

BENEFIT-COST ANALYSIS: 1933-1985

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PRE-WAR BEGINNINGS

The issue of applying economic benefit-cost tests to public investment projects first arose in the United States (U.S.) during the great economic depression of the 1930s. Under the “New Deal” administration of Franklin Roosevelt, massive programs of public works were mounted to provide jobs and to stimulate the collapsed economy. The question soon arose of how to assess the social worth or value of individual projects. It was apparent that the customary financial pay-out tests applied to private investment projects were not appropriate for most public projects such as highways, reservoirs, canals, and harbors. Yet, few satisfactory tests of economic worth for public projects had been developed, largely because the need for such tests had not been perceived as important.

This issue was addressed by the National Planning Board, established in 1934 as the first in a series of national planning agencies set up under the “New Deal” (Holmes, 1972; Clawson, 1981). Soon after its creation, the National Planning Board commissioned two studies, one by a planner on criteria and planning for public works (Black, 1934) and the second by an economist on the economics of planning public works (Clark, 1935).

The report by Clark (a prominent professor of economics at Columbia University) is especially interesting as it revealed that the basic economic principles and concepts of benefit-cost analysis (BCA) were well understood by the leading economists of the time. Basic concepts and approaches such as the willingness to pay test of value, externalities, shadow price of unemployed labor, economic valuation of morbidity and mortality, and secondary benefits were all discussed by Clark. He recommended that where public works provide an economic service, these values be measured in money terms whenever possible, and that reliance be placed on individual willingness to pay as a basic standard.

This economic test first appeared in legislation in the Flood Control Act of 1936, which, in authorizing a massive new federal government program of flood control

projects, specified that projects should be undertaken if “the benefits to whomsoever they may accrue are in excess of the estimated costs” (U.S. Flood Control Act of 1936, Section I, Eckstein, 1958). As the U.S. Army Corps of Engineers and the Department of Agriculture began to implement this program, the need arose for a uniform set of principles and standards to measure these benefits and costs. These issues were initially dealt with by an inter-agency Water Resources Committee established by the National Resources Committee (the successor to the national planning agency). An inter-agency evaluation subcommittee of the Water Resources Committee was created in 1937 to review water resource project proposals of the federal government agencies for the U.S. Bureau of the Budget, and the president. This subcommittee began to develop a set of evaluation criteria for use in ranking such projects by their economic and social worth. These criteria were used by the subcommittee in its work during the years 1937-1943. Because of changing priorities brought on by World War II, the national planning agency (then known as the National Resources Planning Board) was abolished by the Congress in 1943, thus terminating the work of the Water Resources Committee, including its evaluation subcommittee (Clawson, 1981).

POST-WAR: PREPARATION OF THE GREEN BOOK

With the demise of the National Resources Planning Board and its committees, a new pattern of coordination arose with the establishment in 1946 of the Federal Inter-Agency River Basin Committee (FIARBC), with representation from the major federal water resources agencies – the Army Corps of Engineers; the Departments of Agriculture, Interior, and Commerce; and the Federal Power Commission (Eckstein, 1958). This inter-agency body established a subcommittee on benefits and costs “for the purpose of formulating mutually acceptable principles and procedures for determining benefits and costs for water resources projects” (FIARBC Subcommittee on Benefits and Costs, 1950). This subcommittee and its part-time staff drawn from member

agencies worked over a four-year period on this task, and in May 1950 issued the now classic report on *Proposed Practices for Economic Analysis of River Basin Projects*, which was accepted by FIARBC “as a basis for consideration by the participating agencies as to the application in their respective fields of activity in river basin development” (FIARBC Subcommittee on Benefits and Costs, 1950). However, these practices were never formally adopted by any of the participating agencies as rules to be strictly applied.

Viewed from hindsight of almost 40 years, the subcommittee’s report (which soon became known as the Green Book) is a very impressive document. It was especially strong in stating the basic principles of welfare economics and micro-economics (although not in highly theoretical terms), and in applying those principles to develop realistic and workable standards and procedures for measuring benefits and costs for a number of project purposes – irrigation, flood control, navigation, electric power, watershed treatment, and, to a limited extent, recreation, and fish and wildlife. The report established a standard that went far beyond the existing evaluation practices of the agencies. In particular, its treatment of the thorny issue of secondary benefits was at odds with the practice of the Bureau of Reclamation in counting secondary benefits along with primary benefits in evaluating the worth of irrigation projects. It was no surprise that the subcommittee’s recommendations were not formally accepted for implementation by the member water resources agencies.

THE ISSUE OF SECONDARY BENEFITS

The most controversial issue related to treatment of secondary benefits. The subcommittee report took the position that secondary benefits should be measured from the strict national economic efficiency point of view. The Bureau of Reclamation maintained that the local or regional benefits induced by or stemming from an irrigation project should be counted along with the primary (national economic efficiency) benefits in a single benefit-cost calculation. In order to help resolve this issue, the commissioner of the Bureau of Reclamation called on a panel of three distinguished economists to (1) evaluate the adequacy of the existing procedures of the bureau on evaluating secondary or indirect benefits and costs, and (2) to set forth a recommended basis for their evaluation. The panel’s report, filed June 26, 1982, recommended a cautious approach to including secondary benefits. In general, separate benefit-cost ratios should be shown for primary benefits and for primary plus secondary benefits. Where warranted, induced benefits

from employing otherwise unemployed or underemployed labor (reflecting zero or reduced opportunity costs) should be shown either as a public benefit or as an offset to project costs. Secondary benefits stemming from the outputs of the project are held to be difficult to measure and in many instances likely to be small. In summary, the panel supported the more conservative position of the Green Book over the more liberal practices of the Bureau of Reclamation (Clark, Grant, and Kelso, 1952). However, the panel did not specifically rule out the use of secondary benefits by the Bureau of Reclamation and hence, did not succeed in putting the controversy to rest.

BUDGET CIRCULAR A-47

Under procedures established in the late 1930s, the U.S. Bureau of the Budget reviewed all major water resources project proposals for the president before they were submitted to the U.S. Congress for authorization and funding.

As the president’s fiscal watchdog agency, the Bureau was very concerned with the economic and financial soundness of public investment projects. Although the Bureau had no formal ties to FIARBC, or to its Subcommittee on Benefits and Costs, bureau staff members closely followed the progress of the subcommittee’s work. Following issuance of the Green Book in 1950, the Bureau of the Budget began preparation of a set of standards and procedures that it proposed to use in reviewing water resources project reports submitted to it by the federal water resources agencies. These principles and procedures were issued on December 31, 1952, as Budget Circular A-47, to serve as guidance to the water resources agencies (U.S. Bureau of the Budget, 1952). The subject matter coverage was much the same as the Green Book; basically, it was a conservative document, which placed primary emphasis on economic efficiency-oriented primary benefits for project justification. The use of secondary benefits was severely restricted, an opportunity-cost concept of interest or discount rate, tied to the interest rate of long-term government bonds, was adopted, and a 50-year time horizon was established.

Budget Circular A-47 was widely regarded by the water resources agencies and by the many proponents of water resources projects in Congress as a severe restraint on water projects. It served this purpose during the eight years of a relatively conservative republican administration under President Eisenhower from 1952 to 1960, and was finally rescinded in 1962 in the early days of President Kennedy’s administration.

STATUS AS OF 1960

During the 1950s, inter-agency work on evaluation standards continued in the Inter-Agency Committee on Water Resources (IACWR, successor to FIARBC) and its Subcommittee on Evaluation Standards. In 1958, a revised edition of the Green Book was issued under the same title, *Proposed Practices for Economic Analysis of River Basin Projects* (U.S. IACWR, Subcommittee on Evaluation Standards, 1958). Only minor revisions were made to the original 1950 version.

As of 1960, three separate sets of water resources evaluation principles, standards, and practices were in existence.

1. The proposed practices of the revised Green Book of 1958, which had no official status, either with the water resources agencies or the Bureau of the Budget, but which nonetheless had considerable influence on agency practice.
2. Budget Circular A-47, the officially approved standards and procedures used by the executive office of the president in reviewing agency project proposals.
3. The various standards, practices, and procedures used by individual water resources agencies such as the Bureau of Reclamation and the Army Corps of Engineers, in formulating and evaluating their water projects.

Although wide areas of agreement existed among these three sets, there were some significant differences. Budget Circular A-47 was the most conservative, emphasizing a single test of economic efficiency, opportunity-cost discount rates, shorter time horizon, and tight financial criteria for cost allocation. In contrast, the Bureau of Reclamation's standards emphasized secondary benefits relating to regional or local area development, and looser cost allocation formulae. The Green Book took an immediate position, but on the secondary benefits issue was closer to Budget Circular A-47 than to the Bureau of Reclamation's position.

THE ROLE OF ECONOMISTS

The early work in the 1940s on water resources evaluation principles and standards leading to the publication of the Green Book was undertaken by professionals from federal government agencies. Some of these professionals had

economic training, largely in agricultural economics. The intellectual leader of this small group was Mark M. Regan of the Bureau of Agricultural Economics, Department of Agriculture. However, it is noteworthy that there was very little published in economic journals on the economics of public investments to serve as guidance to this staff of government employees. Nor were any academic economists brought in as consultants to the FIARBC Subcommittee on Benefits and Costs.

However, following the publication of the Green Book and a major national report on U.S. water resources policy in 1950 (President's Water Resources Policy Commission, 1950), academic economists became increasingly interested in problems of benefit-cost analysis of water resources projects. As already noted above, three distinguished economists were asked to advise the Bureau of Reclamation on the secondary benefits issue (Clark, John M. et al., 1952). Other economists – principally at Harvard, the University of Chicago, and the RAND Corporation in California – began to make systematic studies, such that in 1958 three major books on water resources economics were published (Eckstein 1958, Krutilla and Eckstein 1958, and McKean 1958). This was followed in 1960 by a book on water supply economics (Hirshleifer, DeHaven, and Milliman, 1960), and in 1962 by the path-breaking report of the Harvard Water Program on the economics and technology of water resources systems (Maass et al., 1962). Taken together, these books presented a comprehensive analysis and critique of the theoretical and applied aspects of benefit-cost analysis as applied to water resources. Although differing in detail, these books shared the same economic paradigm based on welfare economics and related microeconomic theory. Many difficult conceptual issues such as externalities, consumer surplus, opportunity costs, and secondary benefits that had troubled earlier practitioners were resolved and other unresolved issues, such as the discount rate, were at least clarified.

Taken together, the work in the federal government that produced the Green Book and the follow-up work by academic economists that produced the literature of the late 1950s and the early 1960s provided the basis for (1) further development of federal water resources standards and criteria in the 1960s and 1970s that accommodated multiple objectives, and (2) extension of application of benefit-cost analysis beyond water resources to many other public investment programs and to other countries, both developed and undeveloped. These extensions of benefit-cost analysis are discussed in the following papers.

EVOLUTION OF BENEFIT-COST ANALYSIS FOR WATER RESOURCES PLANNING: 1960-1985

There was a fundamental reconsideration of federal water resources standards and criteria with the coming of the Kennedy administration.

The Senate Select Committee on National Water Resources report of January 1961 took the position that a liberal approach should be adopted to economic analysis including an assessment of the regional economic effects of water projects. Although the report did not focus on benefit-cost analysis, it did call attention to need for efficiency in water use and the role that economic incentives, such as full-cost pricing, could play in increasing the economic efficiency of use of water.

To meet the dissatisfaction of key congressional committees with existing water resources principles and standards (based on Budget Circular A-47 and the 1958 version of the benefit-cost manual), the Bureau of the Budget established a panel of consultants in the spring of 1961 to report on "suggested standards and criteria for formulating and evaluating federal water resources developments." The panel in its report on June 30, 1961, (U.S. Bureau of the Budget Panel of Consultants, 1961) dealt with issues of the discount rate, period of economic analysis, and so-called secondary benefits. Influenced by the work of the Harvard Water Program over the preceding four years, the panel introduced the multiple-objective approach to water resources planning. It stated that in addition to national economic efficiency – measured in national productivity or national income terms – equitable income distribution could also be an important objective. In addition, "preservation of aesthetic and cultural values" was introduced as a forerunner to what later became the environmental quality objective.

On the whole, the panel's report took a conservative stance on the key issues of discount rate and treatment of secondary benefits, and, in order to forestall adverse congressional reaction, was not distributed widely by the Bureau of the Budget. However, it was used as a background document by an inter-agency Water Resources Council, established by President Kennedy in October 1961, which was directed to prepare an up-to-date set of uniform benefit-cost standards. The council report was approved by the President on May 15, 1962 (Senate Document 97, 87th Congress, 1962).

The key feature of this report was its adoption of the multiple-objective approach. Three objectives were identified: national economic development, "preservation"

(a forerunner of the environmental quality objective), and "well-being of people" (a surrogate for the income distribution objective). However, primary emphasis was still given in the formulation of projects to the national economic development objective; hence, the proposed approach was not fully multiple objective in nature.

The report adopted a financial formula for computing the discount rate based on the cost of long-term (15 years or more) securities to the federal government, which resulted in a significant increase (to 3 1/8 percent) in the 2 1/2 percent discount rate that federal agencies had been using.

Of significance is the fact that the federal agencies agreed to adopt the standards and procedures set forth in Senate Document 97, so that, for the first time, uniform standards would be used by the federal water agencies. Following Presidential approval of the report Budget Circular A-47, which had guided the executive office policy on water resources since 1953, was rescinded.

Following the completion of many large-scale, multiple-purpose dams and reservoirs, water-based recreation became an important use, and by extension an important purpose in planning future projects. Attention was accordingly focused on concepts and methods of estimating outdoor recreation benefits from such projects. Although the report of the panel of consultants had recommended against the use of single unit benefit values for the country as a whole, the ad hoc Water Resources Council, in a supplement to the Senate Document 97 standards dated June 1964, adopted uniform ranges of unit day recreation values for two types of water-based recreation. However, willingness to pay was recognized as the theoretical basis for recreational benefits in national economic efficiency terms.

As David Major points out in his monograph (Major, 1977), it remained for a special task force of the Water Resources Council to spell out the multiple objective approach in detail. In its preliminary report of June 1969 and final reports of 1970, the task force proposed four objectives for water resources planning: national economic development, environmental quality, regional development, and social well-being. The report stated that "No one objective has any inherently greater claim on water and land use than any other." The report suggested that alternative plans be formulated with different mixes of contributions to the objectives, to serve as a basis for selecting a recommended plan based upon an evaluation of trade-offs among the objectives.

After thorough review of the task force reports, the Water Resources Council in 1973 adopted a version of the

proposed standards that adopted only two objectives for formulating plans – national economic development and environmental quality. Contributions of projects to other objectives including regional development and social well-being could be displayed for consideration by decisionmakers, but projects would not be formulated for these objectives.

The next significant development occurred in the administration of President Jimmy Carter. On June 6, 1978, the President issued his water resources policy reform message to the Congress. This was followed on July 12, 1978, by a presidential directive to the federal agencies for a thoroughgoing review of planning and evaluation standards and practices in order to make major improvements in planning and evaluation of projects. This message and directive set in motion a process that resulted in a complete revision of the 1973 water resources standards, so that by mid 1980 proposed new rules for principles, standards, and procedures for water resources planning had been promulgated by the Water Resources Council as binding on the federal water resources agencies (U.S. Department of the Interior, 1980). These rules called for (1) full integration of water conservation into project and program planning; (2) preparation of a primarily nonstructural water resources plan as an alternative to a structural project or program; and (3) uniform and consistent calculation of national economic development benefits and costs. By these changes and other procedural and financial reforms, the President sought to reduce the number of economically marginal and environmentally destructive water resources projects undertaken by the federal government.

However, with the change in the national administration in 1981 came a major shift in water resources policy at the national level. Federal government leadership in water resources planning and policy was sharply reduced. The statutory U.S. Water Resources Council and six associated river basin commissions were abolished in September 1981 to be replaced by a council established by executive order. In addition, the “Principles and Standards” (P&S) adopted as federal rules in 1980 were repealed on the basis that they were “too complicated, too rigid, and too cumbersome” to be effective as legally binding formal rules. After extensive review, revised and much simplified principles and procedures were approved by the President in early 1983 to serve as guides to the federal water agencies (U.S. Water Resources Council, March 1983). These principles and procedures, however, continued the use of two objectives – national economic development and environmental quality.

Emphasis in the new administration turned to cost-sharing and pricing policy as a means of curbing perceived

excessive federal investment in water resources projects. This shift was summarized in a congressional budget office report (August, 1983) which emphasized a policy reorientation involving greater state and local responsibility for project costs, financial arrangements and project selection, and increased user fees to recoup costs of projects providing private benefits. As of 1988, this policy redirection had been accomplished in part, although much remains to be done to achieve the goals of greater cost-sharing by states and more appropriate payment of user charges by private beneficiaries.

LANDMARKS IN EVOLUTION OF BENEFIT-COST ANALYSIS

1935-1960

- 1935: Professor Clark report for National Planning Board on *Economics of Planning Public Works*.
- 1936: Flood Control Act of 1936: “If the benefits to whomsoever they may accrue exceed the estimated costs.”
- 1936: Water Resources Committee of the National Resources Committee begins review of agency water project proposals.
- 1943: Natural Resources Planning Board abolished. Bureau of the Budget assigned sole responsibility of review of water proposals.
- 1946: Federal Inter-Agency River Basin Committee establishes a Subcommittee on Benefits and Costs.
- 1950: Green Book: *Proposed Practices for Economic Analysis of River Basin Projects* issued by Subcommittee on Benefits and Costs.
- 1950: Report of President’s Water Resources Policy Commission.
- 1952: Report of panel of three economist consultants on *Secondary or Indirect Benefits of Water-Use Projects*.
- 1952: Bureau of the Budget issues Budget Circular A-47 on economic principles and procedures for water resources projects.

- 1958: Revised version of Green Book issued by Subcommittee on Evaluation Standards of the U.S. Inter-Agency Committee on Water Resources.
- 1958: Publication of major economic critiques of benefit-cost analysis:
- Eckstein: *Water-Resource Development: The Economics of Project Evaluation*
- Krutilla and Eckstein: *Multiple Purpose River Development: Studies in Applied Economic Analysis*
- McKean: *Efficiency in Government Through Systems Analysis: With Emphasis on Water Resource Development.*
- 1960: Publication of Jack Hirshleifer, et al., *Water Supply: Economics, Technology and Policy.*
- 1962: Publication of Maass, Hufschmidt, et al., *Design of Water-Resources Systems.*
- 1960-1985**
- 1960: Report of Senate Select Committee on National Water Resources.
- 1961: Consultants report to Bureau of the Budget on *Standards and Criteria for Formulating and Evaluating Federal Water Resources Development.*
- 1962: Senate Document No. 97: President's Water Resources Council report on *Policies, Standards, and Procedures . . . for Water Resources Plans*
- 1964: Supplement No. 1 to Senate Doc. No. 97 issued on *Evaluation Standards for Primary Outdoor Recreation Benefits.*
- 1969: Water Resources Council special task force preliminary report on *Multi-Objective Approach to Planning Water and Land Resources.*
- 1971: Water Resources Council *Proposed Principles and Standards for Planning Water and Related Land Resources*, issued for public review.
- 1973: Water Resources Council issues presidentially approved "Principles and Standards" for use by federal water resources agencies.
- 1978: Presidential directive for *Improvements in Water Resources Planning and Evaluation Principles, Standards, and Procedures*, July 12.
- 1979: Presidential Executive Order 12113, January 5, 1979, directing Water Resources Council to revise the "Principles and Standards" and to develop a planning manual incorporating them.
- 1979: Water Resources Council issues revised "Principles and Standards" and manual of procedures for evaluation of national economic development benefits and costs, December 14, 1979.
- 1980: Water Resources Council issues *Proposed Rules for Federal Water Resources Planning*, April 4, 1980.
- 1981: Water Resources Council issues notice of intention to repeal *Principles, Standards and Procedures for Planning Federal Water Projects*, September 10, 1981.
- 1983: President approves new *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, February 3, 1983.

AUTHOR

Maynard M. Hufschmidt is a native of Tomahawk, Wisconsin. He attended the University of Illinois, graduating in engineering in 1939. After working for the state of Illinois he moved to Washington where he worked for the National Resources Planning Board, the Bureau of the Budget, and the Department of the Interior between, 1941 and 1954. In 1955 he went to Harvard where he earned an MPA in 1955 and then joined the Harvard Water Program where he worked for 10 years with Arthur Maass, Robert Dorfman, Gordon Fair and Harold Thomas among others. A major output of the program was the classic *Design of Water Resource Systems*. In 1964 he received his DPA from Harvard.

Professor Hufschmidt then went to the University of North Carolina at Chapel Hill where he was professor in the Departments of City and Regional Planning and Environmental Science and Engineering from 1965 to 1979. Retiring as Emeritus, he then began his third major career at the East-West Center in Honolulu where he established the environmental economics program and produced a series of books on economic valuation of environmental resources (Environment, Natural Systems and Development and Economic Valuation Techniques for the Environment) with John Dixon and others. Retiring in 1994, he is listed in Who's Who in America and now resides in Irvine, California.

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