Transportation Planning

Textbook

Definition of transportation planning

■ It is a methodological process of preparing physical facilities and services of modes for transportation needs.
■ It is not intended to furnish a decision or to give a single result that must be followed, although it can do so in relatively simple situations.
■ It is intended to provide the appropriate information to those who will be affected and those responsible for deciding whether the transportation project should go forward.
Transportation planning is needed because of

- Increased demand of new facilities and services
- Huge investments in transportation projects
- Land use development
- Many alternatives exist for any transportation project

Basic elements of transportation planning

The transportation planning process comprises seven basic elements,

1. Situation definition
2. Problem definition
3. Search for solutions
4. Analysis of performance
5. Evaluation of alternatives
6. Choice of project
7. Specification and construction
Basic elements of transportation planning

The elements are:

- Interrelated
- Not necessarily carried out sequentially.
- The information acquired in one phase of the process may be helpful in some earlier or later phase, so there is a continuity of effort that should eventually result in a decision

Basic elements of transportation planning

1. Situation Definition

Involves all of the activities required to understand the situation that gave rise to the perceived need for a transportation improvement

- The present system is analyzed, and its characteristics are described
- Information about the surrounding area, its people, and their travel habits may be obtained.
- Previous reports and studies that may be relevant to the present situation are reviewed
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2. Problem Definition:

- To describe the problem in terms of the objectives to be accomplished by the project
- To translate those objectives into criteria that can be used to quantify the extent to which a proposed transportation project will achieve the stated objective (measures of effectiveness).
- Identified the characteristics of an acceptable system
  - Constraints placed on the project (e.g. physical limitation [presence of other structures ])
  - Design standards (e.g., bridge width, clearances)

Problem Definition:

- Traffic congestion
- Reduce traffic congestion
- Travel time
- Establish design standards
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3. Search for Solutions (Idea-generating phase)

- Consideration is given to a variety of ideas, designs, locations, and system configurations that might provide solutions to the problem

- Includes
  - Preliminary feasibility studies, which might narrow the range of choices to those that appear most promising.
  - Some data gathering, field testing, and cost estimating may be necessary at this stage to determine the practicality and financial feasibility of the alternatives being proposed

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4. Analysis of Performance:

- To estimate performance of proposed alternatives under present and future conditions.
- Determination of the investment cost of building the transportation project, as well as annual costs for maintenance and operation.
- Involves the use of mathematical models for estimating travel demand.
- Determine use of the system (such as trip length, travel by time of day, and vehicle occupancy)
- Environmental effects are estimated
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3. Search for solutions (Idea-generating phase)

➢ Consideration is given to a variety of ideas, designs, locations, and system configurations that might provide solutions to the problem.

➢ Includes preliminary feasibility studies, which might narrow the range of choices to those that appear most promising.

➢ Some data gathering, field testing, and cost estimating may be necessary at this stage to determine the practicality and financial feasibility of the alternatives being proposed.

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5. Evaluation of Alternatives:

■ How well each alternative will achieve the objectives of the project as defined by the criteria.

➢ Performance data produced in the analysis phase are used to compute the benefits and costs that will result if the project is selected.
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6. Choice of Project:

■ It is made after considering all the factors involved.

■ Whether the factors were a single criterion such as cost (select the lower cost)

■ In more complex projects other factors might be considered, selection is based on how the results are perceived by those involved in decision-making

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Basic elements of transportation planning

7. Specifications and construction

■ Detailed design phase in which each of the components of the facility is specified.

■ This involves its physical location, geometric dimensions, and structural configuration.
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Summary

<table>
<thead>
<tr>
<th>Situation definition</th>
<th>Inventory transportation facilities, Measure travel patterns, Review prior studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem definition</td>
<td>Define objectives (e.g., Reduce travel time), Establish criteria (e.g., Average delay time), Define constraints, Establish design standards</td>
</tr>
<tr>
<td>Search for solutions</td>
<td>Consider options (e.g., locations and types, structure needs, environmental considerations)</td>
</tr>
<tr>
<td>Analysis of performance</td>
<td>For each option, determine cost, traffic flow, impacts</td>
</tr>
<tr>
<td>Evaluation of alternatives</td>
<td>Determine values for the criteria set for evaluation (e.g., benefits vs. cost, cost-effectiveness, etc)</td>
</tr>
<tr>
<td>Choice of project</td>
<td>Consider factors involved (e.g., goal attainability, political judgment, environmental impact, etc.)</td>
</tr>
<tr>
<td>Specification and construction</td>
<td>Once an alternative is chosen, design necessary elements of the facility and create construction plans</td>
</tr>
</tbody>
</table>

Example: Planning the relocation of a rural road

This example is based on a study completed by the engineering firm, Edwards and Kelsey

![Map of a rural road relocation plan]
Basic elements of transportation planning

Example: Planning the relocation of a rural road

Step 1 - Situation definition

- The project is a proposed relocation or reconstruction of 3.3 miles of U.S. 1A located in the coastal town of Harrington, Maine.

- The town of Harrington has 553 residents, of whom 420 live within the study area and 350 live in the town center.

- Most of the town’s industry consists of agriculture or fishing, so a realignment of the road that damages the environment would also affect the town’s livelihood.
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Example: Planning the relocation of a rural road

Step 1 - Situation definition

- Most of the town’s industry consists of agriculture or fishing, so a realignment of the road that damages the environment would also affect the town’s livelihood.

- The average daily traffic is 2620 vehicles/day, of which 69 percent represent through traffic and 31 percent represent local traffic.

Step 2 - Problem definition

- Problems
  
  - High accident rate on 1A route
  
- Objective
  
  - Reduce the high accident rate on this road
  
  - Improve the level of service for through traffic by increasing the average speed on the relocated highway.
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Example: Planning the relocation of a rural road

Step 2 - Problem definition

- Measures of effectiveness
  - Accident rate
  - Travel time
  - Construction cost
  - Changes in noise levels and air quality
  - Number of businesses and residences that would be displaced

Example: Planning the relocation of a rural road
Basic elements of transportation planning

Example: Planning the relocation of a rural road

Step 3 - Search for solutions

- Four alternative routes were identified
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Example: Planning the relocation of a rural road

Step 4 - Analysis of performance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Speed (mi/h)</td>
<td>25</td>
</tr>
<tr>
<td>Distance (mi)</td>
<td>3.7</td>
</tr>
<tr>
<td>Travel time (min)</td>
<td>8.9</td>
</tr>
<tr>
<td>Accident factor (Relative to statewide average)</td>
<td>4</td>
</tr>
<tr>
<td>Construction cost ($ million)</td>
<td>0</td>
</tr>
<tr>
<td>Residences displaced</td>
<td>0</td>
</tr>
<tr>
<td>City traffic</td>
<td>2620</td>
</tr>
<tr>
<td>Futuro (20 years)</td>
<td>4350</td>
</tr>
<tr>
<td>Air quality (μg/m³ CO)</td>
<td>825</td>
</tr>
<tr>
<td>Noise (dBA)</td>
<td>73</td>
</tr>
<tr>
<td>Tax loss</td>
<td>None</td>
</tr>
<tr>
<td>Trees removed (acres)</td>
<td>None</td>
</tr>
<tr>
<td>Runoff</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 11.2 Ranking of Alternatives

<table>
<thead>
<tr>
<th>Criterion/Alternative</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel time</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Accident factor</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Cost</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Residences displaced</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Air quality</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Noise</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
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<tr>
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<td>2</td>
<td>3</td>
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</tr>
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</table>

Note: 1 = highest; 5 = lowest
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Example: Planning the relocation of a rural road

Step 5 – Evaluation of alternatives

- Travel time

![Graph showing travel time vs cost for relocation of a rural road.]

Topic 2: Transportation planning

Example: Planning the relocation of a rural road

Step 6 – Choice of project

Step 7 - Specification and construction