Resource allocation for rehabilitation projects in Ontario

Resource Allocation for Rehabilitation Projects in Ontario

Allocation des moyens dans la rénovation de ponts en Ontario

Mittelzuweisung für Brückenerneuerungsprojekte in Ontario

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1. COST EFFECTIVE METHODS

The Ministry of Transportation, Ontario, is responsible for the management of approximately 3000 bridges on the provincial highway system. It spends about $35 million a year, averaged over the last five years, on the maintenance and rehabilitation of these structures. The financial analysis methods used by the Ministry at the project and network levels to allocate funds in a cost effective manner to meet these needs are described here.

1.1. Present Value Analysis: Present value analysis is used by the Ministry to choose the most cost effective method over the life of the structure from various viable rehabilitation and replacement options at the project level.

The present value of future costs of various treatments for each alternative over the life of the project is determined. The alternative with the least life cycle present cost is the preferred alternative. This allows for the comparison of alternative schemes on an equitable basis.

The parameters required for the analysis are the life cycle agency costs for each alternative, residual life values, and discount rate. Sensitivity analysis are carried out by varying the discount rate. The effects of changes in agency cost estimates are checked by assigning different probabilities of occurrence to agency costs. It is shown that the effects of inflation can be ignored. The analysis is carried out on a spread sheet program written for Lotus 1-2-3, version 2.01.

1.2. Incremental Benefit/Cost Ratio Analysis: Incremental benefit/cost ratio analysis, IB/IC, has been tried by the Ministry to allocate funds between bridges at the network level and found to work satisfactorly.

The incremental benefit/cost ratio is the ratio of additional benefit realized in moving from one improvement alternative to another, divided by the corresponding increase in cost.

The results of present value analysis carried out at the project level for each bridge on the current year's program are used as input into the incremental benefit/cost ratio analysis. Rehabilitation and replacement alternatives for each bridge are listed in order of increasing costs and the IB/IC ratios calculated. Alternatives for which the IB/IC ratios fall below one are discarded. Usually, as the level of cost increases IB/IC ratio

decreases, however, if the IB/IC ratio should increase with an increase in cost an adjustment is made to that particular option. The options are sorted in descending order of IB/IC ratios. For the usual case of limited budgets the order of preference is the order from the highest to the lowest incremental benefit/cost ratios.

The parameters required for the analysis are the agency costs and benefits. If user costs and benefits are available they can be included. The analysis is carried out on a spread sheet program written for Lotus 1-2-3, version 2.01.

2. APPLICATION:

2.1 Project Level: The present value analysis at the project level is used routinely by the Ministry for all the projects on the rehabilitation or replacement programs.

2.2 Current Year Network Level: The incremental benefit/cost ratio analysis method at the network level for the current year was successfully tested on bridges in one of the five Regions of the Ministry. The system will be implemented in all the Regions in the near future.

Northern Region has 134 bridges that are to be rehabilitated within the next 5 years. Of these 18 were scheduled for the 1990 program. The condition surveys for these bridges were reviewed and various rehabilitation options were considered including the replacement option as this is required to determine the agency benefits. Cost of each option was estimated and the incremental benefit-cost ratio analysis carried out.

Some of the bridges had only the replacement option as the feasible option. Projects for which a decision has already been made on a particular option may be excluded from the analysis, or fictitious incremental benefit cost ratios may be input for those projects, so that they are on a higher priority level. The second approach was used in the above analysis.

Incremental benefit/cost ratio analysis gives a list of priorities based on the condition of the bridges and the costs to improve those conditions. This priority list may need to be adjusted to include other factors that go into making the final selection of bridges that should be on the current program.

2.3 Multi-year Network Level: Incremental benefit/cost ratio can similarly be used to prioritize bridges that will be rehabilitated over a number of years. The cost estimates for some of the bridges will be approximate as detailed condition data would not normally be available beyond a two year period. The analysis would be refined on an annual basis.

3. CONCLUDING REMARKS: The allocation of funds to bridge rehabilitation and replacement options at the project and network levels can be based on rational financial analysis principles. A few jurisdictions, including the Ministry of Transportation, Ontario, are starting to use these principles in the management of their bridges, others are expected to follow as these principles are better understood by the engineering fraternity.