

Basic elements of transportation planning

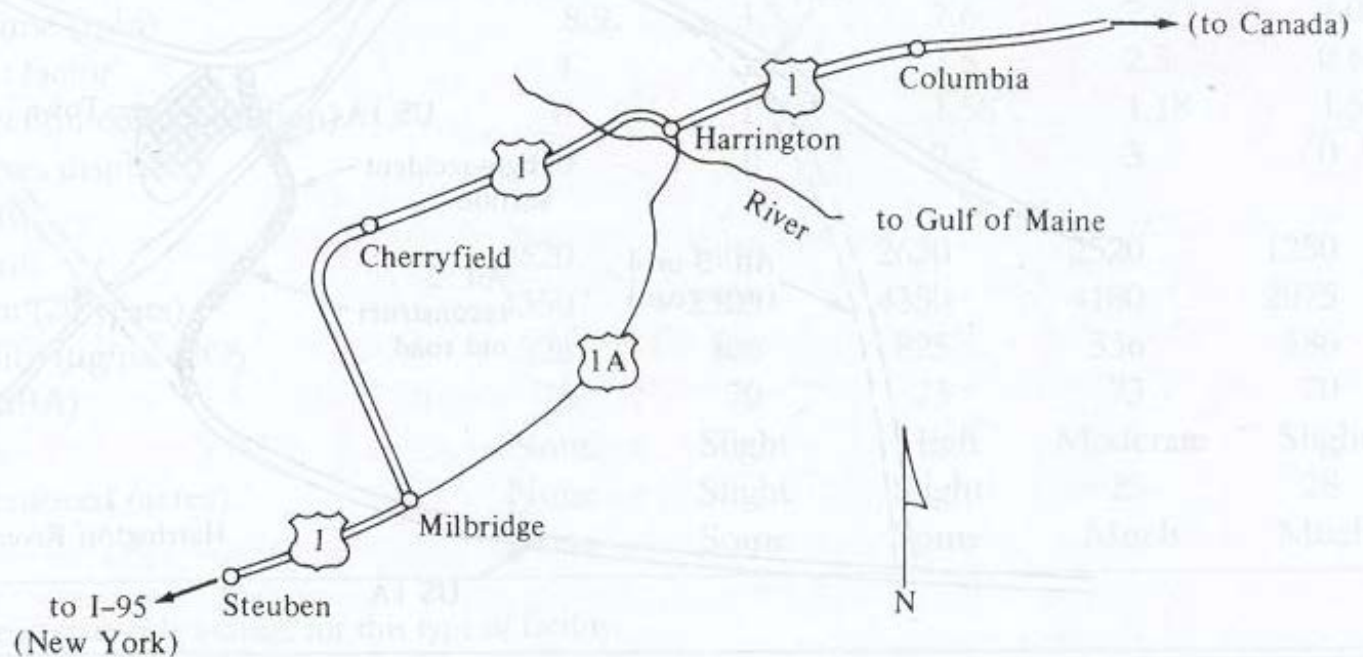
Situation definition	Inventory transportation facilities, Measure travel patterns, Review prior studies
Problem definition	Define objectives (e.g., Reduce travel time), Establish criteria (e.g., Average delay time), Define constraints, Establish design standards
Search for solutions	Consider options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

Example 11-1: Planning the relocation of a rural road (simple, yet good enough to explain the steps...)

Step 1: Situation definition:

- to understand the situation that gave rise to the perceived need for a transportation improvement

Figure 11.2 ■ Location Map for Highways U.S. 1 and U.S. 1A



Step 2: Problem definition

Purpose of the step: Describe the problem in terms of the objectives to be accomplished and translate those objectives into criteria.

Example:

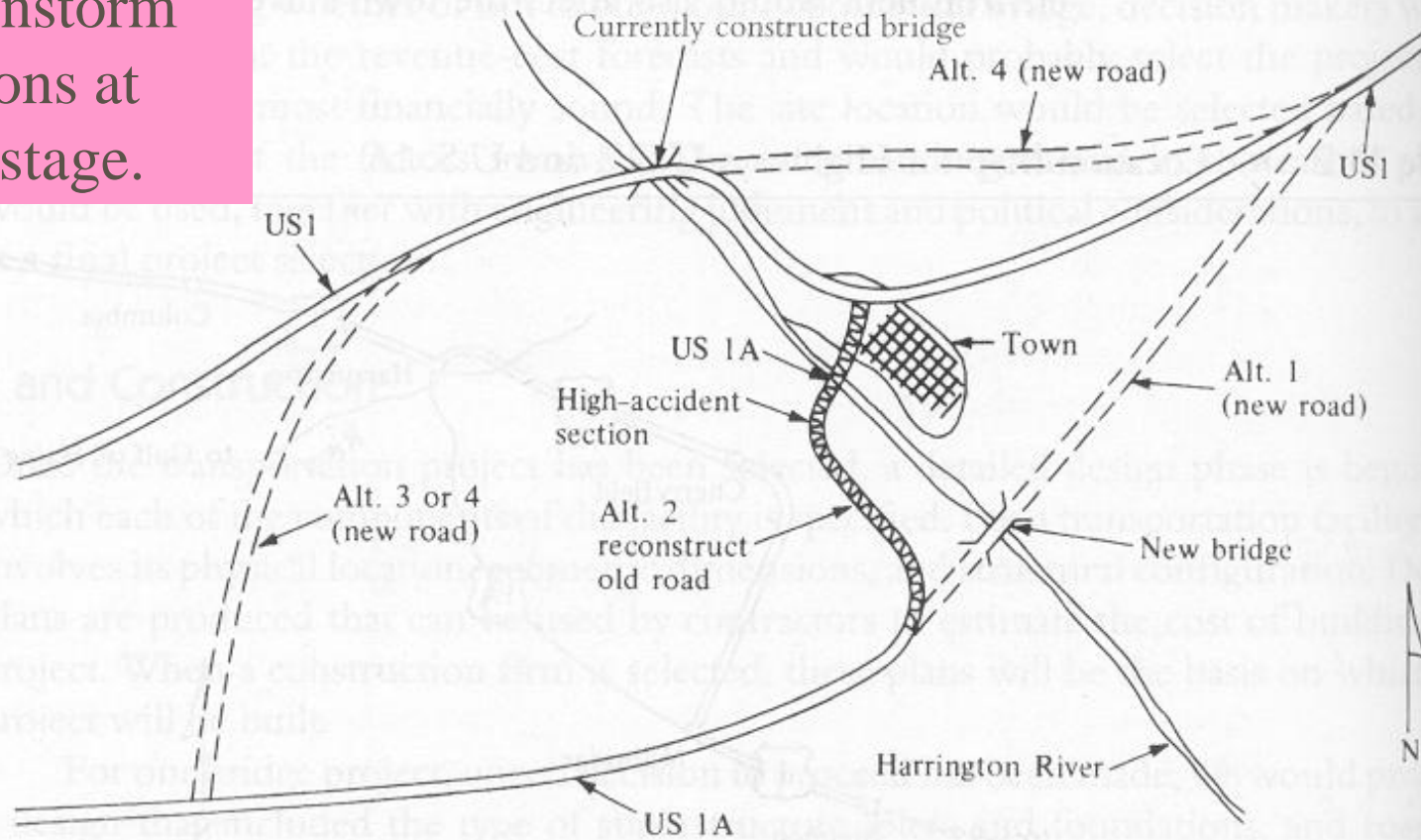
- **Objective = Statements of purpose:** Reduce traffic congestion, Improve safety, Maximize net highway-user benefits, etc.
- **Criteria = Measures of effectiveness:** Travel time, accident rate, delays (interested in reductions in these MOEs)



Step 3: Search for solutions

Alternative Routes for Highway Relocation

Brainstorm options at this stage.



Step 4: Analysis of performance

- Estimate how each of the proposed alternatives would perform under present and future conditions.

Table 11.1
Measures of Effectiveness for Rural Road Alternatives

Criteria	Alternatives				
	0	1	2	3	4
Speed (mph)	25	55	30	30	55
Distance (mi)	3.7	3.2	3.8	3.8	3.7
Travel time (min)	8.9	3.5	7.6	7.6	4.0
Accident factor ^a	4	1.2	3.5	2.5	0.6
Construction cost (\$ million)	0	1.50	1.58	1.18	1.54
Residences displaced	0	0	7	3	0
City traffic					
Present	2620	1400	2620	2520	1250
Future (20 years)	4350	2325	4350	4180	2075
Air quality ($\mu\text{g}/\text{m}^3$ CO)	825	306	825	536	386
Noise (dBA)	73	70	73	73	70
Tax loss	None	Slight	High	Moderate	Slight
Trees removed (acres)	None	Slight	Slight	25	28
Runoff	None	Some	Some	Much	Much

^a Relative to statewide average for this type of facility.

pass thru rt

Step 4: (cont) Ranking of alternatives (in terms of MOE)

Table 11.2
Ranking of Alternatives

Criterion/Alternative	Alternatives				
	0	1	2	3	4
Travel time	4	1	3	3	2
Accident factor ^a	5	2	4	3	1
Cost (\$ millions)	1	3	5	2	4
Residences displaced	1	1	3	2	1
Air quality	4	1	4	3	2
Noise	2	1	2	2	1
Tax loss	1	2	4	3	2
Trees removed (acres)	1	2	2	3	4
Increased runoff	1	2	2	3	3

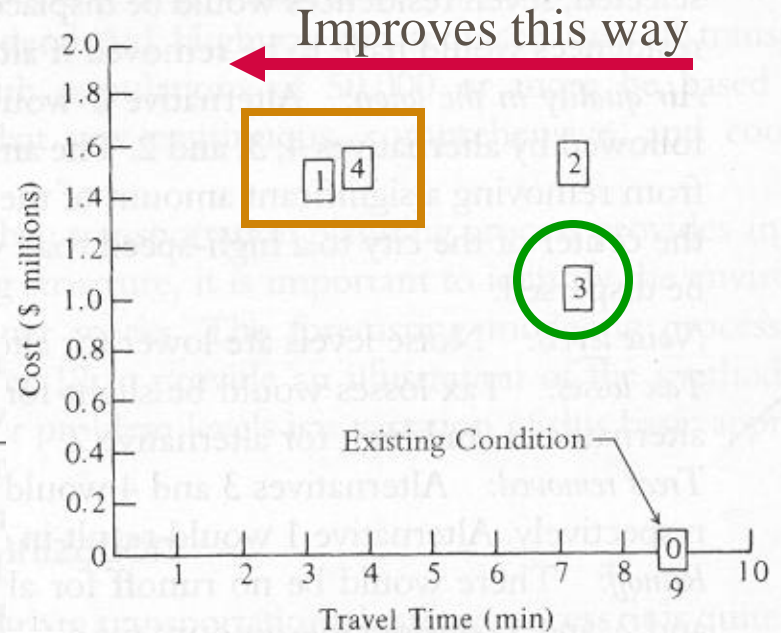
Note: 1 = highest; 5 = lowest.

^a Relative to statewide average for this type of facility.

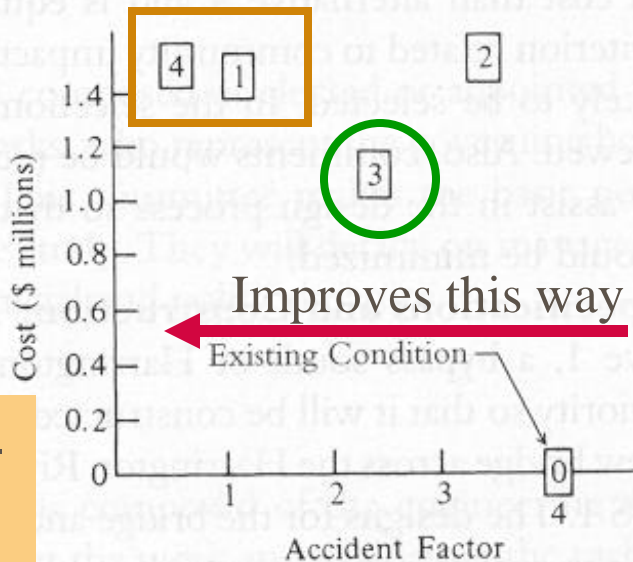
Step 5: Evaluation of alternatives

❑ Determine how well each alternative will achieve the objectives of the project as defined by the criteria.

Travel Time Between West Harrington and U.S. 1 Versus Cost



Accident Factor (relative to statewide average) Versus Cost



○ Cost-wise best

□ Improvement-wise superior



This is a multi-objective evaluation problem.

Step 6: Choice of project

❖ Based on the alternative evaluation in Step 5, we will choose the best alternative for design and eventual construction. The best choice may not be built because of opposition by the people of the community that is affected.



Step 7: Specification and construction

❖ Once the project has been chosen, a detailed design phase is begun, in which each of the components of the facility is specified.