

purpose river basin plans "shall be formulated initially to include all units and purposes which satisfy these criteria in quantitative economic terms:

- (a) Tangible benefits exceed project economic costs.
- (b) Each separable unit or purpose provides benefits at least equal to its costs.
- (c) The scope of development is such as to provide maximum net benefits; and
- (d) There is no more economical means, evaluated on a comparable basis, of accomplishing the same purpose or purposes which would be precluded from development if the plans were undertaken.

These standards for formulation, in the context of appropriate related criteria (including an appropriate discount rate) constitute what economists generally refer to as the requirements for economic efficiency. They imply, in this regard, an optimizing model as distinct from an analytical model for appraising cost effectiveness in meeting a fixed objective (e.g., a quantity of "firepower" in military analyses). If an analysis using these standards is based solely upon benefits appropriate to a national viewpoint, then the analysis (within the limits of the skill of the analyst and the practicability of analysis) is believed to indicate an optimum contribution to growth in national income.

I said previously that comprehensive plans were to be formulated *initially* to include all units and purposes which satisfy the criteria of economic efficiency in quantitative economic terms. Senate Document 97 states further that this will provide "a baseline from which the effect of considering intangibles" (e.g., threat to lives, health, and general security posed by large floods) can be judged. Reports and plans, the document directs, shall indicate the extent to which departures from the most efficient economic development are proposed "in order to take into account intangibles or other considerations warranting a modification in scale not reflected in the tangible benefits and project economic costs."

With the foregoing as a foundation, I would like to turn now, specifically, to the central focus of this hearing: discount rates.

Discount rates, as has been stated several times in your hearings, are utilized in planning to convert benefits and costs which are projected to occur over a period of time to a common time basis. Costs need to be amortized using a discount rate over the period of years of analysis (e.g., 50 or 100 years) so that they can be compared properly with average annual benefits. In arriving at average annual benefits, benefits of the same nominal value beyond the first year are first discounted each year from time zero by a discount rate to make the benefits comparable and then their sum is amortized out over the period of analysis.

Senate Document 97 provides that:

The interest rate to be used in plan formulation and evaluation for discounting future benefits and computing costs . . . shall be based upon the average rate of interest payable by the Treasury (i.e., the *coupon rate*) on interest-bearing marketable securities of the United States outstanding at the end of the fiscal year preceding such computation which, upon original issue, had terms to maturity of 15 years or more.

This formula for annual determination of the discount rate is the same as that which was contained in Budget Bureau Circular A-47, adopted on December 31, 1952, and withdrawn in May 1962, and that contained in the Water Supply Act of 1958. The latter provides for