Chapter 1

Introductory Concepts in Transportation Decision Making

K. C. Sinha and S. Labi
Purdue University School of Civil Engineering
Introductory Concepts in Transportation Decision Making

- Transportation Program Development Process
- Project Development
- Legislation
- Classification of Impacts
- Evaluation Procedures
Introduction

- Transportation System Constitutes the Largest Public Sector Investment

- Economic Vitality and Competitiveness
  - Mobility and Accessibility of People and Goods
  - Economic Development Process

- Continued Growth in Commercial and Personal Travel

- Cost-effective Investment Decisions Require Monitoring and Evaluation of Impacts
  - Costs and Benefits
  - Priceable and Intangible
PHASES OF THE OVERALL TRANSPORTATION DEVELOPMENT PROCESS

Development of Individual Projects → Network-level Planning → Network-level Programming → Network-level Budgeting → Network-level Financial Planning
Network-level Planning

- Metropolitan and State
- Short and Long-range Transportation Improvement Plans
- Management Systems
- Stakeholders: Federal, State and Local Governments, Operators, Citizens Groups, Special Interest Groups
Network-level Planning

- Continuous Process
  - Inventory of Facilities and Travel
- Analysis and Forecast
  - Population
  - Employment
  - Land Use
  - Travel and Facility Needs
- Evaluation and Selection of Alternatives
- Implementation and Monitoring
THE PROJECT DEVELOPMENT PROCESS

1. Review of Network-level Plan
2. Project Development
3. Mitigation
4. ROW Studies

Evaluation of Alternative System Plans and Policies
Evaluation of Alternative Location Plans
Evaluation of Alternative System Designs
Evaluation of Alternative Construction Practices
Evaluation of Alternative Operation Policies and Regulations
Evaluation of Alternative Preservation Practices

4. System Design
5. Construction
6. System Operation
7. System Preservation

For proposed projects only
For existing and proposed projects
Project Identification and Scoping (3 to 5 Years)

- Location Planning
- Evaluation of Existing Conditions
- Social, Economic and Environmental Data
- Definition of Alternative Project Corridors, Links or Nodes
- Informal Public Meetings
- Draft Environmental Impact Report
- Location Public Hearings
- Final Report and EIS Approval
- Location Approval
Facility Design (2 to 5 Years)

- **Engineering Design**
  - Design Studies and Review
  - Public Hearings on Design
  - Final Design
  - Approval of Final Design
  - Detailed Plans and Specifications
  - Cost Estimation

- **Contract Administration**
  - Preparation of Contract Documents
  - Evaluation of Bids
  - Contract Award
**Facility Construction** (2 to 5 years)

**Facility Operation** (Continuous)
- Alternative Operational Policies

**Facility Preservation** (Continuous)
- Preventive Maintenance
- Rehabilitation
Major Federal Legislation in the U.S. that Affect Transportation Decisions

- NEPA of 1969
  - Categorical Exclusion (CE)
  - Environmental Assessment (EA) and Finding of No Significant Impact (FONSI)
  - Environmental Impact Statement (EIS)
- Clean Air Act of 1970
- ISTEA of 1991
- TEA – 21 of 2001
- SAFETEA – LU of 2005
HISTORY OF FEDERAL LEGISLATION RELATED TO THE TRANSPORTATION PROJECT DEVELOPMENT PROCESS

Up to 1969
- Rivers and Harbors Act, 1899
- Fish and Wildlife Coordination Act
- Federal-Aid Highway Act of 1950
- Federal Aid Highway Act of 1956
- Federal Aid Highway Act of 1962
- Urban Mass Transportation Act
- National Historic Preservation Act
- National Environmental Policy Act
- Land and Water Conservation Act
- Wilderness Act
- Civil Rights Act

1970s
- Uniform Relocation Assistance and Real Property Acquisition Policy Act
- Environmental Quality Improvement Act
- Clean Air Act
- Federal Water Pollution Control Act/Clean Water Act
- Resource Conservation and Recovery Act
- Wild and Scenic River Act
- Marine Protection Research and Sanctuaries Act
- Coastal Zone Management Act
- Endangered Species Act
- Archeological Resources Protection Act

1980s
- Coastal Barrier Resources Act
- Comprehensive Environmental Response, Compensation and Liability Act
- Farmland Protection Policy Act
- Safe Drinking Water Act
- Surface Transportation and Uniform Relocation Assistance Act of 1987

After 1990
- Intermodal Surface Transportation Efficiency Act
- Americans with Disabilities Act
- National Highway Systems Act
- Transportation Equity Act of the 21st Century
- Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users
CLASSIFICATION OF TRANSPORTATION STIMULI

Stimuli

- Internal (Agency)
  - Physical Interventions
    - Weather
    - Earthquakes
    - Wind
    - Etc.
  - Policy Changes
    - Changing Usage (demand)
    - Vandalism
    - Terrorist Attacks
    - Common Crime
    - Etc.
- External Environment
  - Natural Events
  - Man-Made Actions
# Impact Categories and Types

<table>
<thead>
<tr>
<th>Category of Impact</th>
<th>Impact Types</th>
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<tbody>
<tr>
<td>&quot;Technical&quot;</td>
<td>Facility condition, Travel time, Vehicle operating cost, Accessibility,</td>
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<td></td>
<td>mobility, and congestion safety, Intermodal movement efficiency,</td>
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<td>Land-use patterns (including urbanization), Risk and vulnerability</td>
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<td>Environmental</td>
<td>Air quality, Water resources, Noise, Wetlands and ecology, Aesthetics</td>
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<tr>
<td>Economic Efficiency</td>
<td>Initial costs, Life-cycle cost/benefits, Benefit cost ratio, Net Present</td>
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<tr>
<td></td>
<td>value</td>
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<tr>
<td>Economic Development</td>
<td>Employment, Number of business establishments, Gross domestic product,</td>
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<td></td>
<td>Regional economy, International trade</td>
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<tr>
<td>Legal</td>
<td>Tort liability exposure</td>
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<tr>
<td>Sociocultural</td>
<td>Quality of life</td>
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## EVALUATION SCOPED OF IMPACTS

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<thead>
<tr>
<th>DIMENSION (SCOPE)</th>
<th>LEVELS</th>
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<tbody>
<tr>
<td>Affected Entities</td>
<td>Users</td>
</tr>
<tr>
<td></td>
<td>Non-Users</td>
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<tr>
<td></td>
<td>Community</td>
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<tr>
<td></td>
<td>Agency</td>
</tr>
<tr>
<td>Geographical Scope of Impacts</td>
<td>Project</td>
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<tr>
<td></td>
<td>Corridor</td>
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<tr>
<td></td>
<td>Regional</td>
</tr>
<tr>
<td></td>
<td>National/International</td>
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<tr>
<td>Temporal Scope of Impacts</td>
<td>Short Term</td>
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<td>Medium Term</td>
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<td>Long Term</td>
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Others Ways of Categorizing Transportation Impacts

- Direct vs. Indirect
- Tangible vs. Intangible
- Real vs. Pecuniary
- Internal vs. External
- Cumulative vs. Incremental
Transportation Decision Making

- Decision –
  - Selecting a Course of Action in Committing Resources
  - Purposeful Choice of One from Several Alternatives

- An Evaluation Process Must Have a Clear Definition of Goals and Objectives
Basic Elements of Evaluation

- Efficiency
- Effectiveness
- Equity
Measures of a Project’s Worth

- The choice of a decision parameter depends on the decision-maker, the type of decision, and the available alternative actions.

- The relative and absolute assessment of the worth of a particular course of action.

- How should worth be measured?

- What unit of measure should be used?
Evaluation Process

- Many measures with different units
- Conflicting measures of worth
- Different stakeholders have different preferences
- The challenge is to bring all measures of worth to a common and commensurate Scale

- Tradeoff

- Example of a transit line
  - Enhanced accessibility vs. ecological damage

- Choice may not be optimal, but should represent consensus
Procedure for Transportation System Evaluation

1. Identify the Evaluation Subject
2. Identify Concerns of the Parties Concerned
3. Define Goals and Objectives
4. Establish Performance Measures
5. Establish Evaluation Scope
6. Recognize Legal and Administrative Requirements
7. Identify Possible courses of Action and Develop Feasible Alternatives
   - Appropriateness (of Course of Action)
   - Adequacy (of Each Alternative)
   - Implementation Feasibility
Procedures for Transportation System Evaluation (Contd.)

8. Estimate Agency Cost and User Costs

9. Estimate Other Benefits and Costs

10. Compare the Alternatives
    - Maximum benefit for a given level of investment
    - Least cost for a given level of effectiveness
    - Maximum cost effectiveness
Good Practices in Evaluation

1. Focus on the problem at hand
2. Relate alternatives to goals and objectives
3. Comprehensive list of appropriate criteria
4. Clear definition of objective function
5. Clear definition of constraints
6. Ability to carry out tradeoffs
7. Ability to carry out sensitivity analysis with respect to key evaluation input variables
8. Clear presentation of evaluation process and results
Exercise

- Identify the various types of impacts of transportation system changes, and give one example of each
- Describe the role of evaluation in the transportation development process
- What are the elements of the 3E triangle, and what do they represent?
Exercise (contd.)

- List some of the common measures of effectiveness for assessing community objectives of transportation projects

- List the phases of a typical evaluation work plan

- What are the basic principles for developing transportation alternatives?