

# Principles of Highway Engineering

## Economic Analysis\*

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### ABRIDGMENT

•THE FOUR principal methods used in highway economic analysis are defined and the relative advantages of each are described.

1. Benefit-Cost Ratio—This method was originally developed for use in evaluating river basin projects as required by the Congress and adopted for highway projects by the AASHO Committee on Planning and Design Policies. It has been presented in a publication commonly called the "Red Book."

2. Present Worth—The values of all costs and benefits are reduced to a present worth for comparison purposes.

3. Annual Costs—Values of all costs, both of construction and users costs, are calculated as an average annual cost, thus giving a direct comparison of alternate schemes.

4. Rate of Return—This method considers the interest rate at which the expected income (net benefits) will amortize the proposed investment.

The paper discusses the determination of quantifiable costs as:

1. Highway costs, consisting of operating, maintenance, and construction costs (capital costs);

2. User costs, consisting of operating costs of motor vehicles, including the evaluation of the users time;

3. Accident costs, an evaluation of monetary worth of an expectation of reduction of accidents by use of a proposed improved facility; and

4. Comfort and convenience, an evaluation of the users' probable preference for the new facility, even if the expected operating costs thereon may be greater than those on the old facility.

The paper discusses the consideration to be given to intangibles, secondary benefits, and social consequences not reducible to money terms.

The principle interest formulas usable in problems of engineering economic analysis are given and described, and definitions of the principal terms used in the discussion are included.

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\*This paper is based on a manual of the same title issued as a supplement to the "Route and Project Planning Manual," prepared for use by the Advanced Planning Division of the West Virginia State Road Commission, Charleston.