of congestion unless done on a link basis also.
• Air Quality	Fair to good measure for air quality; more throughput should mean higher speeds and greater use of efficient modes; but could also show positive under conditions of capacity expansions or land use shifts.
• Mobility	Fair measure for mobility; begins to reflect speed of travel to user.
• Multiple (non-SOV) Modes	Good measure for multimodal purposes; on densely used facilities, higher values indicate greater use of higher occupancy modes.
• Consistency with Regional Goals	Generally should be consistent with regional efficiency goals, may be in conflict with air quality goals under conditions of capacity expansion or land use dispersion.
ACCEPTANCE:	
• User Oriented	Has some value to users: while generally a system measure, higher values generally mean better transportation service.
• Understandable	Understanding is not intuitive.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Must measure with models, cannot do easily with manual methods and field data.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Fair as a triggering mechanism; is a very effective efficiency measure.
• Local Accountability for Land Use	Can be an inconsistent measure on land use.
• Local Responsibility for Traffic	Fair to good measure on traffic; again, may conceal sub-optimal land use or highway capacity decisions.

MEASURE: Accessibility – % Employees within X Minutes

DEFINITION AND MEASUREMENT:	Measures accessibility of each employment area/activity center by measuring the % or number of employees (or population) within a specified travel time. Can be reversed to measure % of jobs within x minutes of each residential area, or modified to address non-employment travel objectives.
CONCERNS ADDRESSED:	
• Congestion	Not a direct measure of congestion, but does reflect congestion to the extent that congestion reduces accessibility.
• Air Quality	Not a measure of air quality.
• Mobility	Measures not just the ease of travel, but also – and more important – the ease of achieving travel objectives.
• Multiple (non-SOV) Modes	Can be measured for each travel mode, so long as the requisite calculations are carried out.
• Consistency with Regional Goals	Should not run counter to regional goals.
ACCEPTANCE:	
• User Oriented	Clearly reflects situation improvements to the trip maker.
• Understandable	Relatively easy to understand, with proper explanation.
• Objectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Requires network analysis programs and techniques to develop efficiently, but travel demand models are not needed. Manual computation is possible but inefficient.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Useful in that it provides a direct measure of balanced land use benefits along with reflecting congestion impacts, both measurable at the local area. Must be evaluated relative to some standard.
• Local Accountability for Land Use	Directly measures the benefit of balanced land use at both the local and regional levels.
• Local Responsibility for Traffic	Indirectly reflects the impacts of congestion on local areas, but can't separate local contribution from external contributions.

MEASURE: Accessibility -- % Employees within X Miles

DEFINITION AND SUREMENT:	Measures accessibility of each employment area/activity center by measuring the % or number of employees (or population) within a specified distance. Can be reversed/modified as described for the minutes-based accessibility measure.
CONCERNS ADDRESSED:	
• Congestion	Not a measure of congestion.
• Air Quality	Measures the potential for VMT savings afforded by reducing travel distances and vice-versa.
• Mobility	Measures the ease of achieving travel objectives, but only to the extent that speeds are uniform.
• Multiple (non-SOV) Modes	Measure is not mode-specific.
• Consistency with Regional Goals	Should not run counter to regional goals.
ACCEPTANCE:	
• User Oriented	Reflects benefit of having travel objectives close at hand.
• Understandable	Relatively easy to understand.
,ectivity	As long as measurement rules are firm, OK.
COST/OPERATIONAL DIFFICULTY:	Can be measured manually, with GIS, or with a highway network analysis program used in combination with population and employment data.
KEY POLICY QUESTIONS:	
• Value as "Triggering Mechanism"	Useful as a relatively easy local area measure of balanced land use benefits, but does not address congestion.
• Local Accountability for Land Use	Measures the potential for VMT reduction as a benefit of balanced land use.
• Local Responsibility for Traffic	Not a measure of congestion.

SESSION 5

IDENTIFICATION AND EVALUATION OF STRATEGIES

INTRODUCTION

Given their integration into the systems planning process, the management systems play an important role in identifying and evaluating actions that can be implemented to solve identified problems. And as was noted in the previous section on performance measures, actions targeted at identified problem locations can originate from several of the management systems.

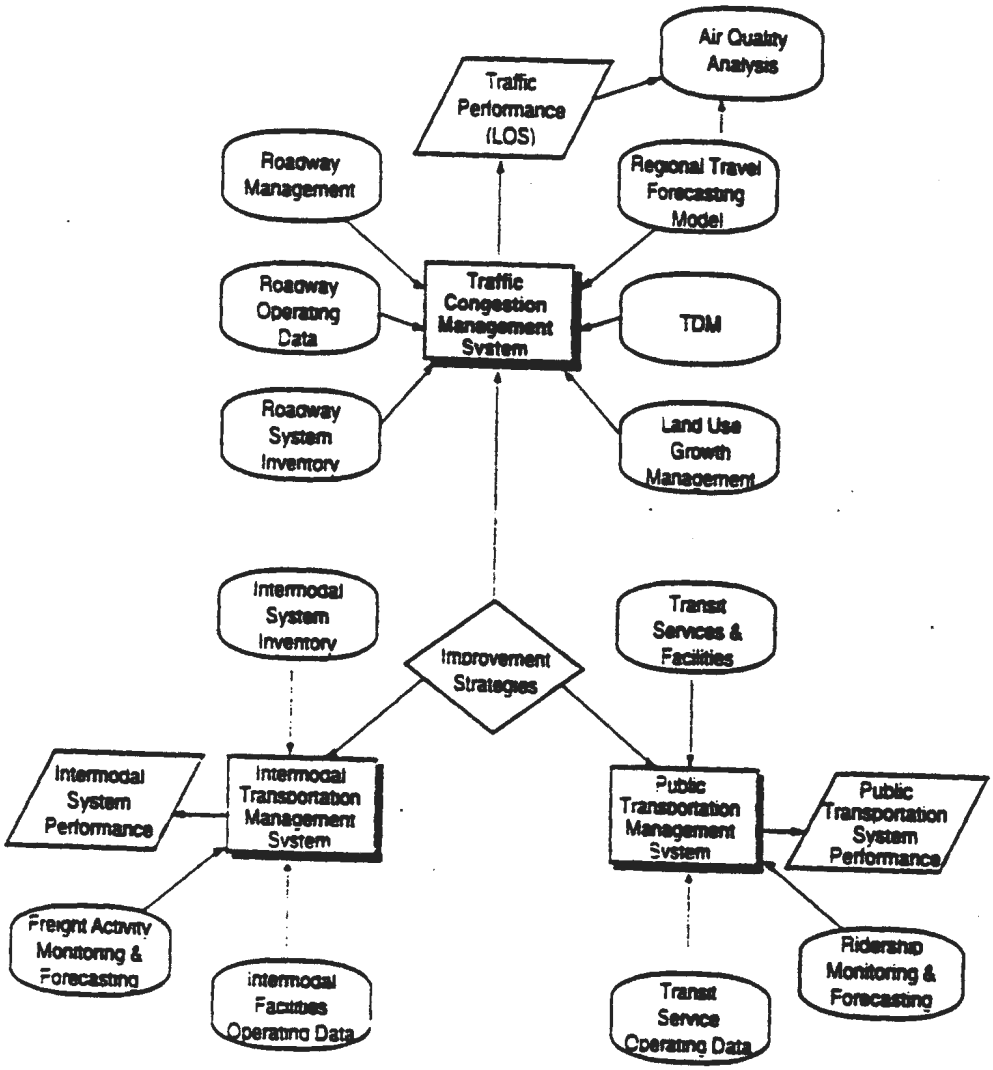
The purpose of this session is to provide participants with an overview of the different types of actions and strategies that can result from the management system process. The identification of problem locations, and the subsequent analysis and evaluation of strategies will be highlighted.

POINT OF DEPARTURE

- **LINKED TO PLANNING PROCESS**
- **INPUT INTO DECISION MAKING**
- **ACTIONS/STRATEGIES CAN CONTRIBUTE TO SOLVING MANY PROBLEMS**
- **PERFORMANCE MEASURES LINKED TO KEY CONCERNS**
- **MANAGEMENT SYSTEMS WORKING IN INTEGRATED FASHION**

  e.g., need identification through CMS and IMS will establish expansion requirements; PTMS will establish replacement priorities and schedules

MANAGEMENT SYSTEMS LEADING TO STRATEGIES



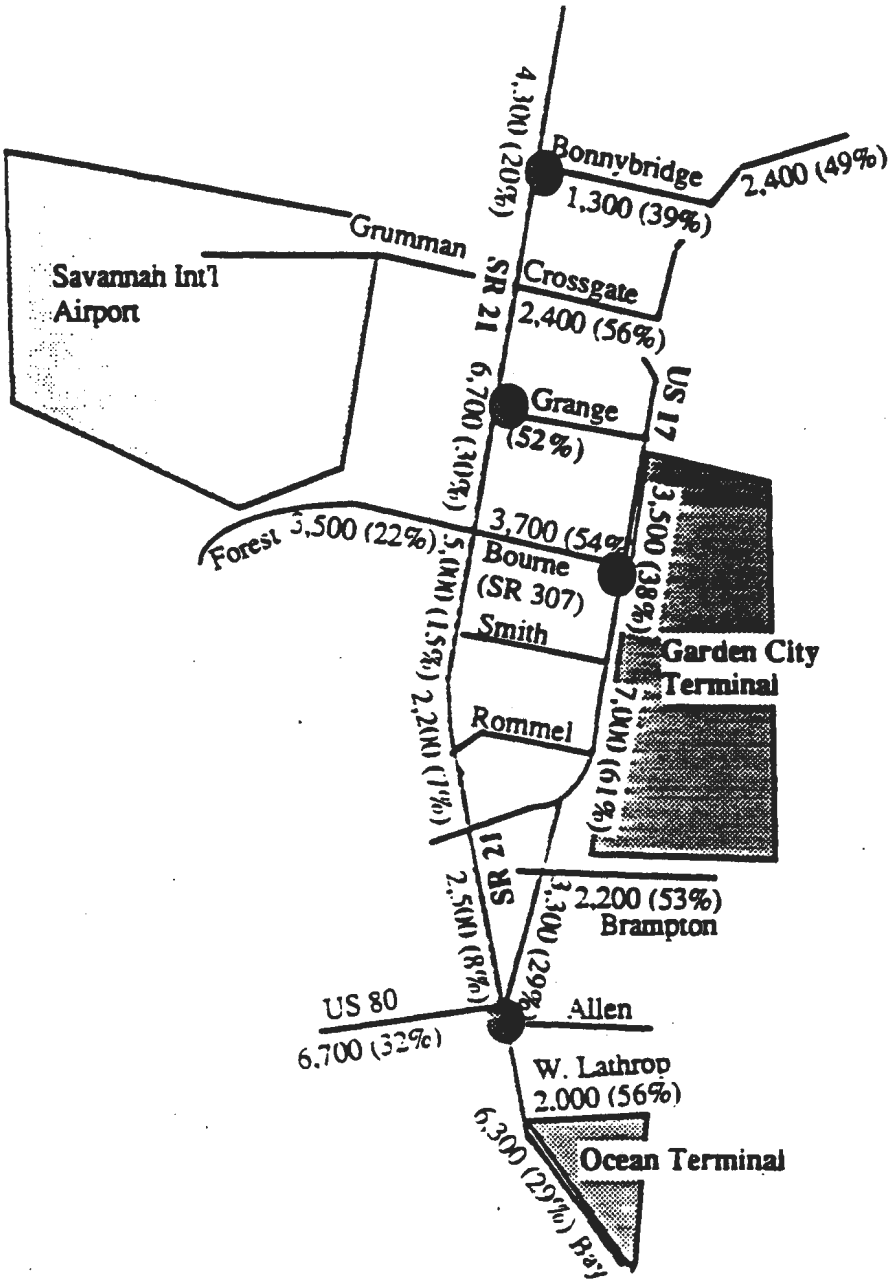
OHIO DOT'S CORRIDOR IDENTIFICATION

Criteria	Weight
Average Daily/Yearly Traffic	25%
A Commercial Truck Traffic	(20%)
B Class I/II Freight Rail	(5%)
Population	20%
Economic Activity	30%
A Manufacturing Establishments	(10%)
B Manufacturing Employment Density	(10%)
C Number Employees	(10%)
Trade/Intermodal Centers	15%
Natural Resources/Agriculture	10%
A Natural Resource Centers	(5%)
B Agribusiness Centers	(5%)

USE OF GIS PERMITS "COMBINED FACTORS" IDENTIFICATION

SAVANNAH EXAMPLE

Truck Densities

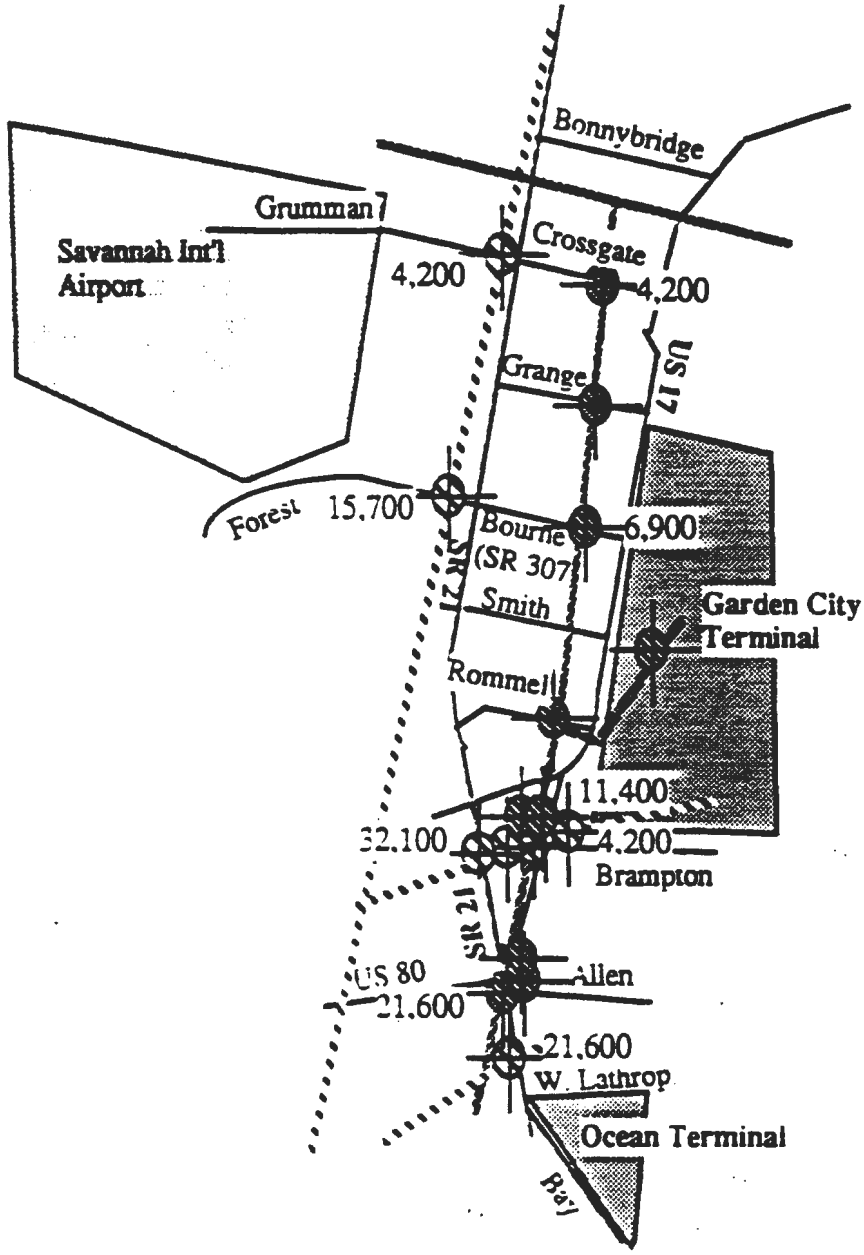


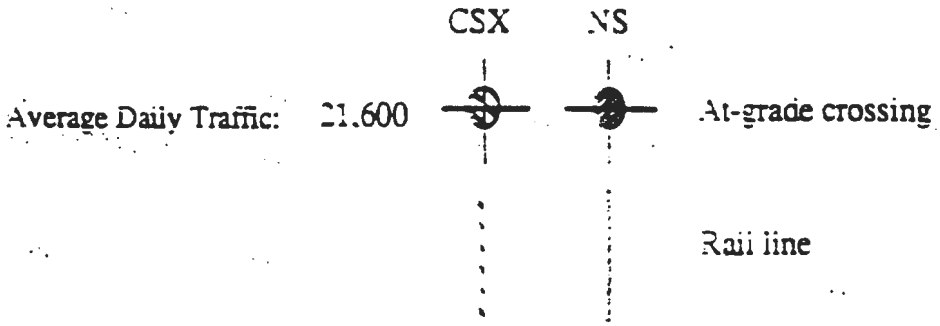
● Intersection with a Rush Hour Level of Service of "E" or "F" in at least one direction

6,300 (29%) ← Percent of total volume represented by trucks

Average trucks per day (1989)

At-Grade Rail Crossings



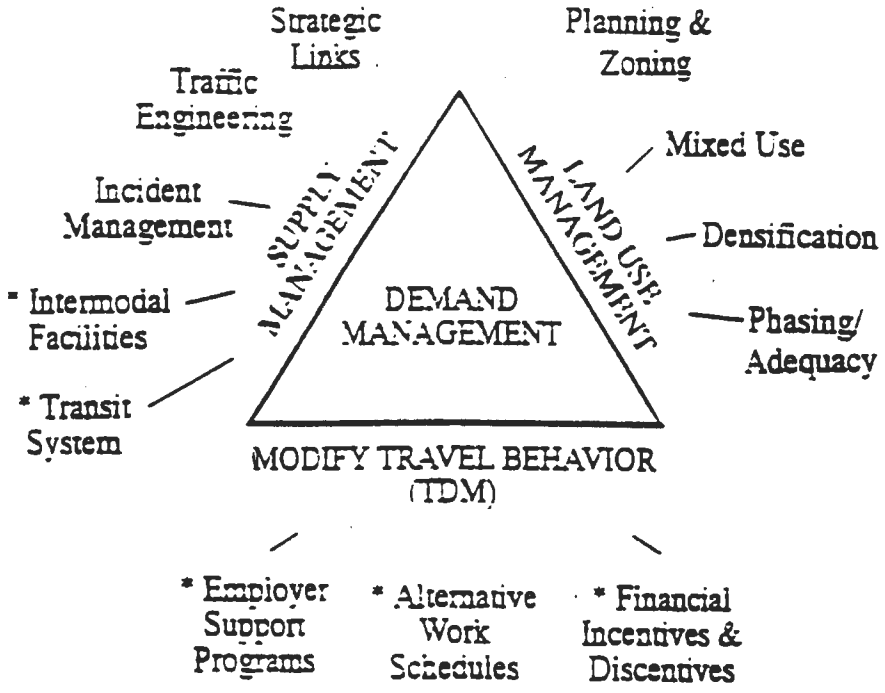


TYPES OF STRATEGIES

CMS STRATEGIES

- Transportation demand management
- Traffic operational improvements
- High occupancy vehicle measures
- Public transit capital and operational improvements
- Nontraditional modes (e.g., bicycles and pedestrian facilities)
- Congestion pricing
- Growth management and activity center strategies
- Access management techniques
- Incident management
- Intelligent Vehicle-Highway System technologies
- Addition of general purpose lanes

TRAVEL DEMAND MANAGEMENT



IMS STRATEGIES

"Statewide and local strategies and actions that imoprove the intermodal efficiency for the movement of people and goods shall be developed and evaluated. Methods for increasing productivity and the use of advanced technologies (such as high speed rail) and innovative marketing techniques (such as just-in-time delivery) shall be evaluated where appropriate. The evaluation program shall determine what project or combination of projects and actions would most effectively improve the intermodal productivity of transportation systems. in terms of the established performance measures. for both the short and long term."

PTMS OPTIONS

- *Refurbishment*

  Equipment/facilities restored to adequate levels of performance without the necessity for major replacement of parts. Refurbishment should result in the capacity to sustain existing system performance.

- *Rehabilitation*

  Higher level of investment such that worn or weakened equipment/facilities are replaced with new parts having basically the same design/function as the original equipment.

- *Modernization*

  Higher level of investment required when original equipment/facilities are replaced with new parts having basically the same design/function as the original equipment.

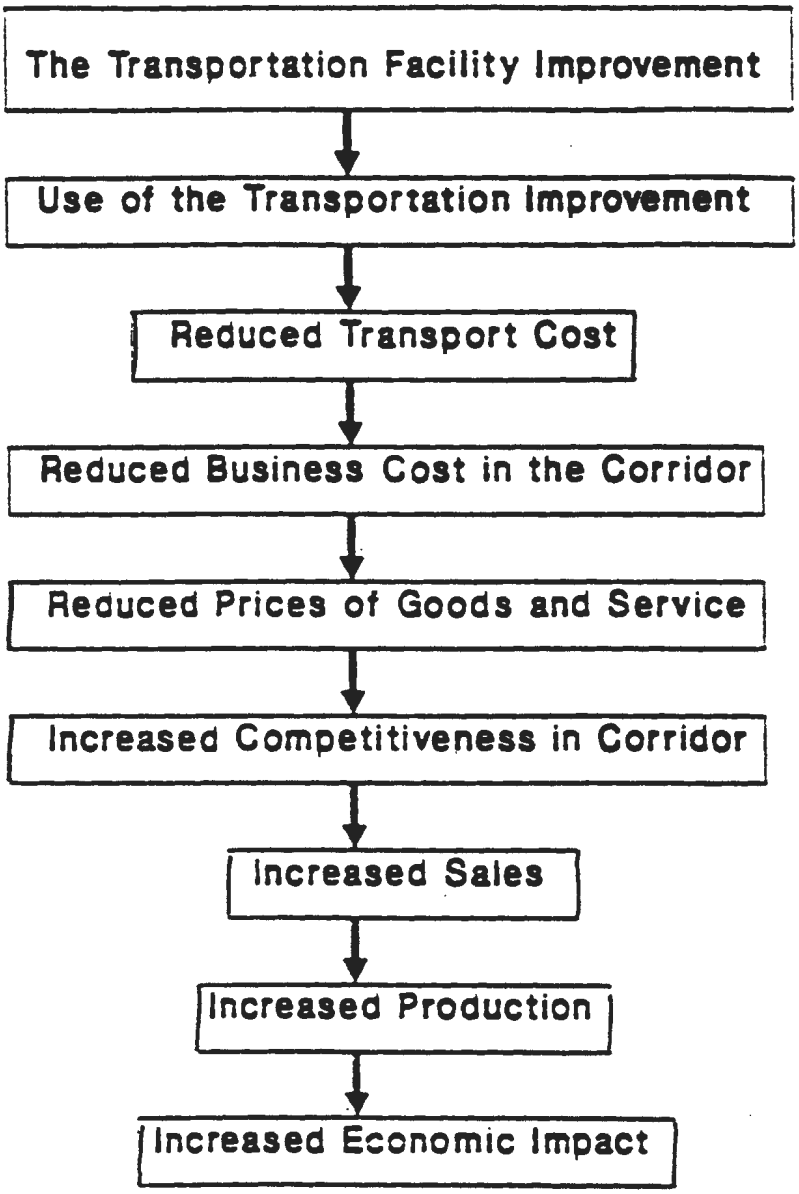
LEVELS OF ASSESSMENT
(Depending on Context)

- International/Global Market
- Inter-State Corridors
- State
- Regional (Metropolitan Planning)
- Corridor/Subarea
- Site

TYPES OF ANALYSIS TOOLS

- Econometric Models
- Input-Output Models
- Logistics Models
- Travel Demand Forecasting
- Elasticity-based Models
- Simulation Models
- Sketch Planning Tools
- Commodity Flow Models
- Impact Models (e.g., Air Quality)
- Capacity and Level of Service Analysis

Competitive Position Principles



LINKAGE TO AIR QUALITY CONSIDERATIONS

- For carbon monoxide and ozone nonattainment areas, the CMS will provide appropriate levels of analysis for all reasonable travel demand reduction and operational management strategies where SOV capacity will be increased.

- Other TDM and operational management strategies appropriate for the corridor shall be identified through the CMS.

- CMS strategies in nonattainment areas shall be developed in coordination with the transportation control measures of the State Implementation Plan.

FEEDBACK IN CMS

"A process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures shall be implemented. The results of the evaluation shall be provided to decisionmakers to provide guidance on selection of effective strategies for future implementation."

PROCESS EVALUATION

- ACTION/STRATEGY ASSESSMENT
- TYPES OF INFORMATION/DATA
- AGENCY ROLES/RESPONSIBILITIES
- TOOLS, TECHNIQUES AND PROCEDURES
- TAKE ADVANTAGE OF NEW TECHNIQUES AND TECHNOLOGIES (e.g. DATA COLLECTION)

KEY QUESTIONS FOR PROJECT EVALUATION

- **How effective has project been in meeting objectives? (Note from whose perspective?)**
- **Is the project cost effective?**
- **What lessons can be gained from the implementation strategy?**
- **Based on our experience, what characteristics of future situations are necessary for similar projects to be successful?**

PRIVATE SECTOR vs. PUBLIC SECTOR PERSPECTIVES

PROJECT/STRATEGY EFFECTIVENESS

TDM and HOV Strategies

- Surveys in work place
- O-D/market surveys
- AVR/occupancy counts
- Travel time studies

TSM and Operational Strategies

- LOS measurement
- Travel time and delay

Incident Management

- Change in incident duration
- LOS on targeted road

Transit

- AVR/Person flow
- Travel time
- Accessibility by income category

Capacity Expansion

- Facility/corridor volumes and LOS
- Facility/corridor travel time
- Facility/corridor vehicle occupancy
- Over long term, effect on land use

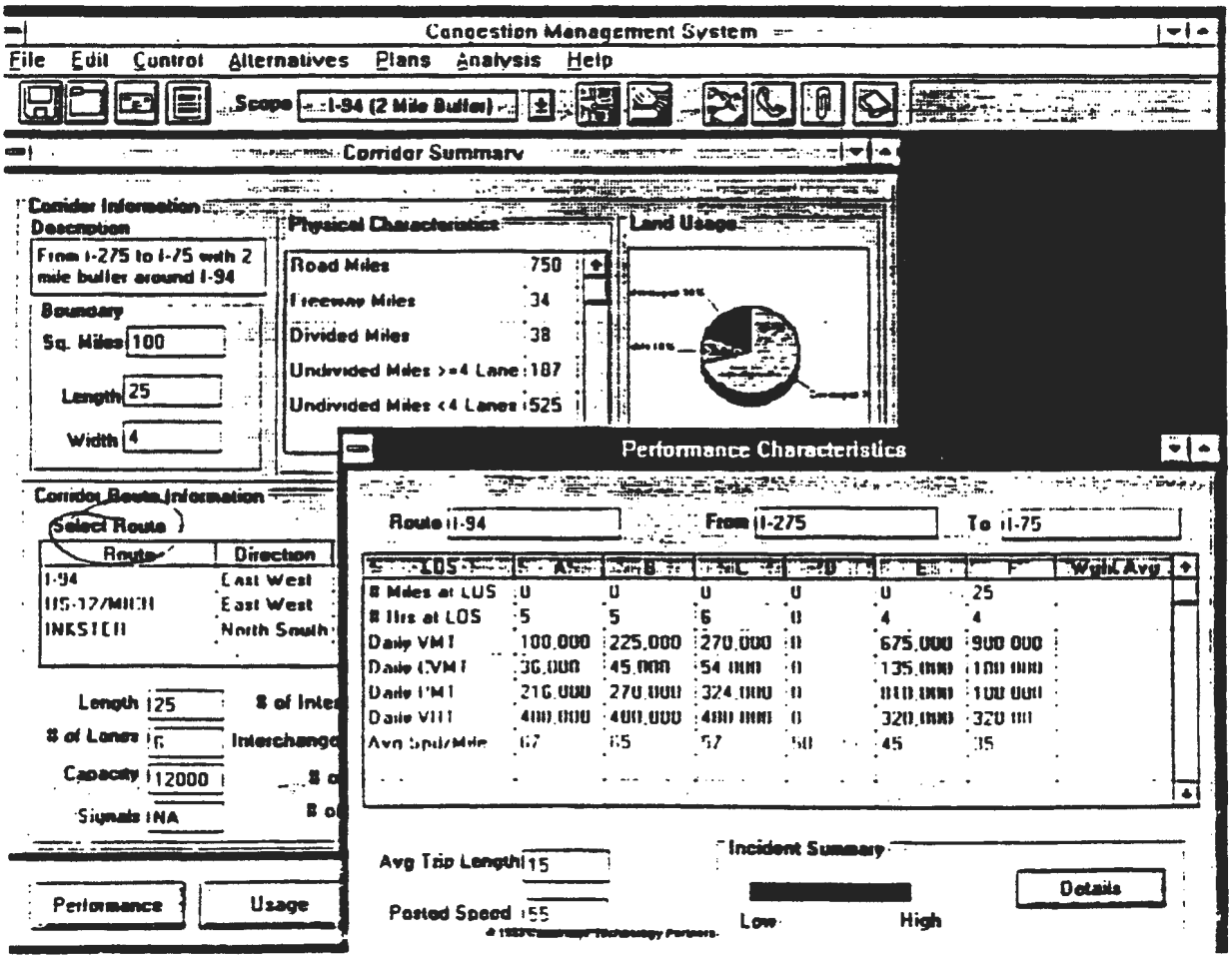
IVHS

- Travel time/delay reduction
- System efficiency

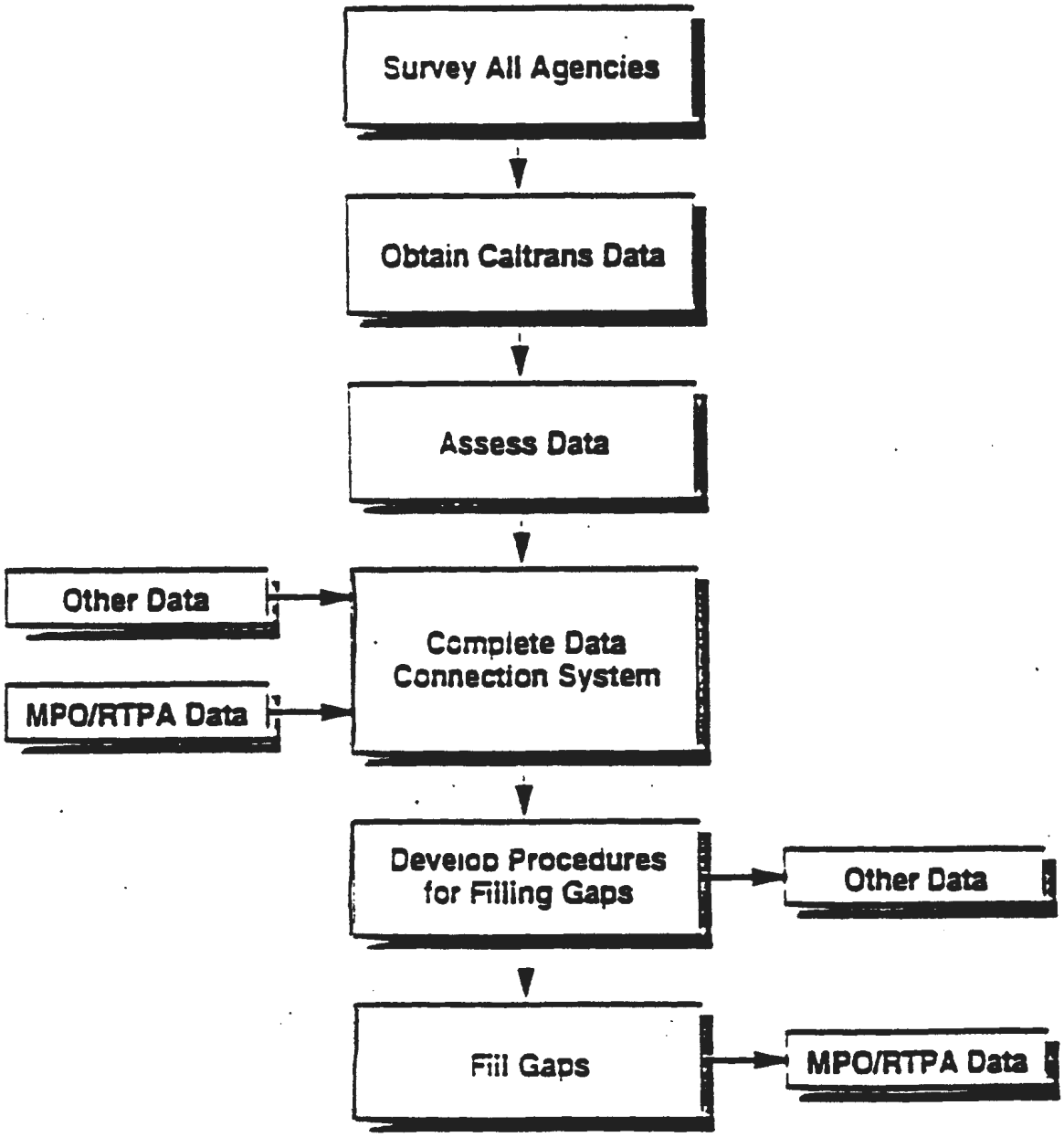
SYSTEM PERFORMANCE MONITORING

- SCHEDULE OF DATA COLLECTION/INFORMATION FLOW
- AGENCY RESPONSIBILITIES (DATA COLLECTION STRATEGY)
- DISPLAY AND USE OF PERFORMANCE INFORMATION

MICHIGAN DOT APPROACH



DATA COLLECTION STRATEGY



DATA COLLECTION MANAGEMENT PLAN

DATA	AGENCY	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Travel Surveys	MPO	•					•				
Parking Surveys	City DPW		•		•		•		•		•
Transit Counts	RTA	•	•	•	•	•	•	•	•	•	•
Highway Counts	SDOT	•	•	•	•	•	•	•	•	•	•
Attraction Surveys	MPO		•		•		•		•		•
Screenline Counts	MPO	•				•				•	
Freight Surveys	SDOT	•		•		•			•		
Corridor Counts	SDOT		•		•		•		•		•

INSTITUTIONAL RESPONSIBILITIES

REQUIREMENT	RTC	LOCAL AGENCIES
General		
Provide Policy and Technical Forums	Lead	Participate
Policy Development (RTP, RTIP, SIP, etc.)	Coordinate	Participate
Conflict Resolution	Lead	Participate
Bi-State Agreements	Lead	Participate
Coordinate Policy/Plan Submission	Lead	Participate
Area of Consideration and Monitoring Network		
Provide Forum	Lead	Participate
Identify Geographic Areas	Lead	Participate
Identify Land Use Activities	Coordinate	Participate
Identify Regional Network	Lead	Participate
Identify Key Subareas	Coordinate	Participate
Identify Critical Links	Coordinate	Participate
Performance Evaluation System		
Provide Forum	Lead	Participate
Define Performance Measures	Lead	Participate
Define Performance Standards	Lead	Participate
Data Collection and Monitoring		
Provide Forum	Lead	Participate
Determining Collection Methodology	Coordinate	Participate
Provide Link Traffic Counts	Coordinate	Participate
Provide Link Forecasts	Lead	Participate
Provide Transit Capacity	Coordinate	Participate
Provide Transit Ridership	Coordinate	Participate
Provide Vehicle Occupancy Data	Coordinate	Participate
Provide Link Descriptors (length, # lanes)	Coordinate	Participate
Provide Link Capacities	Coordinate	Participate
Performance Evaluation		
Provide Forum	Lead	Coordinate
Assess Current Performance Levels	Lead	Coordinate
Assess Future Performance Levels	Lead	Coordinate
Track Performance Change	Lead	Coordinate

INSTITUTIONAL RESPONSIBILITIES

REQUIREMENT	RTC	LOCAL AGENCIES
Identification and Evaluation of Improvement Strategies		
Provide Forum	Lead	Participate
Propose Strategies	Coordinate	Participate
Evaluate Strategies	Coordinate	Participate
Coordinate Results	Coordinate	
Implementation		
Provide Forum	Lead	Participate
Develop Programming Criteria	Coordinate	Participate
Develop Implementation Plans	Coordinate	Participate
Implement Strategies	Participate	Lead
Data Management		
Develop Data Base	Lead	Participate
Develop Data Definitions Format, Submission Protocol	Lead	Participate
Develop System Functionality (V/C calculations, aggregations, Reports, etc.)	Lead	Participate
Develop Data Dissemination Methods	Lead	Participate
System Evolution		
Provide Forum	Lead	Participate
Propose New Performance Measures	Lead	Participate
Use Additional Data (travel time, VMT/VHT, area-wide indices)	Coordinate	Participate
Further Integrate with Other Management Systems	Lead	Participate

Lead: *Policy involvement/development*
Coordinate: *Combine information, collect data/conduct analysis*
Participate: *Contribute information, data, or analysis*

DUE: SUBPART: MANAGEMENT SYSTEMS: Key Dates

TRAFFIC CONGESTION (CMS)

	500.509	CMS Compliance Schedule
10/1/94	(a)	Work plan with activities, responsibilities, schedule for CMS in nonattainment TMAs; collect data in critical areas
10/1/95(#)	(b)(1)	System fully operational in nonattainment TMAs and used in MPO and state TIP development
	(b)(2)	System design complete or underway in other areas; full-scale data collection underway
10/1/96	(c)	CMS fully operational in all areas; in use when developing MPO and state TIPs

PUBLIC TRANSPORTATION (PTMS)

	500.609	PTMS Compliance Schedule
10/1/94	(a)	Work plan for PTMS identifying activities, responsibilities, and schedule
10/1/95	(b)	Condition measures and data system structure established; and data collection underway
10/1/96	(c)	PTMS fully operational and in use for state and MPO TIP development

INTERMODAL (IMS)

	500.709	IMS Compliance Schedule
10/1/94	(a)	IMS work plan with activities, responsibilities, and schedule developed; inventories and data collection initiated
10/1/95	(b)	Performance measures and standards established; system design completed or underway; data collection underway
10/1/96	(c)	IMS fully operational and in use when developing MPO and state TIPs

TRAFFIC MONITORING SYSTEM FOR HIGHWAYS (TMS/H)

	500.809	TMS/H Compliance Schedule
10/1/94	(a)	Work plan for TMS/H with activities, responsibilities, schedule for use on NHS
10/1/95(*)	(b)	TMS/H for the NHS fully operational and in use; TMS/H for other roads under development
10/1/96	(c)	TMS/H fully operational and in use for all public highways

(#) - TMA nonattainment areas and MPO dates of significance
(*) - NHS dates of significance

Date:		MANAGEMENT SYSTEMS: Compliance Schedule Dates
6/1/94	500.113(c)	State requests for acceptance of existing management system(s) due; FHWA review/respond in 90 days
9/30/94	500.107(b)	Governor must notify FHWA Division Administrator of the certifying official(s)
10/1/94	500.709(a)	IMS work plan with activities, responsibilities, and schedule developed; inventories & data collection begun
10/1/94	500.309(a)	Adopted BMS work plan with formalized objectives, major activities, responsibilities, and schedule
10/1/94	500.209(a)	PMS work plan with major activities, responsibilities, and schedule developed and adopted
10/1/94	500.509(a)	Work plan with activities, responsibilities, schedule for CMS in nonattainment TMAs; collect data in critical areas
10/1/94	500.409(a)	SMS work plan with major activities, responsibilities, and schedule developed and adopted
10/1/94	500.609(a)	Work plan for PTMS identifying activities, responsibilities, and schedule
10/1/94	500.809(a)	Work plan for TMH/S with activities, responsibilities, schedule developed for NHS by 10/1/95; other roads by 10/1/96
1/1/95	500.107(c)	Certification statement due to FHWA by January 1 of each year, beginning 1/1/95
1/1/95	500.109(a)	USDOT may withhold funds for any FY after 9/30/95 from states failing to submit annual certification
1/1/95	500.809(e)	Work plan for the TMS/H due to FHWA
10/1/95	500.109(a)	Must be implementing management systems by FY 1995; must certify annually to USDOT Secretary
10/1/95	500.409(b)	SMS completed or underway
10/1/95	500.309(b)	BMS design completed or underway; data collection underway
10/1/95	500.609(b)	Condition measures and data system structure established; and data collection underway
10/1/95	500.709(b)	Performance measures and standards established; system design completed or underway; data collection underway
10/1/95(#)	500.509(b)(1)	System fully operational in nonattainment TMAs and used in MPO and state TIP development
10/1/95	500.509(b)(2)	System design complete or underway in other areas; full-scale data collection underway
10/1/95(*)	500.209(b)(1)	PMS for NHS system operational and used in TIP development
10/1/95	500.209(b)(2)	PMS for non-NHS system under development
10/1/95(*)	500.809(b)	TMS/H for the NHS fully operational and in use; TMS/H for other roads under development
10/1/96	500.709(c)	IMS fully operational and in use when developing MPO and state TIPs
10/1/96	500.609(c)	PTMS fully operational and in use for state and MPO TIP development
10/1/96	500.309(c)	BMS fully operational and in use when developing state and MPO TIPs
10/1/96	500.409(c)	SMS fully operational and in use as part of HSP, SEP, MPO and state TIP development
10/1/96	500.509(c)	CMS fully operational in all areas; in use when developing MPO and state TIPs
10/1/96	500.809(c)	TMS/H fully operational and in use for all public highways
10/1/97	500.209(c)	PMS for non-NHS system fully operational and in use when developing state and MPO TIPs

Notes:
(#) - TMA nonattainment areas and MPO dates of significance
(*) - NHS dates of significance

SESSION 7

COURSE SUMMARY

Incorporating Intermodalism into Transportation Planning

The Intermodal Management System as a Foundation

MICHAEL D. MEYER

The Intermodal Management System (IMS) is one of the more challenging of the six management systems required by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). At its very heart, IMS encompasses much of what ISTEA intended as a shift in the transportation planning process: increased emphasis on intermodalism and greater use of performance-based planning tools. As noted in the Interim Final Rule for the management systems, IMS is

> a systematic process of, 1) identifying key linkages between one or more modes of transportation, where the performance or use of one mode will affect another, 2) defining strategies for improving the effectiveness of these modal interactions, and 3) evaluating and implementing these strategies to enhance the overall performance of the transportation system.

Importantly, IMS is to be developed in coordination with the Congestion Management System (CMS) and the Public Transportation Management System (PTMS). This coordination can occur through the types of strategies and options that are to be considered by each of these systems, by the definition of the targeted transportation system, and with the identification of compatible performance measures. In addition, IMS, CMS, and PTMS are to be integrated with the transportation planning process at the state and metropolitan levels.

Michael D. Meyer is Professor and Director of the Transportation Research and Education Center, Georgia Institute of Technology.

Linking Modes

Crucial to this definition of an IMS is the concept of links (or connections) from one mode to another that are often inherent in many trips. Transportation professionals have known for years that terminals or transfer points are major bottlenecks for the efficient movement of people and goods.

IMS now provides a means of highlighting these issues in the planning process. The types of planning and policy issues that can be considered as part of IMS planning process include such things as physical constraints that limit the access to intermodal facilities (e.g., bridge height restrictions and posted bridge weights for truck access), coordination and transferability (e.g., delays caused at highway and rail or waterway crossings), delivery and collection (e.g., landside access to airports and truck curbside restrictions), safety (e.g., bicycle and pedestrian safety at high-volume locations), legal and regulatory issues (e.g., truck route restrictions), and economic and environmental impacts (e.g., economic impact of railroad abandonment). By focusing its system monitoring and strategy identification activities on the intermodal elements of the transportation system, IMS can provide significant input into the process of resolving many of these issues.

New Challenges

Although each of the ISTEA management systems has its own set of challenges associated with development and implementation, IMS represents a true departure from many characteristics of transportation planning as it has traditionally occurred. The key elements of this departure include the following:

- Goods movement. IMS focuses on the intermodal movement of people and goods. However, transportation planning has not had a long record of successfully dealing with goods movement, from either a technical or process perspective. IMS now places greater emphasis on these issues.
- Data collection and analysis. The effective analysis and evaluation of the intermodal movement of people and goods needs to be based on data that describe such movement and that can be used to forecast future trip patterns and needs. Much of this information will probably come from private sources where proprietary issues could become significant.
- Measures of system performance. The basic foundation of IMS is the identification of performance measures that represent what is truly important in the role of transportation in the economy and

IMS Development

Most states are in the early stages of developing their IMS. One of the first steps in IMS development is an inventory of intermodal facilities; this step appears to be the one that is most advanced among the states. Ohio, for example, has conducted an extensive inventory of intermodal facilities, as have California and several other states. Given that such an inventory is to be completed by October, it should not be surprising that this element of a state's IMS has received most attention.

ransportation planners and decision mak-

continued on page 44

The real test of IMS development, however, will be the identification of performance measures. Only a few states have reached this stage of development, with many states not likely to identify such measures until later in the year. Some examples of performance measures include time for transfer of people and goods from one mode to another (Ohio, Florida), reliability of travel time (California), and safety record (Oregon).

In sum, IMS is potentially one of the most important innovations resulting from ISTEA. More than any other tool available to planners, it has the greatest chance of firmly embedding the "I" from ISTEA into transportation planning. In addition, by opening the planning process to many users of the transportation system who have not been heard before, IMS takes a major step in introducing a customer perspective into the planning and decision-making processes.

State Management Systems

Overview of ISTEA Requirements and Current Implementation

DANE ISMART

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) requires the development and implementation by the states of six management systems. Congress included the management systems in ISTEA legislation for several reasons. U.S. highway and transit systems are aging and the nation is faced with tight financial constraints and increased environmental concerns. Planning must therefore focus on how to use the transportation systems more effectively and address the public's higher performance expectations.

Management systems are the key to addressing these concerns and effectively managing existing transportation systems and resources. In its response, Congress included the following management systems in ISTEA:

1. Pavement Management System (PMS),
2. Bridge Management System (BMS),
3. Safety Management System (SMS),
4. Congestion Management System (CMS),
5. Public Transportation and Equipment Management System (PTMS), and
6. Intermodal Management System (IMS).

Dane Ismart is an Intermodal Engineer with the Federal Highway Administration.

In addition to the management systems, states are required to develop, establish, implement, and operate on a continuous basis a traffic-monitoring system (TMS). The purpose of TMS is to provide traffic data to support the management systems as well as studies and programs of the U.S. Department of Transportation.

On December 1, 1993, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) jointly issued an interim rule for the six management systems and the traffic-monitoring system. The regulation was issued as an interim instead of a final rule because of concerns about the data burden that states, metropolitan planning organizations (MPOs), and local agencies may have during the implementation and continual operation of these systems.

Although FHWA and FTA believe that much of the data needed to implement management systems currently exists and is available to states, an evaluation of the data burden is being conducted by FHWA and FTA. Comments on the data burden have been received by these agencies and estimates of the data effort required by the regulation will be submitted to the Office of Management and Budget.

After review and analysis of the data burden and comments, the Interim Final Rule will be completed. Although the management system regulations have not yet received final acceptance from the Office of Management and Budget, all requirements of the Interim Final Rule were effective as of January 3, 1993, and remain so.

The Interim Final Rule provides a common framework for all six management systems. Each management system should be the result of a systematic process designed to assist decision makers in selecting cost-effective strategies and actions to improve the efficiency and safety of, and protect the investment in, the nation's transportation infrastructure. The results of the management systems should be entered into the statewide and metropolitan planning process and the development of State Transportation Improvement Programs (STIP) and Metropolitan Transportation Improvement Programs (TIP).

Although the interim rule provides flexibility, a basic structure is required for all management systems. Each management system should include the following elements:

1. Identification of performance measures,
2. Data collection and analysis,
3. Determination of needs,
4. Evaluation and selection of appropriate strategies and actions to address needs, and
5. Evaluation of the effectiveness of the implemented strategies and actions.

5. Evaluation of the effectiveness of the implemented strategies and actions.

The states' progress on the implementation of the management systems varies based on their experience with management systems before the passage of ISTEA. Many states have had previous experience in the establishment of bridge and pavement management systems as well as safety management systems. However, very few states have had previous experience with congestion, intermodal, or public transportation and equipment management systems. Lack of experience and examples of ongoing management systems have created a need for technical guidance, especially for CMS, IMS, and PTMS. Efforts are currently under way by FHWA and FTA to provide technical guidance and prototype management systems to assist states and MPOs.

States with existing management systems were advised that they could submit documentation to FHWA by June 1, 1994, requesting acceptance in lieu of developing a new system. Required documentation included demonstrating that the existing system meets the interim rule requirements and reflects the views of all affected agencies. Several states and MPOs indicated that requests for accepting existing systems would be submitted.

For states that are establishing new or modified systems, serious challenges exist in developing coordination among the six management systems. Many states have formed separate committees or task forces for each management system. However, establishing coordination among the six management systems can be elusive when developed separately by independent committees.

One approach that state departments of transportation (DOTs) are taking to develop coordination among their management systems is through the application of geographic information systems (GIS). States such as California and Michigan are conducting extensive efforts for creating GIS-based systems that will provide data integration for all the management systems. Also, GIS-T, a national pool-funded study with the participation of more than 40 states, is currently under way. The purpose of the project is to develop a GIS that states may use for coordinating the data base required for all six management systems.

Although establishing coordination within state DOTs may be difficult, coordination may also be hard to establish among the states and MPOs during the development and operation of management systems. The state has the responsibility for establishing the management systems, except for congestion management systems in transportation management areas (urbanized areas with populations of more than 200,000). States should coordinate the congestion management system activities to ensure compatibility of the systems and their results.

Technical coordination between the states and MPOs will also be necessary for establishing performance measures and data-collection responsibilities. When coordination has not been established, local agencies and MPOs have become unsure about what role they will have in the creation and operation of management systems.

The roles and responsibilities of the states, MPOs, and other agencies involved should be mutually determined. States may enter into agreements with other agencies but the state remains responsible for overseeing the coordination of the management system activities and taking corrective action, including implementing systems at the regional and local levels if necessary.

By October 1, 1995, the states must develop work plans that identify major activities and responsibilities for implementing the management systems. The work plans should include time schedules, identification of available resources, and a discussion of how the management systems will be coordinated. The work plans must be submitted as part of the January 1, 1995, certification statement. The states will be certifying that the management systems are being implemented in accordance with the compliance schedule specified in the interim rule.

States failing to certify that they are implementing the management systems may be subject to withholding of up to 10 percent of the funds apportioned to the state under Title 23, U.S.C., and to any recipient under the Federal Transit Act. Before imposing any sanctions, FHWA will notify the state of the actions necessary to correct deficiencies in the implementation of the systems.

Management system development and implementation by the states and MPOs is an evolving process. As the learning curve on management systems progresses, it is inevitable that states and MPOs will find it necessary to make modifications to their systems as they gain operational experience.

For many states the most difficult part of implementing management systems is taking the first step. Uncertainty on how to develop management systems led to inertia in the implementation of the systems. States and MPOs, however, should recognize that the management systems that are in place 10 years from now may be significantly different from those that were initially implemented. The management system program is a continuous process that will improve over time.

Additional information on FHWA management system technical assistance and courses may be obtained from Dane Ismart,

Deen Retires; Skinner Named New TRB Director

Thomas B. Deen will retire after 14 years of distinguished service as Executive Director of the Transportation Research Board. Bruce M. Alberts, Chairman of the National Research Council, has announced the appointment of Robert E. Skinner, Jr., to succeed Deen. The transition will take effect later this year.

Deen presided over TRB's growth into new research areas and modes, initiating a program of policy studies on critical national transportation issues while enhancing the quality of traditional programs including technical committee activities, the Annual Meeting, publications, the Transportation Research Information Services, and the National Cooperative Highway Research Program. The size and scope of TRB's programs grew significantly during Deen's tenure.

Skinner joined TRB in 1983, becoming Director of the Studies and Information Services Division in 1986. Under his direction, the division has performed key studies, earning the Board a reputation for authoritative analysis of national transportation policy issues.

Workshop Objectives

- Understand the concept of the ISTEA management systems;
- Understand the legislative and regulatory requirements for the implementation of the management systems;
- Understand the common elements of the management systems, and the overall structure and interrelationships of the management systems;
- Understand the necessary steps to successfully design, implement, and administer management systems.

Who Should Come

Elected Officials
Transit Operators
Trucking & Railroad Companies
Shipping and Delivery Service Companies
U.S. DOT
Caltrans
County Transportation Commissions
Sub-regional transportation planners

Workshop Discussion Leaders

Dane Ismart has worked with the Federal Highway Administration (FHWA) for 25 years in a variety of policy, planning and engineering positions. He is currently serving as the Intermodal Planning Team Leader within FHWA.

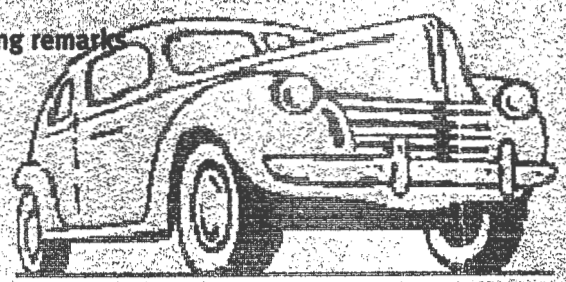
Michael D. Meyer is Professor and Director of the Transportation Research and Education Center, Georgia Institute of Technology.

Program

ISTEA Management Systems

October 13, 1994 • 8:00 a.m. to 5:00 p.m.
Southern California
Association of Governments
818 West Seventh Street, 12th floor,
Downtown Los Angeles

8:00	**Registration & coffee**
8:30	**Welcome**
8:45	**Identification of key issues**
10:00	**Break**
10:15	**Organizing to implement management systems in your agency**
11:45	**Lunch**
1:00	**Basic elements & performance measures of management systems**
2:30	**Identification & evaluation of strategies**
3:15	**Break**
3:30	**Implementation & feedback**
4:00	**Summary & discussion**
4:45	**Closing remarks**



R.S.V.P.

___Yes, I will be attending the ISTEA Management Systems Workshop at $10 per person

Name _____

Company _____

Title _____

Address _____

City _____

Phone _____

FAX _____

Enclosed is my check for $10 x ____ = _____

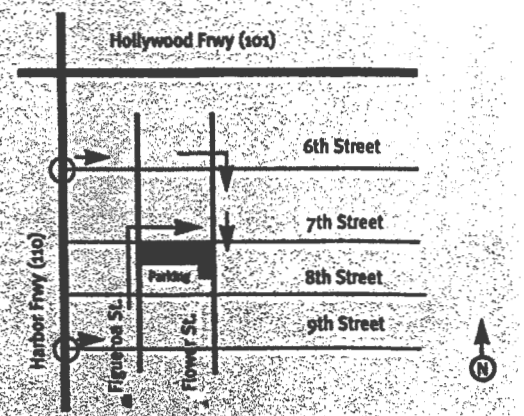
Registration may be available at the door for $15 subject to seating availability. Please call (213) 236-1892 to confirm seating availability.

Seating is limited.

Please detach this registration form and mail with a check payable to Southern California Association of Governments by October 7, 1994 to:

Bernice Villanueva
Southern California Association of Governments
818 West Seventh Street, 12th floor
Los Angeles, CA 90017-3435

or fax your registration to (213) 236-1963.



Southern California **Association of Governments** and **Caltrans** have joined together to sponsor a workshop on ISTEA Management Systems. The workshop is designed to provide for a basic understanding of the ISTEA management systems and offer guidance on the design, implementation, integration, and administration of the ISTEA management systems. The workshop outline is designed and conducted by FHWA as part of the National Highway Institute's technical training and public outreach program.

October 13, 1994

October

Southern California
Association of Governments
818 West Seventh Street, 12th floor
Los Angeles, CA 90017-3435

09/19

Mr. Vic Kamhi
Project Manager
South Bay Area Team
LA County Metropolitan Transp Auth
818 West 7th St. #900
Los Angeles, CA 90053

ISTEA Management Systems Workshop

Jointly sponsored by Southern California Association of Governments and Caltrans

October 13, 1994