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Federal water resources projects are seldom authorized unless their estimated benefits exceed their estimated costs. The Water Resources Council (WRC) established principles and standards for planning water resources projects which were to help establish uniform procedures for more accurate benefit-cost analysis. Findings/Conclusions: In spite of the importance of cost-benefit analyses, Federal water resources agencies have had a continuing problem preparing accurate, uniform, logically developed benefit-cost ratios. Present standards and criteria are not specific enough to provide guidance for developing procedures for benefit-cost analysis. Lack of uniformity in methods of computing benefits has resulted in inconsistent and questionable computations, especially in areas such as recreation, area redevelopment, and navigation benefits. In some instances, agency regulations were not being followed, and questionable assumptions and inaccurate computations were made. Also, objective analysis is hampered by agency self-interest and outside influence. Alternatives for achieving more objective and reliable analyses would be to establish a focal point within the existing organizational structure or to establish an independent group to either prepare or review benefit-cost analysis. Recommendations: The WRC should: review principles and standards and provide specific guidance and criteria to insure uniform benefit computations, request the agencies, if they have not done so, to submit their procedures for implementing the principles and standards for approval, and review implementing procedures which have been approved for uniformity. The

Secretaries of Agriculture, the Army, and the Interior should agree upon uniform methods and revise implementing procedures to insure consistency. These Secretaries should insure that internal regulations for benefit computations are specific enough to insure logical and consistent development and that they are developed for all authorized benefits used in agency calculations. They should also have their agencies strengthen their internal management review procedures for benefit-cost analyses to prevent mathematical errors, resolve inappropriate assumptions, and insure that adequate studies and supporting documentation are provided. (HTW)

7248

BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

An Overview Of Benefit-Cost Analysis For Water Resources Projects-- Improvements Still Needed

Despite a continuing awareness of the need to improve benefit-cost analysis for making decisions on water resources projects costing billions of dollars, Federal agencies still have problems preparing accurate, uniform, logically developed benefit-cost ratios for these projects.

The water resources agencies should work together through the Water Resources Council to (1) establish more specific criteria regarding the value and acceptability of benefits, (2) develop more detailed procedures, and (3) strengthen their reviews to insure correctly prepared benefit-cost analysis. GAO suggests several organizational alternatives to achieve more objective and reliable benefit-cost analysis.



GED-78-127

AUGUST 7, 1978



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-167941

To the President of the Senate and the
Speaker of the House of Representatives

This report discusses the criteria and methods used by the Bureau of Reclamation, Corps of Engineers, and Soil Conservation Service in making benefit-cost analyses for Federal water resources projects.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

Copies of this report are being sent to appropriate House and Senate committees; the Director, Office of Management and Budget; and the heads of departments and agencies directly involved.

A handwritten signature in black ink, reading "Louis B. Stacks".

Comptroller General
of the United States

D I G E S T

Benefit-cost analysis is a vital tool used by both the executive and legislative branches in making decisions on water resources projects costing billions of dollars. Projects are seldom authorized unless their estimated benefits exceed their estimated costs.

Despite the importance of this analysis in making reliable decisions, Federal water resources agencies have had a continuing problem preparing accurate, uniform, logically developed benefit-cost ratios. To help correct this situation, GAO recommends that

- principles and standards be amended to provide for common and uniform estimating procedures and
- internal review procedures be strengthened to insure compliance.

Agency self-interest and outside influence works against the development of objective and impartial benefit-cost analysis and will continue to do so until the system is changed.

The Water Resources Council, a policy and coordinating body, established principles and standards for planning water resources projects, effective in 1973, which superseded previous criteria. The new standards were developed to help establish uniform procedures for more accurate benefit-cost analysis. However, neither the principles and standards, nor Senate Document 97, the governing criteria for benefit-cost analysis prior to 1973, is specific enough to insure consistent interpretation in developing procedures and recommendations for benefit-cost analysis.

Of eight agencies, six have submitted procedures for implementing principles and standards. (See p. 11.) Although the Council has found the agencies' procedures meet the requirements of the principles and standards it has not determined that they are consistent among the agencies.

GAO also found the agencies' regulations are too inconsistent, incomplete, and general to provide adequate guidance for calculating some benefits, especially in areas such as recreation, area redevelopment, and navigation benefits. Inadequate regulations result in inconsistent and questionable benefit computations.

Depending upon the method selected to compute the recreation benefits for one project, the final benefit-cost ratio ranged from a low of .89 (not economically justifiable) to a high of 1.58. (See p. 9.) Agencies computed recreation benefits by using methods such as

- estimating visitors from a percentage of the area's population,
- comparing the facilities of similar projects, and
- estimating visitors based on the capacity of parking spaces at the recreational area.

If all agencies followed the most stringent area redevelopment benefit criteria currently required by the Army Corps of Engineers and Soil Conservation Service, this benefit would not have been authorized for four of the five projects reviewed. Yet, the annual area redevelopment benefits reported for these projects totaled more than \$11.3 million. (See pp. 9 to 11.) In addition, the fifth project also would not have qualified except for a special designation for projects located in the Appalachia Region.

Although several methods which conformed to Corps regulations were used on a navigation project to compute the benefits occurring from reduced navigation delays, the resulting

benefit could range from \$4.7 million to \$43.3 million annually depending upon the method used. (See pp. 16 and 17.) Further, there was no statistical assurance that the sample taken to compute transportation rate savings for this project was representative of actual shipments or that the resulting benefit was reasonably accurate. (See pp. 17 and 18.)

During the audits at each of the five Bureau of Reclamation, Corps of Engineers and Soil Conservation Service projects reviewed, GAO noted instances where agency regulations were not being followed, and where questionable assumptions, and inaccurate mathematical computations were made. The agencies' review processes failed to identify these problems. (See pp. 27 to 26.)

The President also believes that more specific guidelines are needed. In June 6, 1978, National water policy message he directed that the Water Resources Council prepare within 12 months a manual which insures that benefits and costs are calculated using the best techniques and provides for consistent application of the principles and standards and other requirements.

GAO is making a number of recommendations to the Water Resources Council and the Secretaries of Agriculture, the Army, and the Interior in this report which should help the agencies provide more accurate, uniform, benefit-cost analyses to the Congress. (See pp. 13, 21, and 26.)

ALTERNATIVES FOR MORE RELIABLE BENEFIT-COST ANALYSES

Even if the recommended improvements are made, benefit-cost analysis probably will not be consistently prepared in an unbiased, systematic manner so decisionmakers can assess the economic merits of proposed water resources projects.

Problems with the practices and procedures used to calculate the benefit-cost ratios continue, despite a continuing awareness over the years of a need to improve the system. Although the problems can be attributed to many different reasons, a major factor has been the influences from Federal, State, and local levels as well as the self interest of the agencies preparing the analysis.

There are several alternatives for achieving more objective and reliable benefit-cost analysis. One approach would be to establish a focal point within the existing organizational structure and strengthen the role of the Office of Management and Budget or the Water Resources Council. A second approach which has been considered by various studies over the years would be to establish an independent group to either prepare or review benefit-cost analysis. Selection of the most desirable alternative would depend upon the cost, complexity of the new system, range of responsibilities, degree of changes and independence desired, and the wishes of the Congress. Bills such as H.R. 8060 and H.R. 10004 have been introduced which would establish an independent group.

AGENCY COMMENTS

The Departments of the Interior, Agriculture, and the Army agreed with the thrust of the report and with GAO's recommendations and indicated that corrective action would be taken (see pp. 26 and 27.)

Concerning GAO's discussion of feasible organizational changes, the Department of Agriculture and the Tennessee Valley Authority believe that the existing system can be adequately strengthened to provide consistent, logically developed benefit-cost analysis and that an independent agency is unnecessary. While not agreeing that an independent agency is needed, the Departments of the Interior, and the Army and the Water Resources Council staff agreed that some form of organizational change is needed to insure that independent, impartial, reviews are carried out.

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ABBREVIATIONS

EDA	Economic Development Administration
GAO	General Accounting Office
OBE-ERS	Office of Business Economics, Department of Commerce and the Economic Research Service, Department of Agriculture
SCS	Soil Conservation Service, Department of Agriculture

CHAPTER 1

INTRODUCTION

Benefit-cost analysis is one of the major tools used by the President, the Congress, and Federal agencies to make decisions on proposed Federal water resources projects costing billions of dollars. Projects are seldom authorized unless their estimated benefits exceed their estimated costs.

Despite the importance of benefit-cost analysis to informed decisionmaking, Federal water resources agencies have had a continuing problem preparing accurate, uniform, and logically developed benefit-cost ratios.

In GAO reports over the past 10 years we made recommendations to improve this situation. (See app. I.) In response to our 1974 report recommendations, ^{1/} the water resources agencies indicated that the new principles and standards adopted in 1973, and approved agency procedures should substantially improve the reliability of benefit-cost analysis.

We made this follow-up review to

- evaluate the effectiveness of the new governing principles and standards and internal agency procedures for benefit-cost analysis,
- determine if recent benefit-cost analysis had been adequately prepared for selected projects, and
- suggest improvements to assist the water resources agencies in preparing benefit-cost analysis to better meet decisionmakers' needs.

BENEFIT-COST ANALYSIS IS IMPORTANT

Benefit-cost analysis, used by Federal water resources agencies to show the economic feasibility of proposed projects, has long been recognized as an important decision-making tool by both the executive and legislative branches of the Federal Government. This analysis is essentially a comparison of a water project's expected benefits with its anticipated costs. Ordinarily a project is not considered

^{1/}Improvements Needed in Making Benefit-Cost Analyses for Federal Water Resources Projects (B-167941, Sept. 20, 1974.)

justifiable unless the ratio of project benefits to project costs is greater than one-to-one.

On February 21, 1977, the President announced that all Federal water resources projects would be reviewed to determine if they were still justifiable on economic, environmental, and safety grounds. Subsequent review instructions have indicated that the executive branch relies on benefit-cost analysis as one of the most important criteria for determining the economic feasibility of proposed water projects.

Other factors are also considered in determining whether projects should be built. Representatives of the water resources construction agencies, the Council on Environmental Quality, the Office of Management and Budget, and the White House developed review criteria to evaluate all projects. These representatives agreed that the projects should be re-evaluated for (1) assurance that the ratio of remaining direct benefits exceeds the remaining direct costs when discounted at a rate of 6-3/8 percent, (2) major adverse environmental impacts, and (3) safety.

During hearings on the President's water resources project review, many members of the Congress said that benefit-cost ratios are important indicators of project desirability, and used these ratios to support projects being questioned. The Congress also relied on benefit-cost ratios when it voted to appropriate funds for projects which the President had not included in his fiscal year 1978 budget.

Several Federal agencies construct water resources projects for similar purposes, thus benefit-cost analysis is needed to insure that the merits of these projects can be uniformly evaluated. The Corps of Engineers, Department of the Army; the Bureau of Reclamation, Department of the Interior; Soil Conservation Service (SCS), Department of Agriculture; and the Tennessee Valley Authority, plan and construct multipurpose water resources projects for flood control, recreation, municipal and industrial water, area redevelopment, and when necessary, other project purposes. The Corps also plans and constructs inland navigation waterway projects.

HISTORY OF BENEFIT-COST ANALYSIS CRITERIA

Since the Congress declared in the Flood Control Act of 1936 (49 Stat. 1570) that benefits of Federal projects should

exceed costs, agencies have continued to develop and refine criteria for determining more accurate benefit-cost ratios.

Early procedures lacked effectiveness

In May 1950 an interagency committee on water resources developed a procedural guide for evaluating the benefits and cost of proposed water and related land resources. Although this guide was not adopted as official policy by the agencies, it was used to develop economic justifications for proposed projects.

On December 31, 1952, the then Bureau of the Budget notified the agencies of factors it would consider in evaluating projects and required the agencies to prepare uniform data for project comparisons. Thus, Bureau of the Budget Circular A-47 became the governing criteria for benefit-cost analysis from December 31, 1952, to May 15, 1962.

Senate Document 97 becomes the official evaluation criteria

Because existing standards for evaluating projects needed improvement, the President on October 6, 1961, requested the Secretaries of Agriculture; Army; Health, Education, and Welfare; and the Interior to review existing standards used to formulate and evaluate water resources projects and to recommend improvements. On May 15, 1962, the President approved the Secretaries' report entitled, "Policies, Standards and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources."

On May 29, 1962, the Senate printed this report as Senate Document 97, 87th Congress, 2nd session. This Senate document replaced Bureau of the Budget Circular A-47 and provided the governing criteria for water resources project formulation.

Principles and standards replace Senate Document 97

The Water Resources Council ^{1/} was required by the Water Resources Planning Act 1965 (42 U.S.C. 1962) to

^{1/}The Water Resources Council, established by the Water Resources Planning Act, consists of the Secretaries of the Interior, Agriculture, Army, Commerce, Energy, Housing and Urban Development, Transportation, and the Administrator of the Environmental Protection Agency.

establish--after consulting other interested entities and with the approval of the President--principles, standards, and procedures to formulate and evaluate Federal water and related land resources projects. The Council established and the President approved such principles and standards entitled, "Principles and Standards for Planning Water and Related Land Resources." On October 25, 1973, the principles and standards became effective and superseded Senate Document 97 as the governing criteria for formulating and evaluating water resources projects.

SCOPE OF REVIEW

We reviewed pertinent laws and legislative history, Senate Document 97, the Water Resources Council's principles and standards, and the methods and procedures used by the Federal water resources agencies to implement those laws and principles and standards. As part of this review, we gave recognition to all the problems identified in previously issued GAO reports that covered economic aspects of water resources projects and several other case studies on this subject. (See app. I for list of the GAO reports.)

Our review included a detailed examination of five projects (2 navigation and 3 multipurpose projects) as follows:

	<u>Annualized</u>		<u>Benefit-cost</u> <u>ratio</u>
	<u>Benefits</u>	<u>Costs</u>	
	(thousands)		
Navigation Projects:			
Locks and Dam 26, Alton, Illinois, Corps	148,349	37,812	<u>a/3.92:1</u>
Red River Waterway Proj- ect, Corps	50,202	44,900	1.12:1
Multipurpose Projects:			
Arcadia Lake Project, Corps	4,713	3,829	1.2 :1
Dolores Project, Bureau Second Broad River	9,947	7,902	1.27:1
Watershed Project, SCS	531	431	1.2 :1

a/Corps Formulation Evaluation Report dated March 1975, as reported to the Congress. Figures are based on a new 1200 foot Lock with a capacity of 86 million tons.

Although the Tennessee Valley Authority also plans and constructs multipurpose water resources projects, we did not review their projects because most of them were completed and no new projects were scheduled for construction.

We examined each agency's instructions, procedures, project plans, and other documentation used to support the estimated benefit-cost ratios for the above five projects.

Our review was made primarily at the Corps' District Offices at St. Louis, Missouri (Locks and Dam 26), New Orleans, Louisiana (Red River Waterway) and Tulsa, Oklahoma (Arcadia Lake); the Bureau's Regional Office at Durango, Colorado (Dolores Project), and the SCS State Office at Raleigh, North Carolina (Second Broad River). In addition, we reviewed files and held meetings at the Bureau's Engineering and Research Center, Denver, Colorado; SCS's South Technical Service Center, Fort Worth, Texas; and the Bureau, Corps and SCS headquarters, Washington, D.C.

We also had discussions with Water Resources Council staff, Department of Transportation and other appropriate Federal, State, and local agency officials.

CHAPTER 2

MORE SPECIFIC GUIDANCE NEEDED TO ASSIST AGENCIES IN DEVELOPING BENEFIT-COST ANALYSIS

The Water Resources Council's principles and standards for the guidance of Federal agencies, and agency procedures and regulations, established to implement those standards, are so general that they allow varying interpretations which can result in inconsistent and inaccurate benefit computations. These governing documents were designed to assist analysts in preparing accurate, consistent, benefit-cost estimates and range from general Water Resources Council guidance for all agencies to detailed agency regulations for computing specific benefits. Each agency is responsible for preparing implementing procedures and revising their regulations in accordance with the Council's principles and standards.

Although principles and standards have to be broad enough to apply to each agency they should be as specific as possible and agency implementing procedures and detailed regulations should be progressively more specific to provide adequate guidance for preparing benefit-cost analysis. At each level, we identified areas where more complete or specific guidance should be developed. Inadequate guidance has contributed to problems, such as use of inconsistent computation procedures, inappropriate and questionable assumptions, and mathematical errors. In this chapter we address the general guidance provided by the principles and standards and the agencies' inconsistent implementing procedures. Chapter 3 discusses the need for more detailed agency regulations and chapter 4 addresses the need for better agency review procedures for regulation compliance.

More specific guidance and better reviews should improve the current system. Historical evidence indicates, however, that the system must be changed to achieve reliable, benefit-cost analysis from which decisionmakers can adequately assess the economic merits of proposed projects. This approach is discussed in chapter 5.

NEED FOR MORE DEFINITIVE PRINCIPLES AND STANDARDS

Although intended to provide interagency criteria for uniform, consistent, benefit-cost analysis, the new principles and standards are not specific enough to insure

consistent interpretation in developing procedures and regulations for benefit-cost analysis. Most of the benefit-cost analysis techniques previously used by the agencies under Senate Document 97 are just as appropriate under the principles and standards. Officials from the Bureau, Corps, and SCS told us that only a few changes had to be made in their detailed procedures to comply with Council principles and standards. For example, SCS believes its handbook for calculating benefits and costs complies with the principles and standards. This handbook, the "Economics Guide for Watershed Protection and Flood Prevention," had been changed only twice since 1964. A 1968 change dealt with computing values for special recreation activities. The other change was a July 1973 revision of the method for computing erosion and sediment benefits. Both revisions came before the publication of the principles and standards.

Our review focused on two areas--recreation and area redevelopment benefits--to demonstrate the need for more specific guidance to the water resources agencies.

RECREATION GUIDELINES SHOULD BE MORE SPECIFIC

Agencies lack the specific criteria necessary to compute recreation benefits. Consequently, they use different methods which result in inconsistent and nonuniform analysis.

Although previous interagency standards and the current principles and standards recognized recreation as a legitimate project benefit, none provided the specific guidance needed to insure consistent recreation estimates. For example, Senate Document 97 recognized recreation as a project benefit but did not include specific criteria for measurement. The Secretaries of the Army; Agriculture; the Interior; and Health, Education, and Welfare joined in a task force and identified additional definitions and requirements for estimating recreation use in Supplement Number 1, dated June 4, 1964. Although this supplement required that a recreation day be used as a standard unit of measurement for determining primary outdoor recreation benefits, it did not provide guidance recommending a specific method for estimating the number of recreation days which should be attributed to the project.

Although the principles and standards superseded Senate Document 97 and Supplement Number 1, they also failed to identify any specific method for determining recreation benefits. Instead, they allowed any procedure which "best measures a consumer's willingness to pay for project recreation goods or services."

Inconsistent methods used to compute recreation benefits

The estimated recreation benefits for single projects vary widely depending upon the method of computation. According to one Council official, recreation (visitor) days in conjunction with a simulated price or value per day are generally used to compute recreation benefits. Recreation benefits are then determined by estimating the project's annual visitors and multiplying the amount by a fixed rate per visitor day to determine total benefits. However, several methods are used to estimate the number of these visitor days. He stated that agencies use three generally accepted methods--user day value, travel cost method, and comparison of similar projects (survey method). We found, however, that agencies also were using several additional methods in developing recreation benefits. The agencies have predominantly relied on interim unit day values published in the principles and standards, however, as the basis of establishing the price or value of a day of recreation. The official agreed that agencies were authorized to use almost any method they developed. He also agreed that even under the three generally accepted methods vast differences in the allowable benefit claimed would exist which could substantially affect the project's benefit-cost ratio.

Although there may not be one "best" method for calculating recreation benefits, we believe that to achieve consistency and reliability the agencies should decide which method generally would be applicable and use it unless an exception is justified. June 1976 and January 1977 Department of Agriculture audit reports questioned the validity of SCS' recreation benefit estimates for two specific projects and noted that a wide range of estimates was possible depending upon the method used. As shown below, these reports demonstrated that annual recreation benefits could vary by \$1.38 million and cause a project's final benefit-cost ratio to range from a high of 1.58 to a low of .89, depending upon the method used to compute the number of visitors using the facility.

Basis used to determine visitor day estimate	Resulting annual recrea- tional benefit by project (notes a and b)		Benefit-cost ratio by proj- ect (change af- fected by the recreational benefit)	
	<u>A</u>	<u>B</u>	<u>A</u>	<u>B</u>
	Number of facilities available for each recreation activity	\$ 848,700	\$29,500	1.12
Population within a one-hour distance	480,800	28,300	.93	.84
Total number of park- ing spaces	1,775,200	NA	1.58	NA
Comparison with an- other facility	395,000	82,500	.89	1.24

a/Shows how the recreation benefits would vary depending upon the method used to estimate the visitor days.

b/Amounts shown are rounded to the nearest hundred dollars.

Our review showed that the Bureau and Corps also used different methods to compute recreation benefits. At the Bureau's Dolores project three different agencies computed segments of the total recreation benefits for the project. Each used a different method to estimate the visitor days used in computing the project recreation benefits. The National Park Service estimated its visitor days based upon the estimated 1980 population in the vicinity of the project. The Forest Service based its estimate on the capacity of the parking units at the recreation area. From this base they calculated the average number of cars and people which would use those parking units to derive their final visitor day estimate. The Bureau used estimated average occupancy rates for camping and picnicking to compute its visitor days. The Corps also used different methods to compute the recreation benefits for each of the three projects reviewed--Arcadia Lake, Locks and Dam 26, and Red River.

AREA REDEVELOPMENT GUIDELINES SHOULD BE SPECIFIC

Because agencies lack definitive guidance for determining which projects qualify for area redevelopment benefits, various criteria are used. As a result, some projects have

received credit for benefits which, although consistent with governing criteria, would have been ineligible under other existing criteria.

Agencies are authorized to claim area redevelopment benefits when it is estimated that employees from substantial underemployment and unemployment areas will be used to construct the project. Area redevelopment benefits were authorized by both Senate Document 97 and the principles and standards, however, both documents provide only broad guidance to the agencies. Although the Bureau, Corps, and SCS developed implementing procedures for principles and standards, the areas addressing area redevelopment benefits were also very broad, allowing inconsistent criteria for determining eligible projects and computing the area redevelopment benefits.

Senate Document 97 provided that redevelopment benefits could be included in the benefit-cost calculations for areas with, "(1) less than 'full employment' nationally, and (2) chronic and persistent unemployment or underemployment in designated areas...under the Area Redevelopment Act of 1961 or other authorized procedures relating to resource underemployment." The Corps and SCS interpreted this to mean those areas designated by the Economic Development Administration (EDA) as having chronic and persistent unemployment and underemployment. Although the Bureau also interpreted this the same as the Corps and SCS, it failed to provide agencywide criteria.

Council principles and standards did not further clarify this aspect of Senate Document 97 or the agencies' implementing procedures. Rather, they stated that "The Council, considering data from its economic projects and the economic and rural development programs, will designate planning regions in which unemployed or underemployed labor resources exist." However, the Council has not made any such designations, and we were advised that they do not intend to because the water resources agencies believe it unnecessary.

The Council should designate
planning regions with substantial
unemployed or underemployed labor

Because the Council has not designated those planning areas which have substantial unemployment as required by the principles and standards, the three agencies, as well as several districts within the Corps, currently use different criteria to determine project eligibility for this benefit.

Thus, area redevelopment benefits were included for some projects which would not have qualified under criteria used for other projects.

In the absence of Council designations, all three agencies usually rely on designations by EDA. However, EDA categorizes area unemployment at several different levels. The three agencies do not consistently use the same designated level of unemployment as their criteria for determining whether area redevelopment benefits are authorized for projects.

Area redevelopment benefits would not have been authorized for the following projects if all agencies followed the most stringent criteria currently required by Corps and SCS regulations (areas designated by EDA as having chronic and persistent unemployment and underemployment).

<u>Project</u>	<u>Annual area redevelopment benefits claimed</u>	<u>Percent of total project benefits claimed</u>
Arcadia Lake	\$ 206,000	4
Dolores	580,000	6
Locks and Dam 26	2,600,000	a/4
Red River Waterway	<u>8,000,000</u>	<u>16</u>
Total	<u>\$11,386,000</u>	

a/Based on \$63.6 million annual benefits as reported in Supplemental Economic Data, Locks and Dam 26 (Replacement) January 1977.

Although SCS' Second Broad River project also would not have qualified for area redevelopment benefits under the above EDA criteria, it qualified under a special designation attributable only to projects located in the Appalachia Region.

NEED FOR CONSISTENT IMPLEMENTING PROCEDURES

Inconsistent agency procedures allow use of various methods which can cause significantly different benefit-cost ratios. Each agency is responsible for preparing its own procedures in accordance with the principles and standards subject to review and approval of the Council. Of the eight required agencies, only six have submitted their procedures for approval. The Fish and Wildlife Service, and

Forest Service have not complied with the requirement. The Council has reviewed and approved those submitted by the Bureau of Reclamation, Corps of Engineers; Heritage, Conservation and Recreation Service; National Park Service; Soil Conservation Service; and the Tennessee Valley Authority as consistent with the principles and standards but has not determined whether they are consistent among the agencies. Council officials told us they planned to wait until all agencies had submitted their procedures before reviewing them for interagency consistency. This policy has not changed since our 1974 report which noted that the principles and standards required the Council to review the agencies implementing plans for uniformity and concluded that such action should help establish uniform agency procedures.

In our 1974 review of the benefit-cost computations for seven projects we found 11 instances where benefits were not computed consistently, and 16 instances where all costs were not fully considered in the benefit-cost determinations. These and similar problems noted in this chapter and prior reports continue to occur, partially because of the broadly written criteria used in the principles and standards and lack of Council review of the agencies' implementing plans for uniformity and consistency.

The President also believes that the implementing instructions should be more specific. In his June 6, 1978, National water policy message, he said he was directing the Council to improve the implementation of the principles and standards by preparing within 12 months a manual which insures that benefits and costs are calculated using the best technique and provides for consistent application of the principles and standards and other requirements.

CONCLUSIONS

Although the intent of the principles and standards was to assist planners in developing uniform, consistent, and reasonable plans for measuring and judging the beneficial and adverse effects of projects, these guidelines were so broadly written that they permit excessive latitude in interpretation. The types of inconsistent computations noted in previous reports still occur because (1) the principles and standards are not specific enough to insure consistent interpretation in developing implementation procedures and (2) the Council has not reviewed the agencies' implementation plans for uniformity among the agencies. This problem can cause substantial differences in estimated benefits.

We believe the Council could better assist planners in developing uniform and consistent benefit-cost analysis if measures were taken such as (1) working with the planners and agreeing upon one method which would be uniformly used to compute benefits such as recreation and (2) designating planning regions which qualify for area redevelopment benefits as required by the principles and standards.

RECOMMENDATIONS

The Water Resources Council should

- review the principles and standards and provide specific guidance and criteria whenever possible to insure that benefit computations used by decisionmakers are computed in a uniform and consistent basis,
- request the two agencies (Fish and Wildlife Service, and Forest Service) which have not done so to submit their procedures implementing the principles and standards for approval, and
- review those implementing procedures which have already been approved for agency uniformity and similarly review the remaining two agencies' procedures as they are submitted for approval.

Through the Water Resources Council, the Secretaries of Agriculture, the Army, and the Interior should

- agree upon the uniform methods and
- revise their implementing procedures for principles and standards to insure that the agreed upon methods are consistently used.

CHAPTER 3

MORE COMPLETE AND SPECIFIC AGENCY

REGULATIONS NEEDED

Bureau, Corps, and SCS internal regulations for the economic evaluation of water resources projects are inadequate. They are frequently too general or incomplete and lack formal criteria to document the validity of some benefits. As a result, in many instances the regulations fail to assist analysts in making reasonable assumptions and computing accurate and consistent benefits for water resources projects.

REGULATIONS ARE TOO GENERAL OR INCOMPLETE

Partly as a result of general, and often incomplete, agency regulations, the regions and districts within the same agency are using different detailed steps and assumptions to compute certain benefits. These regulations supplement the agencies' implementing procedures for principles and standards. Our review showed that (1) more detailed agency procedures should be developed to assist analysts in computing such benefits as recreation, area redevelopment, and navigation benefits and (2) additional regulations should be developed if certain benefits are to be claimed.

Recreation

Recreation benefits generally are determined by estimating the number of visitors which will use the facility each year and applying a specific value per visitor day. As noted in chapter 2, the principles and standards do not recommend one specific method for computing this benefit. However, even when an agency used one method, internal agency regulations were not specific enough to insure consistent computations for different projects.

At the Second Broad River watershed project in North Carolina, SCS based the recreation benefits on the anticipated use of the recreation area and facilities. The SCS Economic Guide for Watershed Protection and Flood Prevention identified the dollar amount per visitor day to be used when calculating the recreation benefit, but did not describe how to compute the number of visitor days. Although SCS' South Technical Service Center provided guidance to its

State offices, including the North Carolina office, this also was too general. Partly as a result of nonspecific regulations, the North Carolina office (1) did not consider a reduction in the project's facilities and acreage when updating the recreation benefit and (2) used seasonal occupancy rates for camping facilities which, according to a SCS Technical Service Center recreational specialist, may have overstated the number of annual campers. These two examples caused the recreation benefit to be overstated by more than \$33,000. In a prior report we noted that the Corps also used questionable occupancy rates for camping facilities in its recreation benefit analysis for the Catherine Creek Lake Project. The Department of Agriculture's Internal Audit Agency's reports dated June 1976 and January 1977 attested to similar problems in other SCS State offices and recommended that adequate information and appropriate studies be documented to support the benefits claimed.

Bureau and Corps analysts encountered similar problems in determining what detailed steps to use in estimating the average number of visitor days in each facility we reviewed. Also, in four previous reports we noted instances where recreation benefits were not consistently developed.

Area redevelopment

Area redevelopment benefits are inconsistently developed by the Bureau, Corps, and SCS. Even if the Council designated the planning regions that would qualify for area redevelopment benefits this would not insure that the benefit would be consistently developed. Current water resources agencies' internal procedures are too general and in some instances do not exist. Thus, depending on the procedure used, the final estimated benefit could vary substantially.

The Bureau lacks agencywide guidelines for computing area redevelopment benefits. However, Salt Lake City regional office instructions state that all construction wages paid to unskilled local labor may be included in the benefit. The Corps guidelines state the benefit will be estimated as the value of local labor within a reasonable commuting distance from the project. SCS instructions provide some guidance for determining the amount of unemployed or underemployed local labor and the prevailing wage rates. None of these agencies' guidelines, however, provide adequate procedures for computing the benefit.

Because detailed guidance is not available, the method of computation varies by agency and sometimes by project.

For example, although the Bureau only considers unskilled and semi-skilled workers in computing this benefit, the Corps and SCS include the skilled workers in their calculations.

In estimating this benefit for the projects we reviewed, the Bureau, SCS, and the New Orleans Corps district assumed that a percentage of total estimated construction costs would be paid to previously unemployed or underemployed workers. However, each group used different analysis percentages--7 percent, 20 percent, and 24 percent, respectively.

The Bureau used 7 percent based on a regional study which concludes that 27 percent of the total project cost was paid to contractors' onsite labor and that 25 percent of the contractors' labor was unskilled (27 percent x 25 percent = 7 percent). One SCS State official told us the SCS 20 percent factor had traditionally been used in North Carolina unless specific exceptions were proposed. The New Orleans Corps district assumed that labor costs were about 40 percent of total estimated construction costs, and that about 60 percent would be local unemployed and underemployed.

At the St. Louis and Tulsa Corps districts other inconsistent methods were used. The St. Louis district based the Locks and Dam 26 benefit on the annual wages paid to each construction trade group. However, the Tulsa district applied estimated wage rates to various worker skill levels rather than to trade groups to estimate the Arcadia Lake project benefit.

Navigation

Navigation benefits are the estimated savings which shippers will realize after completion of the proposed navigation project. Although the Corps' navigation regulation provides a definition of the benefits to be claimed, it lacks detailed guidance for developing factors for use in measuring these benefits. Thus, depending upon the factor used, a wide range of estimates is possible for the same project. Two examples demonstrate that more specific guidance for Corps navigation benefit computations is needed.

Delay reduction benefits

The St. Louis Corps district considered several different methods in estimating the delay reduction benefit for Locks and Dam 26. Delay reduction benefits occur when shippers incur shorter waits to enter the new locks than

the old ones. Although each method conformed to existing Corps regulations, the resulting annual benefit, depending upon the method used, ranged from \$4.7 million to \$43.3 million.

In 1972 the district estimated delay benefits for the Locks and Dam 26 project. In 1976 the district prepared a second project estimate, using a more complex method. This estimate resulted in a \$43.3 million annual benefit--68 percent of the project's total benefits as reported in the Corps January 1977 supplemental report. In computing this benefit, Corps officials estimated that the benefit would be the freight rate savings to all shippers using the new facility--the difference between barge rates and those rates charged by other transportation modes.

The Board of Engineers for Rivers and Harbors, an organization within the Corps, recommended another procedure. Members of the Board believed that the delay reduction benefit should be limited to those shippers who used the old facility and should not include the additional shippers estimated to transfer after the new facility is completed.

Members of the Board believed this additional tonnage represented an inefficient use of locking facilities and should not be considered a benefit from a national economic standpoint. This method resulted in only a \$4.7 million annual project benefit. Ultimately, Corps officials decided that delay reduction benefits should be based on the savings to shippers rather than the economic capacity of the existing locks and reported the project's delay reduction benefit at \$43.3 million.

Transportation rate savings

The Corps guidance for computing transportation rate savings should include specific instructions for obtaining samples to construct rates. Without adequate samples there is no assurance that the constructed rates and resulting benefits are reasonable. Transportation rate savings benefit analysis is complicated, requiring estimates of tonnage shipped and rates charged by alternative transportation modes to determine the rates which will be saved through project use. Since many rates are confidential and the exact form of the alternative mode is unknown assumptions have to be made. Thus, to reduce uncertainty statistically sound samples must be developed for this analysis. Corps regulations state that if the rate for the prevailing movement is not available it should be constructed from a sufficiently

large sample of existing rates to assure it is reasonable. However, the regulation does not provide detailed instructions explaining how to obtain a sufficiently large representative sample. Subsequently, the Corps did not obtain an adequate sample to compute this benefit for the Locks and Dam 26 project.

The Corps estimated the Locks and Dam 26 project's transportation rate savings by comparing barge rates to the most feasible alternatives, usually rail and rail-barge combinations. A sample of actual barge shipments was used to determine the rates and the amount of commodities being shipped through the lock facility. Alternative modes and transportation rates were developed for these sample shipments.

Instead of taking a statistically random sample, however, a Corp economist subjectively selected a sample of 231 barge shipments from commodity shipments passing through Locks and Dam 26 during calendar year 1972. The sample shipments were segregated by 17 different commodity groups and were to represent the commodity mix of total tonnage moving through the lock facility for a one-year period from one origin dock to another destination dock. We found the Corps sample methodology deficient in several areas.

1. A random sample was not taken. Thus, formulas for projecting sampling characteristics to total shipments may not apply.
2. The sample size was too small to determine whether it was statistically representative for all commodity movements through the locks.
3. The analysis was not independently reviewed for compliance with acceptable statistical practice and accuracy.

Thus, there is no statistical assurance that the sample was representative of actual barge shipments or that the resulting benefit was reasonably accurate.

A prior review of Corps efforts to extend winter navigation on the Great Lakes had identified several additional questionable assumptions used by the Corps in computing their transportation savings benefits. These problems also occurred partially because detailed guidance for calculating the benefit had not been developed.

AGENCIES HAVE NO CRITERIA
FOR SOME BENEFITS CLAIMED

The Corps and SCS included benefits for some projects we reviewed which specifically had not been addressed by agency regulations. Should the agencies decide that some of these benefits are not warranted, then the projects' benefits have been overstated.

Corps needs regulations for
bank stabilization benefits

The Corps has no formal regulations or other criteria for computing bank stabilization benefits. In its 1976 General Design Memorandum for the Red River Waterway Project, however, the Corps claimed benefits totaling more than \$13.4 million--about 27 percent of all project benefits claimed. According to district Corps officials, bank stabilization benefit calculations were based on the experience of responsible district personnel applying common logic to the problem. To compute the benefit, district officials (1) identified those locations subject to bank caving on the proposed route where no stabilization work was planned without the project and (2) projected the year 2000 bank lines by using bank caving records compiled between 1944 and 1971, and plotted them on 1971 aerial photographs of the river. Corps officials determined that the land area between the 1971 bank lines and the projected year 2000 bank lines was 30,740 acres. These acres represented the potential land destruction for the 29-year period between 1971 and 2000. Assuming that the banks would cave at the same rate each year, district officials derived a 1,060 acre annual caving rate. These officials projected this uniform caving rate over the 100-year project life and computed the benefits as a measure of land value and improvements that would be saved by the bank stabilization works during the 100-year period.

The logic used by the Corps district is inconsistent and questionable for the following reasons. The district

--used a 100-year project life for bank stabilization benefits and only a 50-year project life for the other project benefits,

--valued the acres saved through bank stabilization at the net return from comparable land during the 100-year project life although it valued the costs of lands acquired for the project right-of-way at current market, and

--claimed benefits of about \$2 million for the protection of future utility and highway crossings although some may never be built.

Because both the Office of the Chief of Engineers and the Lower Mississippi Valley Division officials recommended that the \$2 million not be included as a savings based on future utility and highway crossings, district officials deleted this benefit. These officials still maintain, however, that the benefits were realistic and economically justified and told us they plan to include the utility benefit when updating the economic analysis of the project.

Another questionable aspect of the Red River bank stabilization benefit is that Corps reports to the Congress include this benefit under the flood control benefit category. Corps officials agreed that bank stabilization did not necessarily provide flood control and that including it as a flood control benefit was misleading.

SCS needs regulations for
flood damage reduction benefits
for roads and bridges

Although both Senate Document 97 and the principles and standards recognize that benefits may result from (1) reduced damage from flooding, (2) reduced erosion, and (3) improvements in the quality of water, SCS methods and accuracy in determining these benefits are questionable.

SCS' economic guide provides for claiming benefits for protection against road and bridge damage from floods but fails to provide a method to compute the benefits. The guide cites sources for obtaining road and bridge damage estimates, but qualifies its recommendations by stating that these sources may be incomplete or inaccurate. Without the benefit of a detailed procedure for roads and bridges, the North Carolina State office computed the benefit at \$19,300. However, according to SCS technical service center officials, the method used by the North Carolina State office was unsound. SCS, however, has provided no additional instructions to State planning offices to assist them in computing accurate and consistent flood benefits for reduced road and bridge damage.

CONCLUSIONS

Bureau, Corps, and SCS internal regulations for the economic evaluation of water resources projects should be more specific to insure the validity of all benefits claimed.

Although generally the agencies have regulations specifically identifying each benefit, detailed guidance for the development of the factors used in measuring the benefits realized over the life of the project are too general or provide incomplete guidance to insure logical and consistent computation of benefits. Depending on the procedures used and the assumptions made during benefit computations, the resulting claimed benefits could vary substantially. In several other instances, agencies have no regulations or other documentation to show that benefits claimed are actually justifiable under Senate Document 97 or the principles and standards. Thus, if these benefits are not warranted under congressional authorized criteria, a substantial overstatement of benefits may occur. In some instances this benefit overstatement could affect projects' economic feasibility.

The water resources agencies should develop or improve their detailed procedures for computing benefit-cost ratios to insure that only recognized benefits under Senate Document 97 or principles and standards are considered in the benefit-cost analysis.

RECOMMENDATIONS

The Secretaries of Agriculture, the Army, and the Interior should insure that

- internal regulations for benefit computations are specific enough to insure that the benefits are logically and consistently developed and
- internal regulations are developed for all authorized benefits used in agency calculations.

CHAPTER 4

INTERNAL REVIEWS NEED STRENGTHENING

A more thorough agency review process is needed to insure that analysts prepare benefit-cost ratios which can be relied on by the Congress to make informed water resources project decisions. Reliable ratios should be based on an accurate, consistently developed, indepth, analysis of a project's benefits and costs. During audits at each of the Bureau, Corps, and SCS projects we noted: internal agency regulations were not always being followed, questionable assumptions, and inaccurate and inappropriate mathematical computations.

AGENCY REVIEW PROCEDURES

Although the agencies' internal review processes vary considerably, each agency requires its benefit-cost studies to be reviewed by at least an internal management review group.

Bureau

The Division of Planning Coordination at the Engineering and Research Center in Denver, Colorado, is responsible for reviewing all the Bureau's project plans. Within the Division it is the responsibility of the Resource Analysis Branch to review the economic justification of each plan.

After the Resource Analysis Branch completes its review, their comments are sent to the Bureau headquarters' Planning Division. The Planning Division examines these review comments but performs no additional detailed review.

Corps of Engineers

Our review was concerned with the Corps' post-authorization studies. The Corps relies on its divisions to review these project study justifications rather than reviewing them at Corps headquarters. At the division level the Planning Division is responsible for reviewing project plans and the Economic and Social Analysis Branch is responsible for a technical review of the economic justification of each plan.

On October 5, 1977, project plan approval authority was delegated to the Corps divisions. Prior to this date, Corps headquarters had final project review responsibility. Of the three Corps projects in our study, only Arcadia was approved by the division. However, even under this earlier policy,

Corps headquarters only performed a general review. Supporting workpapers were not forwarded to headquarters and the Corps relied on the divisions for detailed reviews.

The Corps' survey reports receive more levels of review than its post-authorization studies. These survey reports receive reviews by the Board of Engineers for Rivers and Harbors; Office, Chief of Engineers; affected States and other agencies; Office of Management and Budget; and Office of the Assistant Secretary of the Army. However, the Corps' post-authorization studies are a further refinement of the survey studies and are performed to either reaffirm the basic planning decisions made in the survey reports or to be responsive to changes made since authorization. Despite these levels of review, we identified a number of benefit-cost computational errors.

Soil Conservation Service

Benefit-cost analyses for proposed SCS projects are prepared by State planning staff. SCS regulations require that these plans be reviewed by the State Conservationist, the Engineering and Watershed Planning Unit, officials at the regional Technical Service Center, and the Washington headquarters Administrator. The State Conservationist is responsible for editorial clarity, mathematical accuracy, and technical quality of the work plan. The Conservationist is also responsible for reviewing the plans for conformance with established standards and policy. State-approved plans are sent to the Technical Service Center for detailed review and concurrence.

Issues that cannot be resolved by the State Conservationist and the Technical Service Center Director are sent to the Administrator for final resolution. The Administrator reviews the plan for consistency with policy and administration regulations and provides final concurrence before submission for congressional approval.

BENEFIT-COST STUDY ERRORS NOT IDENTIFIED BY INTERNAL REVIEWS

The review process of each of these three agencies failed to identify (1) instances where regulations were not followed, (2) questionable assumptions, and (3) mathematical errors. We found errors of each type in almost every benefit-cost analysis we reviewed. While some projects had more errors than others which were not detected by internal agency reviews, every project had at least one. The following are representative.

Regulations not being followed

Inconsistent application of instructions for computing irrigation benefits increased annual benefits for the Dolores project by at least \$2.1 million. In computing this benefit, the Bureau did not consistently apply farm budget analysis or estimate crop yields.

The Bureau's estimates of annual irrigation benefits for the Towaoc area of the Dolores project were not calculated in accordance with their established instructions. Bureau instructions state that irrigation benefits must be based on farm budgets which project farm earnings both with and without irrigation from the project. Yet, the irrigation benefits for the Towaoc area were derived from the acre-foot value of water computed from farm budgets prepared for Dove Creek, another area of the project.

The Bureau estimated that Towaoc would use 3 acre-feet of water compared to 2 acre-feet of water for Dove Creek. The Bureau assumed that since Towaoc was further south and had a longer growing season, it would require more irrigation water and subsequently produce higher crop yields. This climatic advantage is at least partially offset, however, because according to SCS reports, Towaoc soil is inferior and irrigation will not increase the crop yield per acre-foot of water for Towaoc as much as it will for Dove Creek.

In 1974, we reported similar incidents for two other Bureau projects. The Bureau had not used appropriate with-and without-farm budgets to compute irrigation benefits for its Savery-Pot Hook and Lower Teton Division projects. In each of these cases, the Bureau's reviews did not detect that the benefit-cost calculations were not prepared in accordance with Bureau regulations.

Questionable assumptions

The following are some assumptions made by the Corps, which if found unreasonable probably would reduce the Red River project's estimated benefits below the estimated cost.

--A major part of the project's navigation benefits was based on tonnage shipments which had not been adequately studied to determine that they actually would be diverted to the new project. One member of a Corps headquarters survey team agreed that including these figures in the estimate may not have been appropriate.

- Transportation savings projections were based on the assumption that the project would be fully operational at the beginning of its first year. No allowance was made for a gradual shift of connage to the waterway in its early years.
- The Corps assumed that land transportation firms would not reduce their rates to compete with the waterway, thus savings per ton remained constant throughout the project life.

Incorrect and inappropriate mathematical computations

During our review we found numerous mathematical errors in the benefit-cost calculations which had not been corrected during the agencies' reviews. Some errors involved a significant dollar impact on the projects.

At the Dolores project, for example, Bureau officials neglected to subtract the initial cost of the cattle in calculating the indirect benefits attributable to cattle sales. If the Bureau had used the difference between the final sales price and the calf purchase price as the basis for the benefit, annual indirect irrigation benefits would have been reduced by \$700,000.

Inappropriate computations also caused erroneous estimates. At Arcadia, project costs were estimated at October 1976 price levels. Land needed for the project, however, was appraised at April 1975 prices and adjusted to July 1976 price levels. If these prices had been properly adjusted to October 1976 instead of July 1976 prices, the project's real estate costs would have increased by approximately 3 percent or \$224,510. Similarly, real estate improvements were estimated at April 1975 price levels. Adjusting these to the October 1976 price level could have decreased their price because of depreciation and offset the understated land values.

CONCLUSIONS

An integral part of an agency's obligation to conduct benefit-cost studies is the responsibility for insuring that calculations are based on a consistent application of established agency procedures and do not use questionable assumptions or contain mathematical errors. To the extent that review procedures fail to identify such problems, agencies will continue to produce incorrect benefit-cost computations. These problems sometimes cause benefits to be overstated and

could subsequently result in positive benefit-cost estimates for projects actually not economically feasible.

We believe that the problems we identified: failure to follow agency regulations, use of questionable (but unquestioned) assumptions, and the presence of mathematical errors show that the current internal review practices of the Bureau of Reclamation, Corps of Engineers, and Soil Conservation Service are clearly inadequate.

RECOMMENDATIONS

The Secretaries of Agriculture, the Army, and the Interior should have their agencies strengthen their internal management review procedures for benefit-cost analyses to (1) prevent mathematical errors, (2) identify and resolve inappropriate or questionable assumptions, and (3) insure that adequate studies and supporting documentation are provided.

AGENCY COMMENTS AND OUR EVALUATION

The Departments of the Interior, Agriculture, and the Army agreed with our recommendations and the general thrust of chapters 2, 3, and 4. They indicated that corrective action would be taken. The Council staff told us that on May 25, 1978, the Recreation Planning and Evaluation Task Force was formed within the Council with the mission of refining interagency implementation guidelines to assist member agencies in making recreation benefit calculations under the principles and standards.

The Corps agreed with our recommendations but stated that we did not fully support our statements concerning inconsistencies in project formulation or the need for more specific principles and standards.

Although Corps officials agreed that a consistent evaluation is desirable, they did not concede that the examples cited demonstrated inconsistency. These officials stated that similar projects formulated under different conditions may require different methodologies in determining benefits. We believe our examples on page 9 alone clearly demonstrate the adverse effect of inconsistent computation and the need for more specific instructions. Furthermore, we did not state that one single method could be used for every situation. For example, when addressing recreation benefits on page 8 we stated that, "The agencies should decide which method generally would be applicable and use it unless an exception is justified."

The Corps maintained that we did not support the need for more definitive principles and standards because many of the projects we reviewed were formulated at the district level prior to implementation of these principles and standards. Our support for more definitive principles and standards is not negated even though most projects we reviewed were formulated under Senate Document 97 guidelines. A close comparison of the two documents concerning the three major issues addressed--recreation, area redevelopment, and navigation benefits--shows that neither document is specific enough to insure consistent interpretation and computation of the benefits involved. Further, we disclosed that because the principles and standards were very general the detailed instructions used by the Bureau and SCS under Senate Document 97 were also being used under the principles and standards and did not have to be changed to comply with them. Although the Corps has made some changes, Corps officials said most of the changes were made to provide further clarification rather than to comply with the principles and standards.

CHAPTER 5

ALTERNATIVES FOR MORE RELIABLE BENEFIT-COST ANALYSES

Problems with the practices and procedures used to calculate the benefit-cost ratios continue to exist despite a continuing awareness over the years of the need to improve the system. Although these problems can be attributed to many different causes, we believe that a major contributing factor has been the influences from Federal, State, and local levels as well as the self-interest of the agencies preparing the analysis. A real change is needed in the system to insure the development of more objective and impartial benefit-cost ratios.

LONG TERM RECOGNITION OF THE PROBLEM

During the past decade, GAO and other studies have shown that water resources project analysis sometimes has been inaccurate, inadequate, and misleading. If officials preparing the analysis had more complete autonomy or if the analysis had been reviewed by an independent board, some problems may not have occurred.

Seven presidential studies, dating back as far as 1949, consistently concluded that an independent board of review was needed because they found many examples where Federal water resources agencies had understated costs and overstated benefits of proposed water projects. (See app. II.)

Some members of the Congress have also recognized a need for an independent review board. For example, two bills--H.R. 10004 and H.R. 8060--were introduced during the 95th Congress. Both bills would have established an Independent Water Project Review Board in the executive branch to advise the President and the Congress. Although both bills were referred to the House Committee on Interior and Insular Affairs, Subcommittee on Water and Power, no action has been taken or is presently planned during the 95th Congress.

The intent of the bills was to establish a review board which would work independently of possible influence exerted by the executive agencies, legislative branches, public and private groups, and individuals.

OBTAINING TRUE INDEPENDENCE WITHOUT CHANGING
ORGANIZATIONAL STRUCTURE IS DIFFICULT BUT
IMPROVEMENTS ARE POSSIBLE

Because subjective judgement is a critical part of water resources project benefit-cost analysis, independence is important for a reliable economic analysis. Since most Federal agencies are part of the executive branch and are funded by the legislative branch, it is difficult to establish a review agency or board which is completely independent of both branches. However, changes could be made within the existing organizational structure which may provide for more objective, impartial benefit-cost analysis reviews.

Water Resources Council

The President also realizes the need for greater independence and has implemented a change. In his June 6, 1976, national water policy message, he stated that (1) more consistent, uniform, benefit-cost analysis is needed and (2) independent reviews should be performed to insure that consistent and uniform analyses are actually prepared. He added that he was creating, by Executive order, a project review function within the Council to insure that impartial reviews would be conducted. Although this change should result in more consistent, uniform, benefit-cost analysis, we do not believe it would provide the independence needed to correct the problem, primarily because the Council is not independent. The Council includes the Secretaries of the Departments under which the water resources agencies are located and is chaired by the Secretary of the Interior. The Bureau, a major water resources agency, is under the Department of the Interior. The Office of Management and Budget will have to allocate personnel positions and the Congress must provide a supplemental appropriation before this review unit can be established.

Office of Management and Budget

The review function of the Office of Management and Budget could be strengthened to provide for more stringent reviews. The office currently reviews selected benefit-cost analysis reports of the water resources agencies. However, the Office's Water Resources Branch is currently staffed with only six people and does not attempt to review the reports for consistency among the agencies. The Office reviews the reports for determination of their relationship to the program of the President and also raises questions concerning any analysis which seems faulty or incorrect.

Increasing the review role and responsibility of the Office should provide for more independent reviews. However, this approach may not provide complete independence because of the Office's commitment to carrying out the President's budgetary policies.

GREATER INDEPENDENCE
COULD BE ACHIEVED BY
CHANGING THE ORGAN-
IZATIONAL STRUCTURE

Among the changes that could be considered to provide greater independence in water resources project review and analysis are an independent review board or an independent agency for computing the benefit-cost analysis. Each change offers certain advantages and disadvantages.

Independent review board

To perform unbiased reviews and make independent decisions, a review board must be immune from undue outside influences. Although difficult, outside influence can be reduced by several different methods.

One approach for reducing outside influence would be to structure the board as an independent agency but insulate it from political pressures by having executive officers appointments which extend beyond congressional or presidential terms and which cannot be easily terminated. This agency could be placed either within the executive or legislative branches.

The two congressional bills also would provide for some autonomy by establishing a board consisting of nine members appointed by the President with the advice and consent of the Senate. After establishment of the Board, members would serve 3 year terms, but would not serve consecutive terms. No more than five of the nine members would be of the same political party.

The bills also provide that the Board would be responsible for the following functions and duties to insure that accurate, unbiased analysis was developed and presented.

- Establish a system for the detailed evaluation of proposed water resources construction projects.
- Establish coordination among all applicable Federal agencies to promptly notify the Board of proposed projects.

- Conduct extensive evaluations of (1) proposed water resources construction projects before construction funds are appropriated by the Congress and (2) other water resources construction projects at the request of the President, five Members of Congress, or the Director of the Office Water Management (as also established by these bills) after a determination by a majority vote of the full board that such an evaluation or re-evaluation of such projects are necessary.
- Provide an opportunity for comment by all interested persons.
- Recommend to the Congress and the President whether or not to construct proposed projects.
- Testify with respect to their evaluations.
- Periodically review the effectiveness of applicable Federal agencies.
- Inform the Congress of undue pressure exerted on the Board or its members and may recommend to Congress further legislation to insure the Board's independence.

Although an independent review board should result in more accurate, well developed, benefit-cost analysis, additional funding and personnel would be required. Total additional costs would depend on the number of Board members, the Board's actual role, and scope of review responsibilities. The Presidential task force's November 11, 1977, draft report estimated that the review board procedure for expensive or controversial proposals would cost between \$100,000 and \$500,000 for each project. The congressional bills make no estimate, but stated that sums as necessary to carry out the provisions of the subject title would be authorized for appropriation. The addition of another review level could also contribute further delays to an already long process.

Locating the review board within the legislative branch may provide additional balance and independence because the benefit-cost analyses are prepared by agencies within the executive branch.

Independent agency for benefit-cost analysis

Another approach to providing better benefit-cost analysis would be to establish an independent agency to

perform the analysis for all agencies' water resources projects. (Independence could be established through an approach similar to that mentioned above.) This method would separate the project analysis and recommendation functions from the construction agencies and reduce the self-interest of the agency making the analysis. Since this new agency would analyze all water resources projects, jurisdictional problems would be eliminated.

Although this approach would not provide for an independent review of project analysis it should provide for a more unbiased initial analysis.

Water resources projects are so complex that highly skilled professionals are needed for proper analysis. Since many of these skilled individuals work for water resources agencies, the individuals currently providing analysis work for these agencies could be transferred to the proposed new agency. The new agency could therefore, be established primarily through reorganization rather than through substantial increases in Federal personnel or funding. The total additional cost would depend on the reorganizational change as opposed to adding a new layer of analysts.

CONCLUSIONS

An unbiased systematic approach by which the general public and decisionmakers can assess the economic merits of proposed water resources projects is an important element of project authorization and appropriation. Under the current system, however, both the Council and the water resources agencies are unable to provide a sound basis for such an assessment.

Problems still exist even though we have issued 15 reports related to benefit-cost analysis during the past 10 years and other individual, agency, and commissioned reports also have addressed this issue.

Recommendations in previous chapters of this report should help the agencies provide more accurate, uniform, benefit-cost analysis. Even if our recommendations are carried out, however, benefit-cost analysis will continue to be subject to outside influence unless the system is changed.

There are several alternatives for achieving more objective and reliable benefit-cost analysis. One approach would be to establish a focal point within the existing organizational structure and strengthen the role of the Office of Management and Budget or the Water Resources

Council. A second approach which has been considered by various studies over the years would be to establish an independent group to either prepare or review benefit-cost analysis. Selection of the most desirable alternative would depend upon the cost, complexity of the new system, range of responsibilities, degree of changes and independence desired, and the wishes of the Congress. Bills such as H.R. 8060 and H.R. 10004 have been introduced which would establish an independent group.

AGENCY COMMENTS AND OUR EVALUATION

The Tennessee Valley Authority and the Department of Agriculture believe that the principles and standards and internal agency regulations can be strengthened to provide the guidance necessary for consistent, logically developed benefit-cost analysis. They also believe that water resources agencies have the necessary technical expertise and objectivity needed for these analyses and that an independent agency to perform or review benefit-cost analysis is unnecessary.

The Department of the Army and the Council staff agreed that greater independence is needed. They stated, however, that there is a substantial difference between an agency which performs benefit-cost analyses and one which reviews them. They suggested that it would be helpful to the Congress if the report would outline and analyze these differences as well as explain the concept of how each agency would function. We made this review primarily to determine how well the existing system was working. We did not attempt to outline in detail the organization or the entire function and responsibilities of the new agency. As explained above, the agency's organization would depend on the cost, complexity of the system, degree of independence, or range of responsibilities desired.

The Department of the Interior also agreed that an organizational change is needed to provide accurate, uniform, and logically developed benefit-cost ratios.

SELECTED LIST OF GAO REPORTS ISSUED SINCE 1967
PERTAINING TO BENEFIT-COST ANALYSES

<u>Title</u>	<u>Date</u>	<u>GAO reference number</u>
Better Analysis of Uncertainty Needed for Water Resources Projects	6/ 2/78	PAD-78-67
Palmetto Bend Dam and Reservoir, Need for Improved Analysis of Alternatives and Cost Data	12/16/77	PSAD-78-43
The Tennessee Valley Authority's Tellico Dam Project--Costs, Alternatives, and Benefits	10/14/77	EMD-77-58
Benefits Claimed for the Corps of Engineers' Catherine Creek Lake Project in Oregon	8/31/76	CED-76-147
Federal Efforts to Extend Winter Navigation on the Great Lakes and the St. Lawrence Seaway-- Status and Problems to be Resolved	4/20/76	RED-76-76
Environmental and Economic Issues of the Corps of Engineers' Red River Lake Project in Kentucky	8/15/75	RED-76-9
Revisions Recommended for the Benefit-Cost Analysis for the Planned Tomahawk Lake Project in Kansas	7/ 2/75	RED-75-382
Economic Benefits and Costs of the Dickey-Lincoln Hydroelectric Project in Maine	6/19/75	RED-75-367
Economic and Environmental Aspects of the Proposed William L. Springer Project, Illinois	4/18/75	RED-75-363
Improvements Needed in Making Benefit-Cost Analyses for Federal Water Resources Projects	9/20/74	B-167941

<u>Title</u>	<u>Date</u>	<u>CAO reference number</u>
Environmental and Economic Issues of Planned Construction of Spewrell Bluff Dam in Georgia	6/13/74	B-177442
Strengthened Cost Estimating Procedures Needed for Water Resources Projects	1/24/73	B-167941
Computation of Flood Control Benefits for the Cascadia Reservoir Project, Oregon, not Adequately Supported	9/19/72	B-136280
Legislation Needed to Revise the Interest Rate Criteria for Determining the Financing Cost of Water Resource Projects	8/11/72	B-167712
Review of Tocks Island Reservoir Project	10/ 1/69	B-164844
Review of Application of Revised Procedures for Determining Irrigation Benefits to the Almena Unit, Missouri River Basin Project	7/ 6/67	B-125042

SELECTED LIST OF STUDY COMMISSIONS
WHICH CONCLUDED THAT THERE WAS A NEED
FOR AN INDEPENDENT BOARD OF REVIEW

COMMISSION ON REORGANIZATION OF THE EXECUTIVE BRANCH OF THE GOVERNMENT (1949). Department of the Interior, House Document No. 122, 81st Congress, 1st Session, U.S. Government Printing Office, Washington, D.C. pp. 2-4.

PRESIDENT'S WATER RESOURCES POLICY COMMISSION (1950). A Water Policy for the American People, 3 vols. U.S. Government Printing Office, Washington, D.C. Vol. 1, p. 3.

COMMISSION ON ORGANIZATION OF THE EXECUTIVE BRANCH OF THE GOVERNMENT (Second Hoover Commission) (1955). Report on Water Resources and Power, House Document No. 208, 84th Congress, 1st Session. U.S. Government Printing Office, Washington, D.C. Vols. I, II, pp. 38-39.

COMMISSION ON INTERGOVERNMENTAL RELATIONS (1955). Report to the President for Transmittal to Congress. U.S. Government Printing Office, Washington, D.C. pp. 241-247.

PRESIDENTIAL ADVISORY COMMITTEE ON WATER RESOURCES POLICY (1955). Report of the President's Advisory Committee on Water Resources Policy, House Document No. 315, 84th Congress, 2d Session. U.S. Government Printing Office, Washington, D.C.

NATIONAL WATER POLICY COMMISSION (1973). Report to the President and Congress on Water Policies for the Future, U.S. Government Printing Office, Washington, D.C., pp. 406-409.

The President's June 6, 1978, National Water Policy Message (Developed from the President's Water Resources Policy Study's December 6, 1977, Task Force Reports).

UNITED STATES DEPARTMENT OF AGRICULTURE**SOIL CONSERVATION SERVICE, P.O. Box 2890**Washington, D. C. ~~20250~~ 20013

Mr. Henry Eschwege
Director, Community and
Economic Development Division
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

MAY 30 1978

Dear Mr. Eschwege:

This letter will confirm discussions we have had between representatives of your office and the U.S. Department of Agriculture on May 25, 1978, on the draft report, "An Overview of Benefit/Cost Analysis for Water Resources Projects--Improvements Still Needed."

General Accounting Office representatives were Mr. Mark Heatwole and Mr. Frank Papineau. U.S. Department of Agriculture (USDA) representatives were as follows:

- David G. Unger - Acting Deputy Assistant Secretary
for Conservation, Research and Education
- William F. Dickson - Director, Conservation, Research and
Automated Systems Division, Office of Audit
- Clyde E. Jones - General Accounting Office Liaison Officer,
Forest Service
- Adrian L. Haught - Staff Specialist, Area Planning and Development
Division, Forest Service
- Roy M. Gray - Director, Economics Division, Soil Conservation Service
- James W. Mitchell - Director, Watersheds Division, Soil Conservation
Service

We agree there is a need to establish procedures to achieve consistency in the estimation of benefits and costs among agencies. The Water Resources Council (WRC) would seem to provide the appropriate mechanism for achieving this. A work group has been established within Water Resources Council to develop consistent procedures for recreation benefit estimation. This same thing could be done for other benefit categories (such as area redevelopment benefits).



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2.

Page 16 of the report indicates that the Forest Service has not prepared procedures for implementing the principles and standards. This is only partially true. The USDA guidelines for implementing the principles and standards in river basin studies, flood prevention projects, and the small watershed program apply to the Forest Service as well as the Soil Conservation Service (SCS). Therefore, the second paragraph on page 16 should read USDA rather than SCS.

The Forest Service has also prepared draft procedures for wild, scenic, and recreation river studies. These procedures have had both field and interagency review. Once these comments have been incorporated, the draft will be sent to WRC for approval.

The SCS Economics Guide has not, as pointed out in the report, been completely updated since the WRC Principles and Standards (P&S) was issued. The P&S provides broad guidelines for benefit/cost estimation, and we do not feel that the Economics Guide is in conflict with these guidelines. The Economics Guide provides much more detailed procedures for benefit/cost estimation. These basic procedures were applicable when benefit/cost ratios were developed according to Senate Document 97 and are still applicable under P&S.

We feel that the intent of P&S to broaden the criteria for selection and authorization of water resource projects beyond simply the existence of a benefit/cost ratio greater than one is not well understood and has not been implemented to the extent that is possible and desirable. If, for example, a project achieves worthwhile environmental impacts, it could be authorized under P&S even though the benefit/cost ratio is less than unity.

We agree with the conclusion of the report concerning the need to strengthen review and concurrence procedures. However, there are several very significant implications of the report's recommendation that an independent agency be developed to review and/or prepare benefit/cost evaluations. Some of these are:

1. The agency would have to be headquartered with field offices in every State or region. It would not be possible for an economic staff to be headquartered in Washington, D.C., and do the economic evaluation of small watershed projects in all of the States.
2. The proposal would isolate the economist from the other disciplines who are involved in water resource planning. For the economist to make a proper input, economic criteria should be employed in developing alternatives and project formulation, not just in analyzing the benefits and costs of alternatives that were developed by people in other disciplines.

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3.

3. The recommendations do not adequately recognize the fact that even a new agency cannot be entirely insulated from pressures to "justify" a project. Any pressures that might be presently exerted on the existing agencies would simply be redirected to the new agency.
4. The recommendation assumes that any existing problems with competency of economists involved in benefit/cost evaluation would be overcome by the new agency. This is not necessarily correct. There will still be some who do good quality work and some who will do poor quality work.

We feel that USDA agencies have the technical expertise and objectivity to review and provide technical concurrence for water resources plans.

Thank you for the opportunity to meet and comment on the draft report.

Sincerely,

R. M. Davis
Acting Administrator

CC:
 David G. Unger, Acting Deputy Assistant Secretary for Conservation
 Research and Education

GAO note: Only oral comments were requested. The Department of Agriculture was the only Department which officially responded in writing.

PRINCIPAL OFFICIALS RESPONSIBLE FOR
ACTIVITIES DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
<u>DEPARTMENT OF THE INTERIOR</u>		
SECRETARY OF THE INTERIOR:		
Cecil D. Andrus	Jan. 1977	Present
Thomas S. Kleppe	Oct. 1975	Jan. 1977
Stanley K. Hathaway	June 1975	Oct. 1975
Kent Frizzel (acting)	May 1975	June 1975
Rogers C. B. Morton	Jan. 1971	May 1975
Fred J. Russell (acting)	Nov. 1970	Dec. 1970
Walter J. Hickel	Jan. 1969	Nov. 1970
Stewart L. Udall	Jan. 1961	Jan. 1969
ASSISTANT SECRETARY, LAND AND WATER RESOURCES (note a):		
Guy Martin	May 1977	Present
Chris Farnan (acting)	Jan. 1977	Apr. 1977
Jack O. Horton	Mar. 1973	Dec. 1976
James R. Smith	Mar. 1969	Feb. 1973
Kenneth Holum	Jan. 1961	Jan. 1969
COMMISSIONER OF RECLAMATION:		
R. Keith Higginson	Apr. 1977	Present
Donald Anderson (acting)	Feb. 1977	Apr. 1977
Gilbert Stamm	Apr. 1973	Feb. 1977
Ellis L. Armstrong	Nov. 1969	Apr. 1973
Floyd E. Dominy	May 1959	Oct. 1969
<u>DEPARTMENT OF AGRICULTURE</u>		
SECRETARY OF AGRICULTURE:		
Bob Bergland	Jan. 1977	Present
John A. Knebel	Oct. 1976	Jan. 1977
Earl L. Butz	Dec. 1971	Oct. 1976
Clifford M. Hardin	Jan. 1969	Nov. 1971
Orville L. Freeman	Jan. 1961	Jan. 1969

a/Title changed from Assistant Secretary for Water and Power Resources in May 1973.

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
ASSISTANT SECRETARY, CONSERVATION, RESEARCH AND EDUCATION:		
M. Rupert Cutler	Apr. 1977	Present
Paul A. Vander Myde (acting)	Jan. 1977	Mar. 1977
Robert W. Long	Mar. 1973	Jan. 1977
Thomas K. Cowden	May 1969	Mar. 1973
John A. Baker	Aug. 1962	Jan. 1969

**ADMINISTRATOR, SOIL CONSERVATION
SERVICE:**

Ronello M. Davis	June 1975	Present
Kenneth E. Grant	Jan. 1969	May 1975
Donald A. Williams	Nov. 1953	Jan. 1969

DEPARTMENT OF DEFENSE

SECRETARY OF DEFENSE:

Harold Brown	Jan. 1977	Present
Donald H. Rumsfeld	Nov. 1975	Jan. 1977
James Schlesinger	June 1973	Nov. 1975
William P. Clements, Jr. (acting)	May 1973	June 1973
Elliot L. Richardson	Jan. 1973	Apr. 1973
Melvin Laird	Jan. 1969	Jan. 1973
Clark M. Clifford	Mar. 1968	Jan. 1969
Robert S. McNamera	Jan. 1961	Feb. 1968

DEPARTMENT OF THE ARMY

SECRETARY OF THE ARMY:

Clifford L. Alexander	Feb. 1977	Present
Martin R. Hoffman	Aug. 1975	Feb. 1977
Howard H. Calloway	May 1973	July 1975
Robert F. Froehke	July 1971	May 1973
Stanley R. Resor	July 1965	June 1971
Stephen Ailes	Jan. 1964	July 1965
Cyrus R. Vance	July 1962	Jan. 1964
Elvis J. Stahr, Jr.	Jan. 1961	June 1962

CHIEF OF ENGINEERS:

Lt. Gen. John Morris	July 1976	Present
Lt. Gen. W. C. Gribble, Jr.	Aug. 1973	June 1976
Lt. Gen. Frederick J. Clarke	Aug. 1969	July 1973
Lt. Gen. William F. Cassidy	July 1965	Aug. 1969
Lt. Gen. Walter K. Wilson, Jr.	May 1961	June 1965

WATER RESOURCES COUNCIL

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
DIRECTOR:		
Leo M. Eisel	Sept. 1977	Present
Gary D. Cobb (acting)	Oct. 1976	Aug. 1977
Warren D. Fairchild	Sept. 1973	Sept. 1976
Reuben Johnson (acting)	Apr. 1973	Aug. 1973
W. Don Maughan	Mar. 1970	Mar. 1973
Reuben Johnson (acting)	Sept. 1969	Feb. 1970
Henry Caulfield	Dec. 1965	Aug. 1969

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