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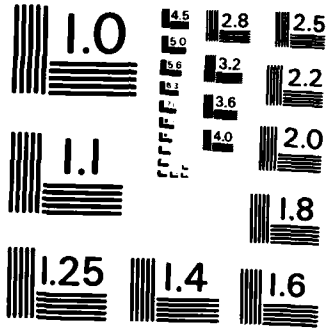

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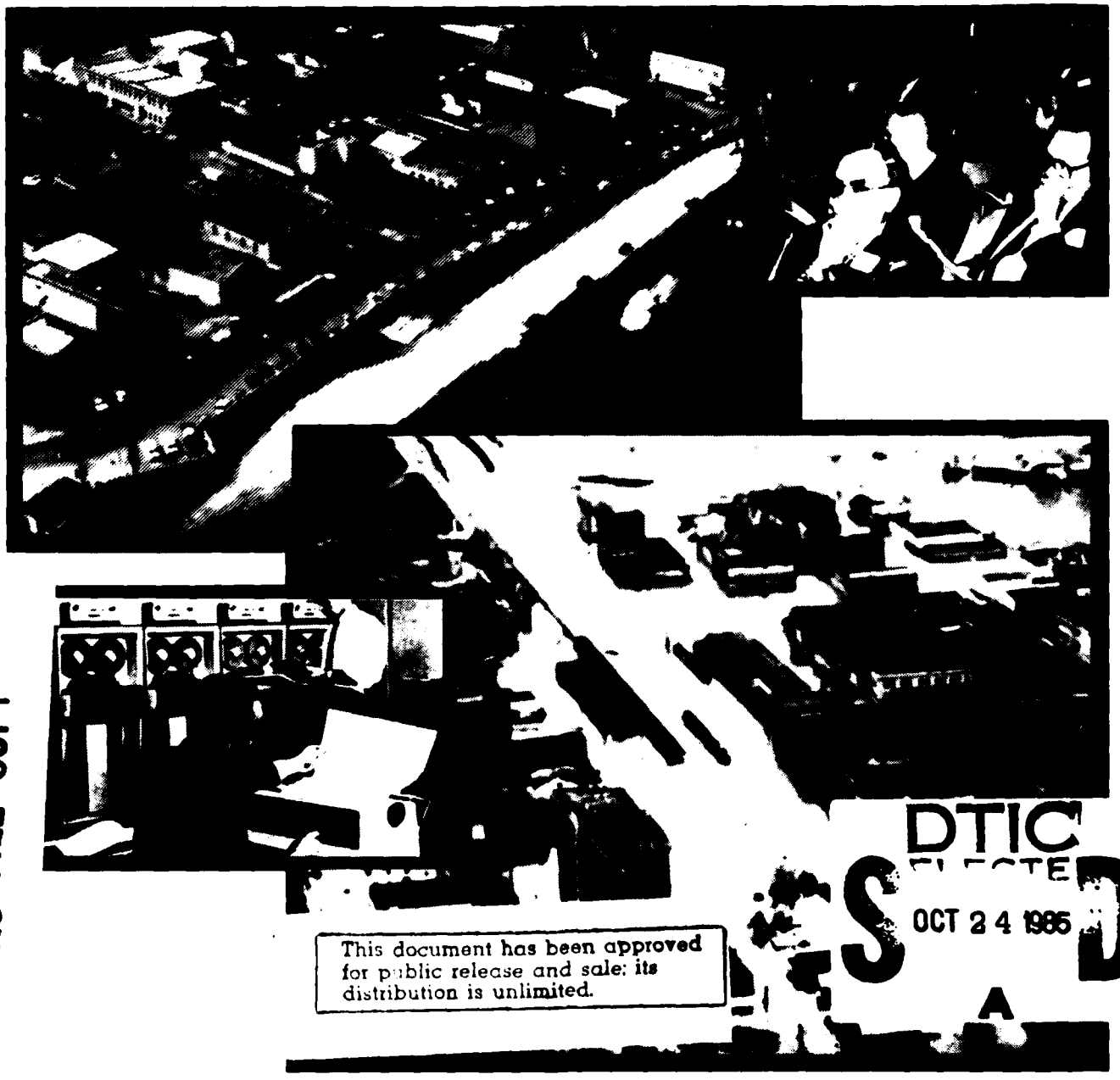
Flood Damage Prevention Services of the U.S. Army Corps of Engineers:

An Evaluation of Policy Changes and Program Outcomes During 1970-1983 Measured Against Criteria of Equity, Efficiency, and Responsiveness.



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FLOOD DAMAGE PREVENTION SERVICES OF THE U. S. ARMY CORPS OF ENGINEERS: AN EVALUATION OF POLICY CHANGES AND PROGRAM OUTCOMES DURING 1970 TO 1983 MEASURED AGAINST CRITERIA OF EQUITY, EFFICIENCY, AND RESPONSIVENESS

by

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A Dissertation Submitted to

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PREFACE

This research is a culmination of sixteen years as a student at the George Washington University School of Government and Business Administration and as a Federal employee in the Programs Division, Civil Works Directorate of the U. S. Army Corps of Engineers. The many courses in public administration and management which I took during the period and the practical experience gained while working in Washington enabled me to appreciate policy issues, executive-legislative battles, and the ensuing outcomes. The intricacies of the budget and project authorization processes became part of my Washington experience. As traditional Corps water resource projects came under attack by environmental groups, landowners, and others, and as budget deficits increased, the authorization of new projects and initiation of construction of new projects virtually came to a halt. The recognition of this problem as it applied to projects designed to reduce flooding impacts provided an area of research which I considered worth undertaking. Much has been done to reduce flood damages; yet annual damages are measured in the billions of dollars.

There are many individuals whose efforts and encouragement were instrumental in my completing the research effort. My dissertation committee, consisting of Dr. Astrid Merget (chairperson), Dr. Charles Washington, and Lieutentant General (retired) Ernest Graves, was a source of encouragement and inspiration. Dr. Merget's

suggestions and comments in developing the research methodology and in organizing the study were most helpful in producing the finished product. Dr. Washington's assistance, particularly in the formative stage, was invaluable as I struggled to develop a research topic that was comprehensive but achievable. General Graves, having been both a Corps division engineer and the Director of Civil Works during the period covered by the research, provided insight into a number of policy issues and the political process which had a bearing on the research.

Much of the intensive research and writing of this dissertation were accomplished during a period when my position as Chief of the Programs Division required a great deal of attention to my work. This made for exceptionally long working days. I am most grateful for the encouragement and commitment of Major General John Wall, the Director of Civil Works, during this critical period.

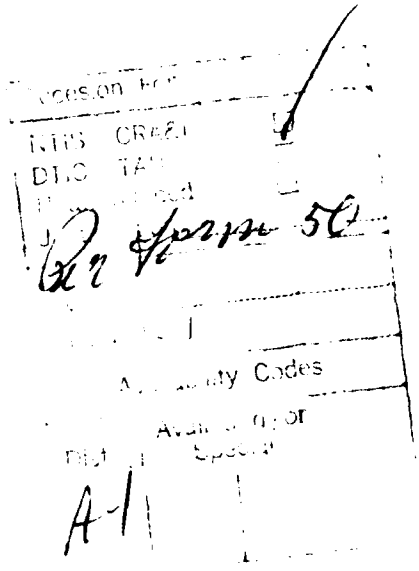
I would like to thank Dr. Mark Dunning of the Corps Institute for Water Resources. His assistance in obtaining census data on areas affected by over 300 Corps projects was a key element in the research effort.

My sincere thanks to Dr. Edward Cohn and Nahor Johnson of the Corps North Atlantic Divsion for their review and valuable comments and suggestions pertaining to the benefit-cost methodology discussed in Chapter III.

The typing of the dissertation proposal and dissertation was in itself an enormous task despite the use of modern word processing equipment. I thank Jacki Partridge, Mary Trainum, Carol Ann Koplik, and Annette Suter for their typing assistance at various stages of

the dissertation. Their patience and hard work are most appreciated. Final editing of the dissertation, following my defense on March 22, 1984, was carried out by Joyce Hardyman. Her meticulous attention to detail and keen eye were most helpful in converting the draft to a finished product.

Finally, without the great sacrifice of my wife, Naomi, this research project would never have materialized. Her continuous encouragement and patience throughout the research and writing period were most essential to my completing the dissertation.



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INTRODUCTION

Flood Damage and Its Prevention

Despite substantial Federal investment in activities designed to reduce flood damages in the United States, average annual damages continue to rise and are now estimated at nearly $3 billion per year.[1] Significant urban development and millions of acres of the nation's agricultural production are on lands subject to flooding. When floods occur, 1) life is endangered and disrupted, 2) productive capacities are impaired, 3) transportation and utility lines are damaged, 4) property and crops are destroyed, and 5) soils are eroded. Flooding can be, and often is, sudden and traumatic, bringing with it loss of life, severe economic losses, adverse social impacts, and environmental damage.

The central theme of this research focuses on policy changes during the 1970-1983 time frame and their impact on the flood damage prevention program of the U.S. Army Corps of Engineers (Corps). Outcomes from policy changes are analyzed and evaluated against criteria of equity, efficiency, and responsiveness.

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[1] U.S., Water Resources Council, A Unified Program for Flood Plain Management (Washington, DC: Government Printing Office, September 1979), p. II-3.

The magnitude of the problem and the complexities involved in developing solutions to meet water resource needs of the nation and particularly flood damage prevention needs make this research worthwhile. Although damages averted as a result of completed Corps projects are substantial, damages incurred in the absence of protective projects are also significant. The implication is that some communities and segments of the population receive a high degree of protection while others are subject to the hazards of periodic flooding. It has long been recognized that no single level of government or agency of government has within its power the ability to produce a program which would turn the tide and significantly reduce flood damages.[1] The Corps, as the Federal agency most directly involved with flood damage reduction on a national scale, is praised and also criticized for its efforts. Praise comes from those who realize the benefits of Corps projects and programs while the criticism has a broader base. It comes from those who 1) have not received flood protection, 2) must sacrifice their land to protect others, 3) oppose projects as designed, 4) believe Federal investments should be made for other programs,[2] and 5) oppose altering nature in the interest of flood control.

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[1]U.S., Congress, House, A Unified National Program for Managing Flood Losses, H. Doc. 465, 89th Cong., 2d sess., 1966, p. 3.

[2]These opponents include proponents of other Federal programs, such as social welfare programs, which more directly involve services or payments to individuals, as well as proponents of greater emphasis on non-structural solutions to flooding problems.

In order to understand the nature of the problem, some background on the type of flood damage prevention activities provided by the Corps is appropriate. Flood damage prevention activities may be categorized in three major strategy groupings: 1) modifying flooding, 2) modifying susceptibility to flood damage and disruption, and 3) modifying the impact of flooding on individuals and the community.

The strategy of modifying flooding consists of structural solutions such as dams, levees, floodwalls, channel alterations, and high-flow diversions and spillways. These structures result 1) in changes in the volume of runoff, 2) in the peak stage of the flood, 3) in the time of rise and duration, 4) in the extent of the area flooded, and 5) in the velocity and depth of floodwaters.[1] This strategy has been and continues to be the major element of the Corps efforts in terms of resources expended.

Actions taken to avoid dangerous, uneconomic, undesirable, or unwise use of a flood plain are designed to modify the susceptibility to flood damage and disruption. This strategy is largely a non-structural approach which includes 1) land use regulations controlling development in flood plains, 2) design and location of services and utilities away from the flood hazard, 3) acquisition of lands or developing rights for the purpose of precluding future uses incompatible with sound flood plain management programs, 4) permanent evacuation of

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[1] Unified Program for Flood Plain Management, pp. IV-10 and IV-11.

structures and facilities from the flood plain, 5) redevelopment as part of an urban redevelopment project involving areas blighted for reasons that may or may not include exposure to flooding, 6) disaster preparedness planning and assistance, and 7) flood proofing of structures.[1] Implementing this strategy is largely a non-Federal responsibility. However, the role of the Corps in considering non-structural approaches received greater emphasis in the 1970s and is, therefore, appropriately within the scope of this investigation.

Another non-structural strategy modifies the impact of flooding by assisting individuals and communities in preparatory, survival, and recovery responses to floods. Programs for implementing this strategy provide 1) information on flood hazards, flood plain attributes, and impact of land use decisions on expected flooding; 2) flood insurance; 3) tax adjustments to encourage appropriate use and discourage inappropriate use of flood plains, and provisions for claiming losses in Federal and state income taxes; 4) flood emergency measures to include preparation for floods and flood fighting; and 5) post-flood recovery activities in the form of facility restoration, aid to individuals, and other relief measures designed to shorten the period of disruption and accelerate the return to normalcy. The Corps role under this strategy is primarily one of providing information, education, and assistance in preparation for floods, flood fighting, and recovery efforts.[2]

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[1] Ibid., p. IV-2.

[2] Ibid., p. IV-13.

The Emerging Problem

During the period since the passage of the National Environmental Policy Act (NEPA) of 1969, there have been significant policy changes which affected the Corps provision of flood damage prevention services. Although projects continue to be built and placed in operation, the substantial residual annual damages would indicate that there are those that fail to receive protection. Knowing of this major unmet need--to provide flood damage prevention services--and recognizing the complexities of the period since passage of NEPA, the research is of interest to those concerned with water resources and related development. In reviewing the literature describing changes during this period, no comprehensive study containing analyses of program outputs against normative criteria could be found. There are recent research efforts which focus on changes in the planning process and organization,[1] the declining workload of the Corps and reduced political support for its programs in terms of authorizing acts and new construction starts,[2] and the emphasis on non-structural approaches to flood problems.[3] What has been lacking is a comprehensive

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[1]Daniel A. Mazmanian and Jeane Nienaber, Can Organizations Change: Environmental Protection, Citizen Participation, and the Corps of Engineers (Washington, DC: The Brookings Institution, 1979).

[2]Charles Yoe, The Declining Role of the U.S. Army Corps of Engineers in the Development of the National Water Resources (Fort Collins, CO: Colorado Water Resources Research Institute, Colorado State University, 1981).

[3]Unified Program for Flood Plain Management, and U.S., Department of Housing and Urban Development, Office of Policy Development and Research, Evaluation of the Economic, Social and Environmental Effects of Flood Plain Regulations (Washington, DC: Federal Emergency Management Agency, 1981).

study of the salient factors which determine recent policy changes that have occurred since NEPA, their impact on the services provided by the Corps, and an evaluation of changes in policies and program outcomes against appropriate criteria. For example, the use of higher discount rates, more restrictive benefit calculations, and the lack of major authorizing legislation would naturally tend to lead to implementing fewer projects. In turn, this outcome needs to be measured and evaluated against criteria which should be the norms of government service delivery; this will provide the real test of policy outcomes as opposed to merely reporting on the statistical impact of changes.

The investigation focuses on policy changes, and unsuccessful attempts at policy changes, during the fourteen years commencing with the passage of NEPA on January 1, 1970, and the impact of those policies on the Corps flood damage prevention services. The period covers Republican as well as Democratic administrations and can be characterized as a period when concern for the natural environment increased, as did the vocal demands of the public. These forces and others altered the Corps approach in developing solutions to water resource problems. The results of these forces frequently are reflected in policy changes which had a significant impact on services provided by the Corps. These policy changes often became intertwined without a clear-cut cause-and-effect relationship. Some of the key changes included:

1. Legislation and Executive Orders: Legislation and executive orders elevated the importance of environmental considerations, called for multi-objective planning, non-structural solutions to flooding problems, and changes in the Corps planning process.

2. Political Process: A drop in congressional and local support of Corps projects resulted in fewer projects being authorized than in prior periods of comparable duration. Considerably more opposition was experienced on authorized projects and on those being considered for congressional authorization. Water resource development bills became more difficult to enact, and, once authorized, it was more difficult to undertake construction of the projects, despite serious attempts to involve the public early in the planning process.

3. Planning Process: Multi-objective planning and public participation became institutionalized. Greater emphasis was placed on water resource problems of urban areas. The duration of planning prior to implementation of a project was lengthened. Opposition was more likely to delay or halt a project.

4. Benefit-Cost Methodology: Changes in the methodology of calculating flood control benefits and the use of higher discount rates reduced the estimated annual benefits, increased the estimated annual costs, and thus decreased the benefit-cost ratio. Other benefits previously allowed are no longer permitted to be included in the formulation of new projects.

5. Organizational Changes: The percentage of engineers on Corps technical staffs decreased while the number of environmental planning personnel increased. The status of the environmental staff was enhanced by the importance given to environmental impact statements and to the environmental quality planning objective; division status was given to the planning function and branch status to enviromental analysis. The number of full time permanent Corps employees decreased by approximately 15 percent compared with the late 1960s.

6. Funding and Programmatic Changes: The construction budget declined while the operation and maintenance budget increased in constant dollars. The number and size of new construction starts decreased. The preconstruction planning budget increased following passage of NEPA but subsequently decreased in the early 1980s.

To be meaningful, an evaluation of policy changes and the resulting impact on services provided by the Corps must be measured against criteria which have relevance to the citizens who receive or fail to receive the services. The criteria should be such that they can be applied by the public as well as government officials. The criteria selected are equity, efficiency, and responsiveness, which are, or at least should be, the norms governing the provisions of public services in the United States. Admittedly, these have not all been the traditional standards by which the Corps water resource programs have been evaluated. The tendency has been for economic efficiency to prevail. However, Haveman has stated that in reality it is a more complex process. He categorizes the forces that interact on the allocation of resources for Corps projects as economic efficiency, regional economic aid or income redistribution, and political manipulation.[1] Despite this finding, the Corps has continued to stress traditional benefit-cost analysis as the tool by which to justify the authorization and funding of water resource projects. At the same time, these traditional objectives of efficiency and economy in government have often become too remote and impersonal to deal with the complex problems in a turbulent world.

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[1]Robert H. Haveman, Water Resource Investment and the Public Interest (Nashville, TN: Vanderbilt University Press, 1965), p. 21.

In recent decades, the perceived failure of government to reach all segments of society in an equitable manner has resulted in a sharply increased demand for participation in administration. This demand arose from a gap between policy, promise, and program delivery, and with a perceived lack of governmental responsiveness to areas of public concern. Equity and efficiency sometimes are in conflict with one another. Equity implies a redistribution of costs and benefits while efficiency implies least-cost solutions and neutral treatment, where benefits to the rich are as valid as benefits to the poor. In pursuing efficiency, government programs may fail to reach a significant segment of the population adequately. Fredrickson, in describing the new public administration, stresses the importance of the objective of efficiency as well as social equity, and he points out that political responsiveness may have to be purchased at a cost in administrative efficiency. Responsiveness is viewed as a balancing force between equity and efficiency.[1] At any point in time, it may be pulling in one direction or another.

Bish and Ostrom conclude that in the final analysis benefits can be calculated only in relation to user preferences. In this sense, user preference is analagous to demand

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[1]H. George Fredrickson, "Toward a New Public Administration," in Toward a New Public Administration, ed. by Frank Marini (Scranton , PA: Chandler Publishing Co., 1971), pp. 309-331.

in the marketplace. They further note that the difficulty of measuring and evaluating public goods and services requires considering efficiency and responsiveness as separate but related criteria in evaluating performance of public agencies.[1]

The Congress of the United States declared that the objectives of Federally financed water resource projects extend beyond the objective of national economic efficiency. Four objectives were cited by Congress. These objectives are the enhancement of 1) national economic development, 2) regional development, 3) environmental quality, and 4) social well-being of the people of the United States.[2] The objectives of enhancing regional development and social well-being have been given very little prominence in the formulation of Corps projects, and the Corps has failed to use them to justify projects. Enhancing the regional development of a poor area and improving social well-being are akin to the notion of social equity. More appropriate consideration of all four objectives would make Corps solutions to flood problems potentially more responsive.

Consequently, the problem that emerges is twofold. First, changes since 1970 have <u>significantly</u> altered the Corps flood damage prevention program. The most notable result has

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[1]Robert L. Bish and Vincent Ostrom, <u>Understanding Urban Government: Metropolitan Reform Revisited</u> (Washington, DC: American Enterprise Institute for Public Policy Research, 1973), p. 22.

[2]<u>Flood Control Act of 1970</u>, Pub. L. 91-611, sec. 209, 84 Stat. 1829, 42 U.S.C. 1962.

been the reduction in the authorization and implementation of new flood damage prevention projects. Secondly, the Corps continues to use national economic efficiency as the yardstick by which projects are justified, whereas Congress, as well as professional public administrators, has called for a broader base by which to evaluate such programs. In order to address each aspect of the problem, it is necessary to identify the policy changes since NEPA, analyze those changes and the resultant program outputs, and then evaluate them against criteria of equity, efficiency, and responsiveness.

Statement of the Problem

A concise statement of the problem presented thus far in the introduction is necessary. The dollar value of annual flood damages continues at a high level despite substantial Federal investments. The Corps, as a Federal agency with a major responsibility for flood damage prevention, has been subjected to policy changes which have impeded the authorization and implementation processes. The problem, therefore, is to identify the policy changes which have impacted the program and to determine whether the resultant program outcomes reflect a greater or lesser degree of equity, efficiency, and responsiveness.

It should be noted that the inability of the Corps to implement a flood damage prevention project is by no means prima facie evidence that the outcome has been adverse. On the contrary, many solutions are no longer acceptable to the public. In this research effort, an attempt is made to address projects which have been supported by the public and their elected representatives but which are not being implemented . In addition, certain flood damage prevention projects constructed under the provisions of older guidelines are analyzed under more current guidelines in an effort to document further the impact of the newer policies. Finally, an assessment is made of flood damage projects which were planned in the late 1970s and early 1980s and are awaiting congressional authorization. It is of interest to see in what manner the salient policy changes since NEPA have contributed to or detracted from the objectives of equity, efficiency, and responsiveness.

Research Questions

The main research question is: To what extent have external and internal pressures from 1970 through 1983 changed the flood damage prevention services of the U.S. Army Corps of Engineers when measured against criteria of equity, efficiency, and responsiveness?

The subsidiary research questions are:

1. What are the specific policy changes of the period, and what dimensions of the planning and implementation process have they affected? Of particular interest are changes having a bearing on

   a. The process for authorization of new projects.

   b. The calculation of benefit-cost ratios.

   c. The types of solutions being recommended.

   d. The implementation of authorized projects.

2. What impacts have fiscal constraints had on the implementation of flood damage prevention projects by the Corps?

3. To what degree have policy changes affected the technical remedies, with the emphasis on non-structural solutions, implemented by the Corps program for preventing flood damage?

4. From the available literature, what operational definitions of equity, efficiency, and responsiveness can be framed to describe and evaluate the Federal provision of flood damage prevention services?

5. In what specific ways have these changes contributed to or detracted from the objective of equity, efficiency, and responsiveness in the provision of flood damage prevention services?

Since the basic research effort attempts to measure change in outputs over a period of time, it is necessary to characterize the services provided at the start and end of the period under consideration. In developing the changes in services that occurred, documentation of the pertinent factors,

internal and external to the Corps, is appropriate. These factors include public participation and perceptions, Corps planning objectives and methodology, composition of the Corps organization, the political process, legislation, and executive orders. Policies related to these factors at the start of the period under consideration as well as changes that occurred during the 1970-1983 time frame are presented and analyzed. Changes in procedures generally occur in a gradual manner, as policies designed to implement the provisions of legislation and executive orders are formulated. The impact of such change on the public often is not felt for many years but may be substantial when measured over a period of a decade or more. Thus, it is appropriate to consider flood damage prevention services on a continuum commencing prior to 1970 and extending beyond 1983. The forces that impacted on these services were different before 1970 and undoubtedly will change in the future. The performance of the Corps, however, needs to be evaluated in terms of criteria which can be applied by citizens as well as Corps officials. The criteria of equity, efficiency, and responsiveness are considered appropriate criteria for such an evaluation.

Research Methodology: Relationship of Data and Information to Research Questions

Data and Information Sources

There are three components to the data and information sources which are at the heart of the research. These are 1) a review of specific types of projects, 2) a detailed analysis of pre-NEPA and post-NEPA legislation and policies, and 3) a set of criteria against which judgments can be made in the evaluation of program outcomes.

In Chapters II and III, information on the pre-NEPA and post-NEPA legislation and policies impacting the Corps flood damage prevention program is presented in some detail. Chapter IV contains a review of various concepts of equity, efficiency, and responsiveness. In this section of Chapter I, the focus is on the identification of the empirical project data which are used in analyses and evaluations and in addressing the research questions.

Data Sources

Project-related data have been selected from seven major sources. The selection of these particular groups of projects was designed to provide a sufficient base against which the outputs of salient policy changes could be assessed in order to address the research questions. The seven categories of projects entail an evaluation of over 500 projects. Some of the projects were constructed (implemented) and are providing their intended services (benefits) to the public today. Others were authorized in the pre-NEPA era but failed to be implemented, and still others were caught up in post-NEPA era changes and have yet to be authorized for implementation. The seven categories of projects are listed below, followed by a discussion of their relationship to specific aspects of the research effort:

1. Phase I projects.[1]

2. Reservoir projects with water quality control storage budgeted for construction in Fiscal Year 1979.

3. Active projects placed in the deferred and inactive category.[2]

4. Section 201 projects approved for implementation by House and Senate committee resolutions pursuant to the provisions of Section 201 of the Flood Control Act of 1965.

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[1]These are projects authorized by the Water Resource Development Acts of 1974 and 1976 (Public Laws 93-251 and 94-587). They were authorized for the Phase I stage of advance engineering and design, essentially an update of project formulation and reconfirmation of public acceptability. Phase I projects were not authorized for implementation.

[2]The definitions of active, deferred, and inactive projects are provided later in this chapter.

5. Authorized projects funded for construction.

6. Other active authorized projects not funded for construction.

7. Reports in Washington recommending authorization of projects for implementation by the Corps.

The relationships between type of project analyzed, policy factor change, and specific research questions are shown in Table 1.

Phase I projects

Numerous projects, authorized prior to the enactment of NEPA, were still in the preconstruction planning stage when the changes of the early 1970s began to be felt. It became apparent that when Corps district offices merely moved ahead with engineering and design of a project, significant problems would arise when efforts were made to implement the project. The project could run into opposition from local interests or from national environmental groups. Certain benefits, acceptable when the project was authorized, were no longer approved when projects were being considered for implementation. The Phase I process was developed by the Corps for the pre-NEPA projects but subsequently was applied by Congress in 1974 and 1976 to projects recommended for authorization by the Secretary of the Army. These legislative Phase I projects, of which there were sixty authorized in 1974 and 1976, have yet to produce an implemented project.[1]

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[1]However, two of the Phase I projects were authorized for construction by Public Law 96-367, The Fiscal Year 1981 Energy and Water Development Appropriations Act, and are now under construction. The projects are Siuslaw River and Bar, Oregon, a navigation project, and Levisa and Tug Forks of the

TABLE 1

RELATIONSHIP BETWEEN PROJECTS ANALYZED, POLICY FACTORS CONSIDERED FOR CHANGE, AND RESEARCH QUESTIONS

Project Data Analyzed	Primary Policy Factors Considered					Related Research Questions					
	Washington Level Review	Intergovernmental Factors	Planning Process & Organization	Benefit-Cost Ratio Methodology	Funding & Programmatic Issues	Main Research Questions	Subsidiary Research Questions				
							One	Two	Three	Four[a]	Five
Phase I projects	X	X	X	X		X	X		X		
Reservoir projects with water quality control storage budgeted for construction in FY 1979				X		X	X				X
Projects placed in the deferred & inactive categories		X		X		X	X				X
Section 201 projects	X	X		X		X	X	X			X
Authorized projects funded for construction	X	X		X	X	X	X	X			X
Other active projects not funded for construction		X		X	X	X	X	X			X
Reports in Washington recommending authorization of projects for implementation by the Corps	X	X	X	X		X	X		X		X

[a]Subsidiary research question number four is based primarily on a review of the literature and consideration of policy changes rather than an analysis of project data.

In essence, the Phase I stage of advance engineering and design is an update of a feasibility study. A Phase I report contains updated information on formulation, evaluation, costs and their allocation, items of local cooperation, and public acceptability. Phase I reports were intended to be submitted to Congress for authorization for implementation. By focusing on these projects, which were authorized for further planning, rather than implementation, the impact of specific policy changes on the planning and implementation process can be evaluated. One subset of these projects is those that are also included in the category of projects now awaiting congressional authorization. A comparison of the Phase I projects authorized in 1974 or 1976 with the recommendation for construction several years later should prove enlightening.

Reservoir projects with water quality control storage budgeted for construction in Fiscal Year 1979

A review of the Fiscal Year 1979 construction budget of the Corps revealed that twenty-eight multiple-purpose reservoir projects with water quality benefits were being funded. These projects all had received initial construction funds prior to October 18, 1972, the date Public Law 92-500 was signed into

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Big Sandy River and Cumberland River, West Virginia and Kentucky, a flood damage prevention project. The scope of the latter project encompasses the Phase I project for Tug Fork authorized by Section 90 of the Water Resource Development Act of 1974. A third Phase I project, Barnegat Inlet, New Jersey, was reviewed and found to be a design deficiency and therefore within the discretionary authority of the Chief of Engineers to reconstruct without further congressional authorization. Funds to initiate the construction work were appropriated in Fiscal Year 1984.

law.[1] Of particular interest is that the authorized discount rate for all but one of the twenty-eight projects was 3-1/4 percent or less and that the water quality control benefits constituted as high as 40 percent of the total estimated annual benefits presented to Congress in support of the Fiscal Year 1979 annual budget request.

Many of these projects are now essentially complete and are providing the benefits for which they were designed and constructed. These projects are reanalyzed using criteria in effect when the Fiscal Year 1979 budget was prepared; the benefit-cost ratios are recalculated on that basis. Although most of the reservoir projects with water quality control storage were begun prior to 1970, this category was selected to illustrate the impact of major policy changes on the benefit-cost ratio and to evaluate whether they would be built today, given the policy changes. In addition, since many of the projects being analyzed are now complete or nearing completion of construction, a limited ex post analysis is made on those that have been producing benefits for a number of years. This effort is designed to determine who the losers would be had the projects not been built and what the loss of such benefits would mean in terms of equity, efficiency, and responsiveness.

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[1]Pursuant to the decision by the Fourth Circuit Court of Appeals on September 18, 1973, in Cape Henry Bird Club, et. al. v. Melvin R. Laird, Secretary of Defense of the United States of America, projects which had received construction funds prior to this date, and which had approved benefits for water quality control storage, could continue to "count" such benefits in calculating the benefit-cost ratio. See Chapter III for a more detailed discussion of this issue.

Active projects placed in the deferred and inactive categories

The backlog of uncompleted Corps project authorizations for implementation is divided into three categories. These are "active," "deferred," and "inactive."[1] A description of the basis for each category follows:

1. Active category. Projects in this category are considered to be necessary and economically justified, engineeringly feasible without requiring modification of the authorized plan beyond the discretionary authority of the Chief of Engineers, supported by local interests as evidenced by recent statements of ability and willingness by responsible bodies to provide local cooperation, and with no anticipated major problems of compliance with those requirements of local cooperation.

2. Deferred category. Projects in this category have doubtful or marginal economic justification and would require a restudy to determine whether an economically justified and locally supported plan of authorized scope can be developed. This category also includes those projects not generally opposed by local interests, but local interests currently may be unable to furnish the required cooperation.

3. Inactive category. Projects whose lack of economic justification is obvious, or was definitely determined, and for which it is apparent that a current restudy would not develop an economically justified plan are placed in the inactive category. This category also includes projects which, as authorized, are not adequate to meet current and prospective needs and which would require such substantial modifications to obtain an adequate improvement that they should not proceed without new congressional authorization. Finally, projects may be inactive because they are opposed by local interests, there is no reasonable prospect that the required local cooperation will be forthcoming, or the projects may have been accomplished by other means or are no longer required.

A number of authorized projects are placed in the deferred and inactive categories each year and, in many cases,

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[1]U.S., Department of the Army, Engineer Regulation 11-2-240: Civil Works Activities Construction and Design (Washington, DC, November 1974), pp. 12-15.

are subsequently deauthorized. Particular emphasis is placed on flood damage prevention projects which were placed in the deferred or inactive category after NEPA.

An analysis of authorized projects which are no longer active (for a variety of reasons) provides a basis for evaluating the impact of changes on this set of projects authorized for implementation. By analyzing these projects, many of which were authorized in the pre-NEPA era, the relationship between the changes during the 1970-1983 time frame and the reclassification of the projects can more readily be established; i.e., the projects were supported at the local level and had a favorable benefit-cost ratio prior to NEPA, but during the 1970-1983 period they were subsequently dropped from further consideration for implementation.

Section 201 projects

Section 201 of the Flood Control Act of 1965[1] established a procedure whereby projects with an estimated Federal cost of less than $10 million could be authorized for construction by adoption of resolutions by the authorizing congressional committees in lieu of waiting for authorization in periodic "omnibus" legislation. Section 201 is specific in requiring a report from the Secretary of the Army with relevant data and costs. Most important was the requirement that any water resource project authorized to be constructed under the provisions of Section 201 is subject to the same requirements

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[1]U.S., Congress, Flood Control Act of 1965, Pub. L. 89-298, October 27, 1965.

of local cooperation as projects with an estimated Federal cost of $10 million or more.[1]

The purpose of Section 201 was to make possible more expeditious authorization of relatively small water resource development projects. It was the intent of Congress that relatively minor projects should not have to wait for action of the whole Congress. Rather, such projects should be authorized, constructed, and put into operation quickly once they have been recommended for authorization following the normal survey procedures.[2]

Between July 1970 and June 1978, the authorizing committees adopted resolutions permitting eighty-four projects to be eligible for advance engineering and design appropriations and subsequent construction. About one-third have been built or are under construction. The eighty-four Section 201 projects are analyzed to determine:

1. The time saved by use of the Section 201 authority vis-a-vis a water resource development act.

2. Why about one-third of the Section 201 projects have been or are being implemented while the other two-thirds are not.

Approximately forty additional projects undergoing the Washington level review would be eligible for Section 201 authorization except that the Federal versus non-Federal cost

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[1]U.S., Congress, Flood Control Act of 1965, Pub. L. 89-298, October 27, 1965. Sec. 201(b). The Federal cost limit was raised to $15 million in 1976.

[2]U.S., Congress, House, Committee on Public Works, River and Harbor, Beach Erosion, Flood Control Projects and Water Supply, H. Rept. 973, 89th Cong., 1st sess., 1965, p. 12.

sharing under which they were formulated or under which they are being considered by the Secretary of the Army is different from existing law. These projects have been formulated under more recent planning guidelines; however, an extended executive-legislative impasse on cost sharing has resulted in a discontinuance of the section authorization process. By focusing on these relatively low-cost projects, the impact of changes relating to the review process and cost sharing can be analyzed and can be related to program outcomes.

Authorized projects funded for construction

The selection of a project for initiation of construction is a rather formal process that may be proposed by the President in a budget request or added by Congress in the markup of an appropriation bill. New construction projects selected by the executive branch for inclusion in a budget request undergo a rigorous review and must pass criteria related to benefit-cost ratio, status of design, local support, and compliance with environmental legislation. Congressionally selected new construction starts frequently are based on similar criteria but may also include broader considerations in response to demands from constituents.

Once a project has been funded for construction, follow-on funding in future Corps budgets is a more routine matter. Efforts are made to construct these projects on the basis of an efficient construction schedule which is maintained unless budget constraints, design problems, delays in receipt of local cooperation, or other procedural occurrences extend the scheduled completion date.

New construction starts in the 1970-1983 time frame are compared with new starts preceding 1970. Also, budget data on flood damage prevention continuing construction projects are evaluated for the 1970-1983 period.

An attempt is made to determine what policy changes reduced the number of new construction projects undertaken during the 1970-1983 period and what impact this had on the initiation of construction. At the same time, an analysis of the continuing construction program budgets (many authorized in the pre-NEPA era) should reveal how those projects fared in the face of policy changes.

Other active authorized projects not funded for construction

The final category of projects analyzed consists of those projects that have been authorized for construction and have remained active but as of 1983 were not being funded for construction.[1] Most of these projects were authorized prior to 1970, yet thirteen or more years later they are not under construction. By being in the active category as opposed to the inactive or deferred category, it would appear that there is some interest in the project and a reasonable probability that the benefit-cost ratio is greater than unity at the authorized discount rate.[2]

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[1]In some instances, construction funds were previously appropriated, but these projects or certain elements of the projects were not constructed.

[2]Since most of these projects were authorized prior to 1970, the legal discount rate used in calculating their benefit-cost ratio is 3-1/4 percent. See discount rate discussion in Chapter III.

All active authorized projects not in the Fiscal Year 1984 budget are analyzed:

1. To determine the causes for the delay in implementation.

2. To evaluate the failure to construct these projects or elements thereof against the criteria of equity, efficiency, and responsiveness.

Reports in Washington, D. C., recommending authorization of projects for implementation by the Corps

During the 1960s, major authorization bills were enacted into law by Congress on the average of every other year. These omnibus bills authorized Corps projects individually, generally on the basis of a study by the Corps and a report which was submitted to Congress by the Secretary of the Army. Omnibus bills were enacted into law in 1960, 1962, 1965, 1966, and 1968.[1] However, only three omnibus bills were enacted into law in the 1970s[2] and none since 1976. Further, the Water Resource Development Acts of 1974 and 1976 authorized sixty projects for the Phase I stage of advance engineering and design but considerably less for construction.

A detailed discussion of the reasons for the impasse in the authorization process is provided in Chapter II.

At the present time, about 170 favorable reports of the Chief of Engineers are either with Congress awaiting authoriza-

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[1]River and Harbor Act and Flood Control Acts of 1960, 1962, 1965, 1966, and 1968, Pub. L. 86-645, 87-874, 89-298, 89-789, and 90-483.

[2]River and Harbor Act and Flood Control Act of 1970 and the Water Resource Development Acts of 1974 and 1976, Pub. L. 91-611, 93-251, and 94-587.

tion or with the Secretary of the Army undergoing review. The total estimated cost of the projects, based on October 1982 price levels, was in excess of $11 billion. This figure, altho' higher than the estimated cost of projects in any single water resources authorization bill ever enacted, reflects an accumulation of seven years of Corps effort since the last water resource development act, as well as the impact of inflation.

Flood damage prevention projects in this category are analyzed with respect to benefits not being realized in an effort to determine what this means in terms of equity, efficiency, and responsiveness. Since these projects have been formulated during a period when increased emphasis has been given to non-structural solutions, an analysis is made to ascertain whether the recommended solutions are, in fact, more geared to non-structural solutions.

Project data: summary

The seven categories of projects represent a complete universe of Corps flood damage prevention projects which were authorized between 1970 and 1983 or were recommended for authorization during this period. This includes all flood damage prevention projects authorized between 1970 and 1983 for Phase I planning or construction as well as those with favorable recommendations awaiting congressional authorization. In addition, projects funded for initiation of construction between 1970 and 1983 are compared with new construction starts of the prior decade. Authorized projects which were reclassified to the inactive or deferred categories or which remained

active but not constructed will also be analyzed.[1] A special analysis is made of the twenty-eight reservoir projects in the Corps Fiscal Year 1979 continuing construction budget which had water quality storage as a project purpose to assess the likelihood of their receiving favorable consideration under current policy guidelines.

Finally, because of the emphasis on non-structural solutions, an analysis is made of the Corps efforts in this direction. Examples of Corps projects which reflect a non-structural approach are reviewed, as well as the success or lack thereof in producing favorable recommendations for non-structural project features.

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[1]For the most part, these projects were authorized prior to 1970.

Information Sources

In addition to the project-related data, information has come from two other major sources. The first was a survey of the literature. This included a review of pertinent literature on the broad concepts of equity, efficiency, and responsiveness, as well as public policy making, and on the specific role of the Corps of Engineers--its organization, policies, and programs, with emphasis on its role in flood damage prevention. The review extended to public laws and accompanying reports, presidential executive orders, executive branch policy documents, Corps regulations and policy documents, budget data, and congressional hearings. The emphasis is on changes in the salient factors impacting the authorization and implementation process following the enactment of NEPA. This search of the literature has been supplemented by interviews and discussions with colleagues in the Corps Washington, D.C., headquarters, division and district offices throughout the nation, and other knowledgeable individuals familiar with the Corps flood damage prevention program.

Theoretical Framework

Since this study covers policy changes over a period of time, it would be appropriate to establish the framework in which the term "policy" is considered. Much has been written about the normative goals behind the formulation and implementation of policy. On the one hand, policy implies a desired cause of events, a selected line of action, and a declaration of intent. On the other hand, it has to do with what is being done, the actions actually undertaken.[1] More basic to this research, however, is the distinction between "policy content" and "policy process," the use of the terms "output" and "outcome," and the relationship of these four terms with the independent and dependent variables.

Policy content as used here is essentially the notion described by Ranney. It includes the particular object or set of objects of the policy that it is intended to affect, the particular course of events desired, the particular line of action chosen, the particular declaration made, and the particular actions taken. In all cases policy content is that actually chosen from among the alternative objects, courses of events, lines of actions, declarations, and actions that might have been chosen.[2]

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[1]Austin Ranney, "The Study of Policy Content: A Framework for Choice," in Political Science and Public Policy, ed. by Austin Ranney (Chicago: Markham Publishing Co., 1968), pp. 6-7.

[2]Ibid., p. 8.

The policy process includes the actions and interactions that produce the authorities' ultimate choice of a particular policy content over its rivals.[1] From the policy process and content flow binding decisions and implementing actions. These are considered outputs. When the consequences of these outputs are determined, they are called outcomes.

The relationship between policy process, policy content, outputs, and outcomes is indicated in Figure 1. The model is a dynamic one with a feedback loop which permits decision-makers to consider policy changes based on an evaluation of outputs and outcomes.

Traditionally, political scientists studied the policy process by observing the making of actual policies, with the policy content or "governmental output" as the dependent variable. In these studies, the independent variables were such factors as the distribution of power among pressure groups and governmental agencies. Froman has proposed that policy content be considered the independent variable with the impacts on policy content the dependent variable.[2]

Others have proposed that policy processes and outputs are important only as they influence the conditions of people's lives and that more must be known about the relationship of policy process to outputs and of outputs to outcomes. It is this relationship that is the essence of the research effort.

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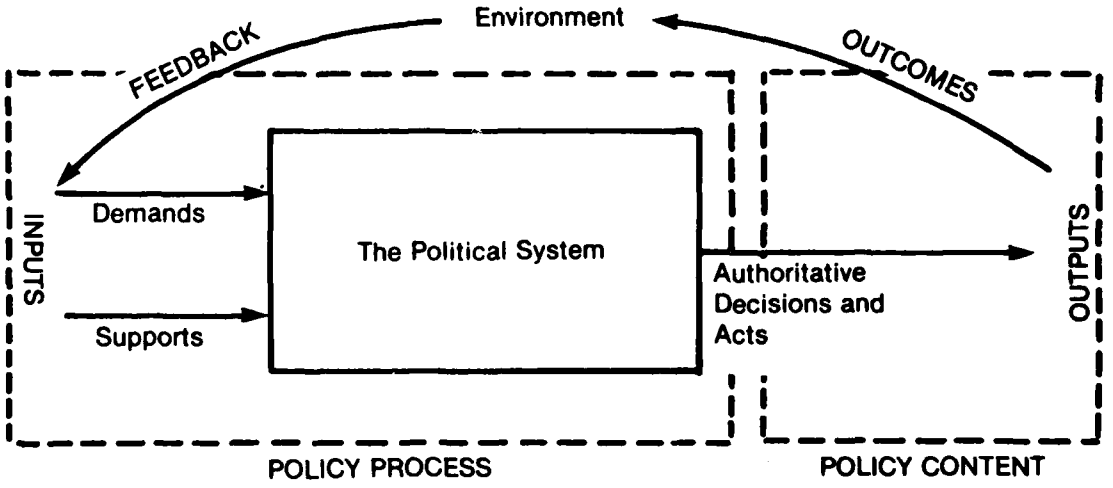
[1] Ibid., p. 8.

[2] Lewis A. Froman, "The Categorization of Policy Contents," in Political Science and Public Policy, ed. by Austin Ranney, pp. 41-52.

FIGURE 1

THE "POLICY PROCESS"



Source: Austin Ranney, "The Study of Policy Content: A Framework for Choice," in *Political Science and Public Policy*, ed. by Austin Ranney (Chicago: Markham Publishing Co., 1968) p. 9.

Dependent and Independent Variables

The research deals with changes in policy content over a period of time and is designed to ascertain the impact of these policy changes on outputs and to evaluate such outputs against criteria of equity, efficiency, and responsiveness to determine the program outcomes. The factors which are analyzed for change are the independent variables[1] and were selected because of their impact on the project authorization and implementation process. The changes are expressed in legislation, executive orders, budgets, other policy documents, and as carried out or influenced by the various actors involved with the policies. The program outputs are related to the product, or that which directly results from the Corps flood damage prevention program through actual facilities authorized or constructed. Outputs also may be the result of inaction as characterized by the lack of enactment of water resource development acts or a reduction in the number of new starts. The removal of projects from the active list after they have been authorized and their placement in the inactive or deferred category also is a program output. The program outputs are the goods and services produced by the Corps, or the lack thereof as affected by decisions.

These outputs represent a way to classify goods and services provided by a public agency and received by or directed

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[1]See Figure 2.

at the public.[1] The quantity of outputs produced can be measured; however, outputs are considered value neutral in this study.

Outcomes are the impacts or consequences of the outputs. This concept envisions a value placed on outputs; the value pertains to how they affect citizens now. The focus of attention is upon goals that satisfy human needs. This makes the policy valuable and gives it its justification.[2] By applying several criteria to the same distribution of outputs, different conclusions as to their value may be drawn.

Since the independent variable considers change in policy content over a period of years, the output changes that occurred during this period are also presented. The relationship between the independent and dependent variables is shown in Figure 2.

In this research the values placed on the outcomes are measured in terms of equity, efficiency, and responsiveness, standards by which public sector performance may be judged or norms established. Here, several criteria are applied to the same outputs leading to combined consequences which are evaluated. Conclusions are then drawn and recommendations made

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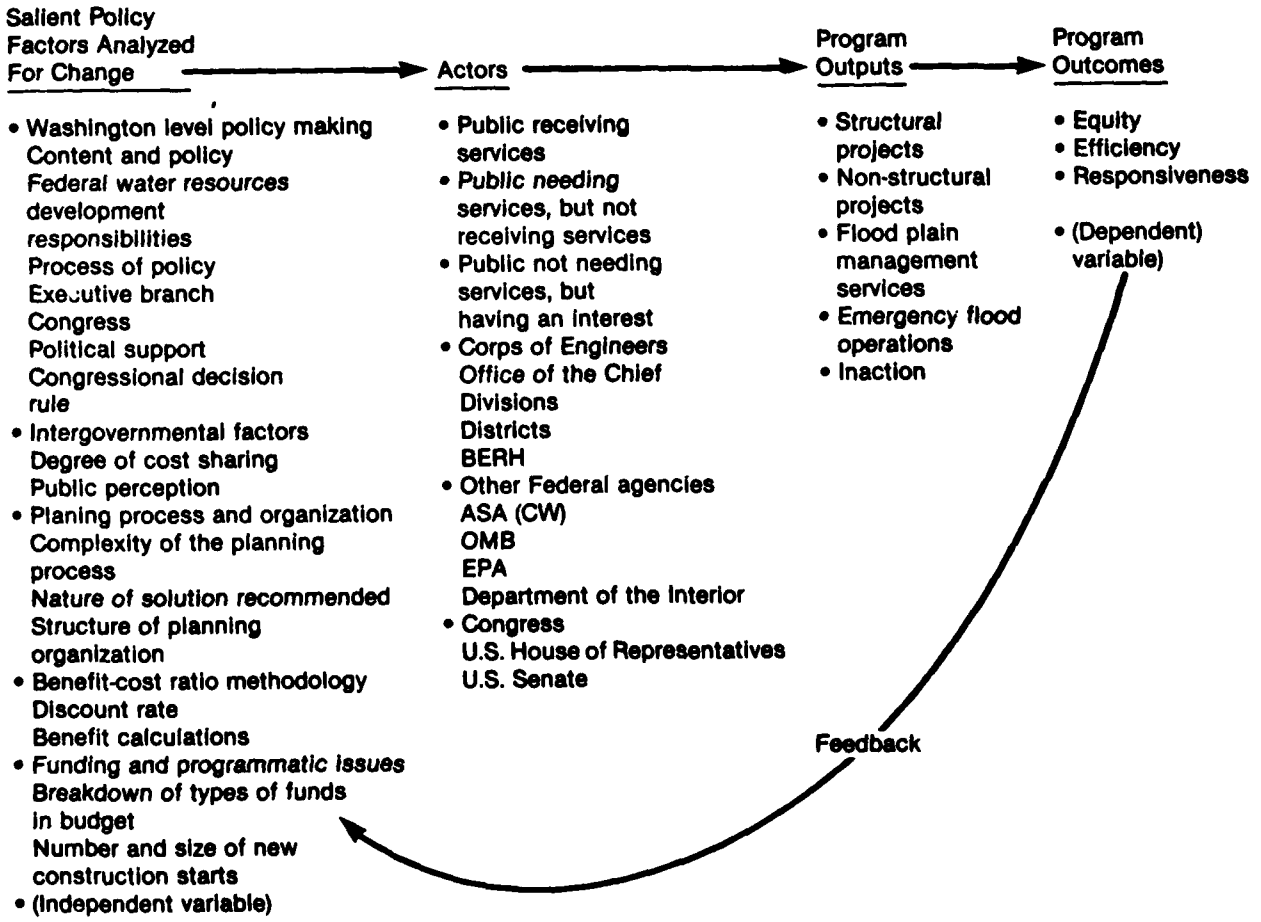
[1]Frank S. Levy, Arnold J. Meltsner, and Aaron Wildavsky, Urban Outcomes (Berkeley: University of California Press, 1975), p. 2.

[2]Ibid., pp. 2-8. Also see Ranney, "Study of Policy Content," pp. 8-9, and David Easton, A System Analysis of Political Life (New York: John Wiley and Sons, Inc., 1967), pp. 351-352.

FIGURE 2

RELATIONSHIP OF INDEPENDENT AND DEPENDENT VARIABLES



Note: The direction of the arrows is intended to reflect the normal flow from the content and process of policy through the interaction with the environment, internal and external to the Corps, yielding outputs which become outcomes when evaluated against the criteria of equity, efficiency, and responsiveness. As indicated in Figure 1, there is an ever-present feedback process which, over a period of time, results in further changes in policy outputs and outcomes.

considering the combined consequences.[1] The changes in outcomes reflect the evaluation of outputs measured against the three criteria in the pre-NEPA versus post-NEPA era. It is the change in outcomes that is the dependent variable.

Because there are so many factors that influence policy and its eventual outcomes, clear distinctions between independent and dependent variables are frequently difficult to draw. However, there are instances, such as the use of higher discount rates and changes in benefit calculation, which permit establishing some clearer linkages. Other policy changes that occurred during the 1970-1983 period result in more inferential conclusions as to outcomes. These include the failure of Congress to enact a water resource development act since 1976 and increased public participation in the planning process. In evaluating outputs and outcomes resulting from the use of higher discount rates, it is possible to document that higher discount rates result in fewer projects meeting the benefit-cost ratio test. This output, in turn, is directly linked to a specific program outcome when measured, for example, against the efficiency criteria. On the other hand, the failure of Congress to enact a water resource development act since 1976 has also resulted in fewer projects being authorized and implemented; however, the relationship of this output to the same evaluation criteria is less clear. Even projects with very high benefit-cost ratios failed to be authorized. The reasons that Congress failed to enact authorizing legislation

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[1]Conclusions and recommendations are presented in Chapter VII.

include 1) opposition of the Carter and Reagan administrations to the traditional cost sharing formulas, 2) bifurcation of public views on traditional projects into either pro-development or environmental interests, and 3) the lack of adequate support in the Congress to authorize traditional Corps projects.

Organization of the Study

Chapter I is an introductory chapter containing background information on the purpose of the research effort, a general statement of the problem, and the research questions. It also describes the methodology and theoretical framework of the research, portraying equity and efficiency at opposite ends of the spectrum being pulled to the center by responsiveness. The main research question focuses on whether the Corps of Engineers flood damage prevention program has moved toward equity or efficiency during the 1970-1983 time frame and whether it has been responsive to the public.

Chapters II through V constitute Part One of the study and contain descriptions and analyses of changes in flood damage prevention activities of the Corps of Engineers. Chapters VI and VII constitute Part Two of the study and include an evaluation of the changes, conclusions, and recommendations drawn from the research effort.

Chapter II contains the historical review of the Federal role, particularly the Corps role in flood damage prevention activities. Pertinent legislation and implementing policies are discussed. The emphasis is on legislative and policy changes during the 1970-1983 time frame which impacted on the Corps flood damage prevention program, except for changes in benefit-cost ratio methodology which are discussed in Chapter III. By describing in considerable detail the legislative and policy changes, the stage is set for analysis of project-related data which were impacted by the changes resulting in program outcomes that will be evaluated against

the specified criteria of equity, efficiency, and responsiveness.

Chapter III is a theoretical overview of benefit-cost analysis and its use in the formulation of Corps flood damage prevention projects. Benefit-cost analysis is discussed in a separate chapter to highlight its importance in the formulation of Corps projects, and because policy and legislative changes pertaining to the appropriate discount rate used in formulating projects and benefit calculation methodology had a significant effect on the authorization and implementation of Corps projects in the 1970-1983 time frame.

Chapter IV provides a review of different concepts of equity, efficiency, and responsiveness. Derived from these grand concepts are a set of definitions for evaluating government services, with particular emphasis on applicability to the Corps flood damage prevention program.

Chapter V provides an overview of empirical findings concerning program outputs resulting from internal and external changes during the 1970-1983 time frame. Results of the analysis of considerable project data are presented, with emphasis on the bearing that policy changes had on project authorization and implementation. A discussion and analysis of census data is presented to provide information concerning the communities which receive or fail to receive flood damage prevention benefits from Corps projects. The intent is to present an analysis of policy changes and resulting project outputs and to give meaning to these outputs by evaluating them against criteria of equity, efficiency, and responsiveness.

Chapter VI, in introducing Part Two, is an evaluation of findings against the specific research questions. Pertinent findings are identified and are related to the research questions. Relationships between policies, program outputs, and program outcomes, measured against the criteria of equity, efficiency, and responsiveness, are presented. Chapter VII is a summary of the findings of the research and includes normative and prescriptive policy recommendations which are based on a consideration of the three criteria as they relate to flood damage prevention.

PART ONE

CHAPTER II

HISTORICAL REVIEW OF LEGISLATION AND POLICIES

Purpose of the Chapter

This chapter provides an historical review of legislation and policies which are the basic framework for the Federal and, more particularly, the Corps role in flood damage prevention. The material is presented in a chronological manner and highlights changes of the post-NEPA era. The focus of this chronology is on the major themes which are pertinent to the research questions and the evaluation of project-related data against the criteria of equity, efficiency, and responsiveness. The major themes include Federal versus non-Federal role, types and comprehensiveness of solutions to flood problems, planning objectives, and the authorization and implementation process. Legislation, policies, and practices pertaining to benefit-cost analysis and flood damage prevention benefits are discussed in greater detail in Chapter III.

Following the discussion of the pertinent legislation and policies which framed the Corps flood damage prevention program in the pre-NEPA and post-NEPA periods are several tables and figures which summarize the major themes and trends present during these periods of time. These themes generally are consistent with the national objectives of the period, such

as the emphasis on building and expanding the nation in the nineteenth and early twentieth century and the concern for the environment in the 1970s.

Flood Damage Prevention and Related Legislation Programs, and Policies in the Pre-NEPA Era

Early Programs: Non-Federal Role Dominant

Like many other current functions of the Federal government, flood control was purely a local concern for many years. National interest in it grew in urgency with the growth of settlement in the lower Mississippi River basin.

By the 1840s, the people of the lower Mississippi River valley, after more than a century of individual, group, and state effort to confine the river, had come to realize that assistance from the Federal government was required. Conventions were held in Memphis in 1845 and in Chicago in 1847 to promote Federal assumption of flood control for the Mississippi River. Support in Congress grew, and, following major floods in 1849 and 1850, Congress enacted the Swamp Lands Acts of 1849 and 1850 granting Federal lands subject to flooding in Arkansas, Louisiana, Mississippi, and Missouri to those states with the proviso that the proceeds from their sale be used for flood control or drainage projects.[1] Initial Federal participation in flood control was followed by congressional direction for the Corps to undertake surveys of the flood problems of the Mississippi. The Corps reported the need for extensive

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[1]Beatrice Hort Holmes, A History of Federal Water Resources Programs, 1800-1960 (Washington, DC: U.S. Department of Agriculture, 1972), p. 4; U.S., Congress, Senate, Select Committee on Natural Water Resources, Water Resources Activities in the United States: Floods and Flood Control, 86th Cong., 2d sess., 1960, p. 11.

levee construction, well beyond the financial capabilities of the states and localities; however, Federal appropriations for such activities were not enacted, in part because of hostilities in the post-Civil War era.[1]

In 1874, following a disastrous flood, Congress appropriated funds for relief work and created a commission to study the problem and to report on a permanent plan for reclaiming the part of the Mississippi valley that was subject to flooding. The commission report discussed alternative flood control methods and severely criticized the ineffectiveness of uncoordinated levee construction programs. The report strengthened the advocacy of Federal action and led, in 1879, to the establishment of the Mississippi River Commission. In 1881, the first appropriation act following establishment of the commission specifically prohibited the construction of levees for any purpose except as a means of deepening or improving the river in the interest of navigation,[2] which had been recognized as a Federal responsibility since the 1820s.[3] A year later, the Appropriations Act of 1882 did permit the commission to repair and build levees "to afford ease and safety to the navigation

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[1]Holmes, History, p. 4.

[2]U.S., Congress, House, Committee on Flood Control, Flood Control in the Mississippi Valley, H. Rept. 1072 to Accompany H.R. 8219, 70th Cong., 1st sess., 1928, p. 342.

[3]In 1824, Congress authorized $75,000 for the Corps to improve navigation on the Ohio and Mississippi Rivers. This was considered a Federal responsibility based on Article I,

and commerce on the river and to deepen the Channel."[1] Congress was unwilling to expend Federal funds to protect land of private owners and felt that the Swamp Act of 1850 provided the states a means of financing flood control.[2]

It was not until 1890 that the prohibitive clause was removed, and from 1890 to 1917 periodic appropriations were divided between levees, revetments, and dredging. Finally, in 1917 flood control became, by law, as much a part of the commission's work as river improvement in the interest of navigation. The act of 1917 (enacted following a major flood) provided the first clear-cut flood control legislation. A requirement of the act was for local interests to pay one-third the cost of levee construction and to assume the entire cost of maintenance after completion of construction. The cost of river improvement by revetments and dredging remained entirely a Federal cost, since that work was considered to be in the interest of navigation.[3]

Section 8, of the Constitution which conferred on the Federal government the power to regulate commerce with foreign nations and among the states. Commerce was judged to include navigation within its definition. See the following two documents prepared for the National Water Commission: John L. DeWeerdt and Philip M. Glick, eds., A Summary Digest of the Federal Water Laws and Program (Washington, DC: Government Printing Office, 1973), pp. 9-10, and Northcutt Ely, Authorization of Federal Water Projects (Springfield, VA: National Technical Information Service, 1971), p. 34.

[1]U.S., Congress, House, Flood Control in the Mississippi Valley, pp. 342-343.

[2]Ibid., p. 342.

[2]Ibid., p. 343.

Growth of the Federal Role

As with many subsequent changes in the Federal-local responsibilities in flood control, a major flood event provided the impetus for a change in law which broadened the Federal role in flood damage prevention. The disastrous Mississippi flood of 1927 was referred to by Secretary of Commerce Hoover as "our greatest peace-time disaster," and President Coolidge stated that "its recurrence must be forever prevented."[1] Congress and the President accepted the Federal responsibility for flood control in the Mississippi River basin. The physical magnitude of the problem, the need for a comprehensive flood control system, not jus levees, and the inability of local interests to finance their share of construction were pertinent factors which influenced Congress to pass legislation in 1928 calling for control of floods of the Mississippi River and its alluvial valley. An interesting point is that the Chief of Engineers and the Mississippi River Commission, in submitting flood control plans to Congress, recommended that the Federal government and local interests share in the cost of protective works.[2] President Coolidge in transmitting the plan of the Corps to Congress recommended substantial local cooperation to avoid waste and suggested that the states share with the Federal government the burden of assisting individual levee dis-

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[1] Ibid., p. 5.

[2] Ibid., pp. 51 and 74.

tricts and individual property owners. He indicated that such local cooperation is essential to avoid waste and is appropriate "in view of the fact that the States benefit directly by the increased taxes from land made more valuable by reason of its protection."[1]

Substantial testimony on the magnitude of the flood problem pointed to the tremendous engineering effort needed to provide flood control for the alluvial valley of the lower Mississippi River. The externalities;[2] inability of states, local communities, and levee districts to cope with the problem; impossibility of obtaining the required local contributions in time of disaster; national defense and national welfare; the interdependence of levee districts; and the necessity of planning across state lines all were cited as justification for Federal assumption of flood control on the Mississippi.[3] Many plans for controlling Mississippi River

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[1]U.S., Congress, House, Flood Control in the Mississippi, H. Doc. 90, 70th Cong., 1st sess., Dec. 8, 1927, p. 2. President Coolidge's letter transmitting the Jadwin plan to Congress indicated that it would be appropriate for the Federal share of the cost to be as high as 80 percent.

[2]Forty-three percent of the drainage area of the continental U.S., including thirty-one states plus 20,000 square miles of Canada, empty into the Mississippi River. The drainage basin extends from the Allegheny in New York to the Yellowstone in Wyoming. Further externalities occur when a levee is built on one side of the river and results in flooding only on the other side rather than equal flooding on each side.

[3]U.S., Congress, House, Flood Control in the Mississippi Valley, pp. 21-36.

floods of greater magnitude than the 1927 flood were submitted to the Committee on Flood Control of the House of Representatives. However, congressional consideration centered on two plans, one submitted by the Mississippi River Commission and one submitted by the Chief of Engineers. The plan of the Chief of Engineers, known as the Jadwin plan, was adopted as the basis for the Flood Control Act of May 15, 1928, with the engineering aspects described in House Document No. 90, 70th Congress, First Session. The plan contemplated the control of a much greater flood than had formerly been thought possible. In addition to raising and strengthening levees, the plan called for lateral floodways to pass flows in excess of the safe river capacity, for revetment of caving banks, and for improved navigation channels for river traffic to be obtained by dredging and training works.

Aside from differences of opinion over some of tne engineering plans, there was considerable disagreement over the share of the construction cost that non-Federal interests should pay in implementing the plan. General Jadwin, the Chief of Engineers, recommended that local interests pay 20 percent of the construction cost for levees and control works. In addition, local interests would be required to provide at no cost to the Federal government rights-of-way for levee structures and drainage works and to maintain the levees after

construction was completed.[1] Although the plan authorized by Congress in 1928 was consistent with the Jadwin plan, the cost sharing recommended by the Chief of Engineers and President Coolidge was not concurred in by Congress. Section 2 of the 1928 act[2] declared it the sense of Congress that the principle of local contribution toward the cost of flood control work, which had been incorporated in all previous national legislation on the subject, was sound. However, in recognition of the very substantial expenditures made by local interests in the past;[3] in view of the national concern to control these floods in the interest of national prosperity, the flow of interstate commerce, and the movement of the U.S. mails; and in view of the gigantic scale of the project involving floodwaters flowing from a drainage area outside the states most affected, no local contribution was required. The total estimated construction cost of over $300 million at then current prices was to be borne by the Federal government.[4]

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[1]U.S., Congress, House, Flood Control in the Mississippi, H. Doc. 90, p. 34.

[2]Norman R. Moore, Improvement of the Lower Mississippi River and Tributaries (Vicksburg, MS: Mississippi River Commission), 1972, p. 3.

[3]Amounts cited in House Document 90, 70th Congress, indicate that from 1882 through 1926, states and local organizations had spent or contributed to the Federal government for expenditure 70 percent of the $238 million expended on flood control levees, including emergency work. See page 10, House Document 90.

[4]Moore, Improvement, p. 3.

In passing the 1928 act, Congress recognized the vast magnitude of the externalities involved, the untold damage and human suffering that occur when levees are overtopped or crevasses occur in levees, and the necessity for the Federal government to provide the needed comprehensive flood control. Section 8 of the 1928 act helped create a strong bond between the Mississippi River Commission and local interests. It called for the commission to make inspection trips and hold public hearings on these trips. This provision has been a cornerstone in the close working relationship that has continued between local interests and the Corps.

Floods of 1936 result in nationwide program

Just as the Federal role for flood control in the Mississippi valley was expanded following major floods, the widespread flooding in 1936 had a bearing on establishment of a national policy on flood control. Following a series of devastating floods in 1936, Congress enacted the Flood Control Act of 1936,[1] which established the Federal interest in flood control on a nationwide basis. Section 1 declared that flood control is a proper Federal activity, that improvements for flood purposes are in the general welfare, and that the Federal government should improve or participate in the improvement of navigable waters or their tributaries for flood control "if the benefits to whosoever they may accrue are in excess of the esti-

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[1] Flood Control Act of 1936, Pub. L. 738, 74th Cong., 49 Stat. 1570, 33 U.S.C. 701a.

mated costs, and if the lives and social security of people are otherwise adversely affected."[1] Jurisdiction over Federal flood control investigations and improvements on rivers and other waterways was assigned to the Corps. However, investigations of the watersheds and "measures for runoff, waterflow retardation, and soil erosion prevention" were assigned to the Department of Agriculture.

The 1936 act also authorized numerous projects for navigation, flood control, and other purposes as well as preliminary investigations and surveys. The projects authorized in this act had been formulated since 1927 based on an authorization contained in Public Law 560, 70th Congress. Section 1 of this act authorized surveys in accordance with House Document 308, 69th Congress (usually referred to as "308 reports") on comprehensive development for navigation, water power, and flood control. The basis for some emergency relief projects of the 1930s and the basic plan of the Tennessee Valley Authority was the 308 reports. Projects authorized in the Flood Control Act of 1936 also had as their basis the 308 reports.

Prior to passage of the Flood Control Act of 1936, there was considerable debate in Congress over the appropriate role of the Federal government and the share of the cost to be assumed by beneficiaries. Even the depression of the 1930s was insufficient to convince Congress in 1935 that flood control should be undertaken by the Federal government on a national

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[1] Ibid.

scale. Although many flood control projects were undertaken by the Federal government under work relief programs of the Roosevelt "New Deal" era, Congress failed to enact flood control legislation that had been proposed in 1935.[1]

Aside from declaring flood control to be a proper Federal activity and authorizing projects and studies, the 1936 act also is credited with requiring all water resource projects of the Corps to be evaluated by benefit-cost analysis. The phrase in Section 1 of the act which provides that the Federal government may improve streams or participate in improvements for flood control purposes "if the benefits to whomsoever they may accrue are in excess of the estimated costs" has been interpreted as meaning benefits based on an objective function of national economic efficiency.[2] The remainder of the sentence in Section 1--"and if the lives and social security of people are otherwise adversely affected"--was not used as a basis for a separate objective function. National economic efficiency became the single objective by which the water resource development projects of the Corps were formulated until the 1970s.

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[1]*U.S., Congress, Senate, Select Committee on National* Water Resources, Water Resources Activities in the United States: Floods and Flood Control, Committee Print No. 15, 86th Cong., 2d sess., p. 12.

[2]*The concept of economic efficiency on Corps projects* actually predated the Flood Control Act of 1936. The first tangible evidence of reviewing the economic merits of a project goes back to the act which created the Board of Engineers for Rivers and Harbors in 1902. See Robert H. Haveman, Water Resource Investment and the Public Interest (Nashville, TN: Vanderbilt University Press, 1965), pp. 21-22.

Section 3 of the 1936 act stipulated that for projects authorized therein, local interests should a) provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction of the project, except as otherwise provided herein; b) hold and save the United States free from damages due to the construction works; and c) maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of War.[1]

These requirements, referred to as "a-b-c" requirements of local cooperation, established the basic framework of the Federal and non-Federal responsibilities in a project for flood control to be implemented by the Corps. At that point in time, levee, reservoir, and channel improvement projects in the interest of flood control all required that local interests furnish the a-b-c requirements.

There remained considerable concern following passage of the 1936 act as to the appropriate non-Federal role in flood control projects. It was recognized that lands for reservoir projects often were required in areas not protected by the projects. Frequently, the areas to receive protection from floods were in different political jurisdictions. The difficulties encountered in requiring local interests to provide lands required for construction of a flood control reservoir

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[1]Flood Control Act of 1936.

project prompted Congress to modify the a-b-c requirements. The Flood Control Act of 1938[1] made a major change in the cost sharing policy of the 1936 act. It provided for Federal assumption of the entire cost of lands, easements, and rights-of-way, except for levee projects. Section 3 of the 1938 act also authorized the Corps to evacuate areas subject to flood in lieu of protecting them by levees or floodwalls when such action was less costly. However, little use was made of this provision for many years, as projects continued to be based on engineering solutions involving flood control structures.

The Flood Control Act of 1941[2] further revised the responsibility for providing the a-b-c requirements. Local interests were again required to provide these items of local cooperation for channel improvement or rectification projects and other local protection projects. The legislative adjustments of 1938 and 1941 can be explained by the fact that lands required for flood control reservoirs generally are not the lands that are subject to inundation, whereas quite the opposite is true in the case of local protection projects. Further, land for channel improvement and levee projects is frequently the same land. The change in local cooperation as

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[1] Flood Control Act of 1938, Pub. L. 761, 75th Cong., 52 Stat. 1215, 33 U.S.C. 701c-1.

[2] Flood Control Act of 1941, Pub. L. 228, 77th Cong.

established by the 1941 act has remained in effect to the present time.[1]

Several other provisions of the Flood Control Act of 1941 are pertinent to this study. Section 2 provided that authorization for any flood control project shall expire unless local cooperation is furnished within five years after notification. This provision was included in subsequent flood control acts as well. Until 1974, it was the only generic legislation which could result in deauthorization of an authorized, but not yet constructed, project that was no longer desired. Section 5 authorized an emergency fund to be used for flood emergency preparation, flood fighting, and repair and restoration of flood control works. This section formed the basis for the Corps nationwide flood emergency authority enacted into law in 1955.[2] Section 7 of the 1941 act provided that 25 percent of the money received from leasing of reservoir lands be paid to the state for schools and roads. This amount was subsequently amended to 75 percent by Public Law 780, 83d Congress.

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[1]Attempts were made during 1978-1980 to change cost sharing arrangements by including such changes in individual project reports to be transmitted to Congress for authorization. No such reports were authorized by Congress. Changes proposed in legislation introduced during the first session of the 98th Congress also have not been enacted.

[2]Emergency Flood Control Funds Act, Pub. L. 99, 84th Cong., 64 Stat. 183, 33 U.S.C. 701n.

Most of the flood control projects authorized between 1936 and 1941 were in direct response to very serious flooding problems; those implemented were consistent with the ideological philosophy of the New Deal. This philosophy generally favored public works jobs for the unemployed, Federal water power development, aid to depressed or undeveloped rural areas and to agriculture generally, and economic and natural resource planning.[1]

The emergence of comprehensive programs

Public Law 534, 78th Congress, the Flood Control Act of 1944,[2] expressed the congressional intent that projects were to be considered "on a basis of comprehensive and coordinated development." The rights and interests of the states in water development and the requirement for Federal consultation and coordination with affected states were recognized. The act was a major step away from single-purpose development and toward a concept of comprehensive programs for the development, use, and conservation of the resources of major river basins.[3]

Several other important policies expressed in the 1944 act are indicative of the comprehensiveness of the Federal role in water resource development. Key provisions are summarized as follows:

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[1]Holmes, History, p. 23.

[2]Flood Control Act of 1944, Pub. L. 534, 78th Cong., 58 Stat. 887, 33 U.S.C. 701-1.

[3]U.S., Congress, Senate, Floods and Flood Control, p. 13.

1. Section 1 declared it the policy of Congress to recognize rights and interests of the states in water resource development and the requirement for consultation and coordination with affected states. It also called for coordination with the Department of Interior in cases involving water rising west of the 97th meridian.

2. Section 2 defined major drainage as flood control, a further broadening of the Federal role.

3. Sections 4, 5, 6, and 8 were the basis for multiple-purpose rather than single-purpose reservoirs. Section 4 authorized the Corps to provide facilities in reservoir areas for public use including recreation and conservation of fish and wildlife and to permit others to do so. Section 5 provided for disposal by the Secretary of the Interior of surplus electric power from Corps projects. Section 6 authorized disposal by the Secretary of War, for domestic and industrial uses, of surplus water available at reservoirs. Section 8 provided that Corps reservoirs may include storage for irrigation purposes in the seventeen western states.[1]

4. Section 7 directed the Secretary of War to prescribe regulations governing the operation of storage allocated to flood control or navigation in all reservoirs constructed wholly or in part with Federal funds.[2]

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[1]U.S., Department of the Army, Office of the Chief of Engineers, Digest of Water Resources Policies and Authorities, EP 1165-2-1, March 27, 1981, p. 25-9.

[2]Reservoirs of TVA were to be regulated by the War Department only in case of danger from floods on the lower Ohio and Mississippi Rivers.

Benefits of multiple-purpose reservoirs

By and large, most Corps reservoir projects for flood control are multiple-purpose projects. Legislation permitting the inclusion of quantifiable economic benefits for other purposes was necessary before such benefits were included in the economic analysis used to justify the project. The specific laws which permitted the inclusion of other purposes are summarized as follows:[1]

1. Hydroelectric Power: Section 5 of Public Law 534, 78th Congress, the Flood Control Act of 1944, and subsequent acts authorized the marketing of Corps-produced power, surplus to project needs, to be marketed so as to encourage the most widespread use at the lowest possible rates to consumers, consistent with sound business principles.

2. Municipal and Industrial Water Supply: Section 301 of Public Law 85-500, the Water Supply Act of 1958, provided that storage may be included for present and future municipal or industrial water supply in Corps or Bureau of Reclamation projects. The legislation calls for costs plus interest allocated to such storage to be repaid by non-Federal entities within the life of the project.

3. Water Quality Storage: Section 2 of Public Law 87-88, the Federal Water Pollution Control Act Amendments of 1961, amended existing law to include the consideration of storage in Federal projects for water quality control.

4. Recreation: Public Law 89-72, the Federal Water Project Recreation Act of 1965, required consideration of opportunities for outdoor recreation and fish and wildlife enhancement in planning water resource projects. The act provided that if non-Federal interests agree in writing to pay

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[1]Frequently flood control is not the major benefit of a multiple-purpose reservoir constructed by the Corps. Water supply, hydroelectric power, water quality control, and recreation have had larger benefits (on a percentage basis) than flood control. However, except in rare instances, the Corps has not been authorized to construct single-purpose water supply, water quality control, or recreation projects.

one-half of the separable first cost and to operate and maintain the facilities at their expense, the benefits of recreation and fish and wildlife and their costs should be included in the benefit-cost analysis.[1]

Non-structural measures[2]

A recognition of the inefficiency and impracticality of controlling all flooding by structural solutions and the recognition that the use and development of flood plains had increased led to enactment of legislation and executive orders during the 1960s which were designed to complement the protection offered by flood control structures.[3] Several of the major legislative provisions and executive orders are summarized as follows:

1. Section 206 of the Flood Control Act of 1960[4] authorized the Corps to provide information, technical planning assistance, and guidance upon request to Federal and non-Federal entities in identifying the magnitude and extent of the flood hazard and in planning wise use of the flood plains.

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[1]Public Law 89-72, the Federal Water Project Recreation Act of 1965, made recreation a cost-shared project purpose and permitted inclusion of benefits during project formulation. Projects authorized prior to enactment of Public Law 89-72 were considered to be "grandfathered." This means that recreation facilities included pursuant to Section 4 of the Flood Control Act of 1944 were paid for entirely by the Federal government.

[2]Types of non-structural measures are described in Chapter I.

[3]As indicated earlier, Section 3 of the 1938 Flood Control Act authorized non-structural measures in the form of evacuation of areas subject to flooding in lieu of protecting them by levees or floodwalls. However, little use was made of this provision.

[4]Flood Control Act of 1960, Pub. L. 86-645, 74 Stat. 480, 500, as amended, 33 U.S.C. 709a.

This program is known as the Flood Plain Management Services (FPMS) program. Although annual expenditures for the program are limited by law, its widespread use in responding to local needs for information and engineering advice for their use in planning to ameliorate the flood hazard has exceeded the expectations of the supporters of the legislation establishing the program.[1]

2. Executive Order No. 11296[2] required Federal agencies to evaluate flood hazards in connection with grants, loans, or mortgage insurance for buildings, structures, roads, or other facilities in order to minimize future flood damages, or Federal expenditures for flood protection and disaster relief. This executive order was an early attempt to use the Federal purse string as a means of influencing decisions on land use planning--normally not considered a Federal responsibility.

3. The National Flood Insurance Act of 1968[3] authorized the Federal Insurance Administration of the U.S. Department of Housing and Urban Development to make available, through the insurance industry, subsidized flood insurance for any properties that are in existence at the time the administration delineates the flood hazard area in which they are located. Properties built subsequently were required to pay "actuarial" rates, i.e., rates high enough to cover the average loss that might be expected over a long period of time.[4] The act also provided means for necessary coordination between agencies and states as required for studies pertaining to land management and zoning.

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[1]U.S., National Water Commission, Water Policies for the Future (Washington, DC: Government Printing Office, 1973), p. 155.

[2]U.S., President, Executive Order 11296, "Evaluation of Flood Hazard in Locating Federally Owned or Financed Buildings, Roads and Other Facilities and in Disposing of Federal Lands and Properties," Federal Register, Vol. 31, No.155, 10663-64, August 11, 1966.

[3]National Flood Insurance Act of 1968, Pub. L. 90-448, 82 Stat. 476, 572, 42 U.S.C. 4001 et. seq.

[4]U. S., National Water Commission, Water Policies for the Future, p. 153.

Summary of Federal Role Prior to NEPA

In order to set the stage for the changes in policy of the 1970-1983 period, this section of Chapter II is concluded with a statement on the Federal role in water resource development in the 1960s. While Federal roles generally are expressed in broad terms, and as such have endured for many years, actual changes in policy, or attempted changes, discussed in the next section of this chapter appear to have reduced the importance and perhaps the continued validity of some of these roles.

According to Corps policy in 1964, the general intent of Congress, as indicated by the body of Federal water resources legislation, included furthering commerce and the general welfare by delineating the Federal roles in:

1. Undertaking only that which local levels of government or private enterprise cannot do as readily or as well from the standpoint of the national interest.

2. Bearing a part of the costs of projects and programs that benefit the nation as a whole, or are necessary to protect the interest of future generations.

3. Providing for the mitigation of any damaging effects of Federal projects, or carrying out measures to compensate for such effects.

4. Providing services which normally would be provided by private enterprise or non-Federal public entities when long-range financial returns are not sufficiently attractive in the short-range view of private enterprise, or when costs are included for purposes not readily marketable, or other problems of comprehensive and coordinated development cannot be readily resolved below the Federal level.

5. Constructing certain works for which local interests will be willing to pay, or may provide subsidies, as by permitting repayment at low Federal interest rates.

6. Developing comprehensive plans embracing even those purposes for which a high degree of responsibility remains with non-Federal entities.[1]

The degree of Corps responsibility for the many aspects of water resource conservation, development, and use varies considerably according to project purpose and function.[2] A review of legislation, policies and budgets of the Corps during the late 1960s reveals the tendency toward broader application of Federal involvement in water resource development.[3] In constant dollars, civil works appropriations for Corps con-

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[1]U.S., Department of the Army, Engineer Regulation 1165-2-1: The Federal Role in Water Resources Development (Washington, DC, 9 November 1964). Despite significant changes in law and policies since 1964, this regulation is still in effect. However, the regulation makes it clear that all purposes do not warrant equal or maximum Federal participation.

[2]Purpose in this sense denotes navigation, flood control, water supply, water quality control, hydroelectric power, recreation, etc., whereas function denotes planning, designing, constructing, operating, maintaining, and financing.

[3]Examples of broader application of Federal involvement in the 1960s include numerous reservoir projects authorized with water quality control benefits and the adding of water quality control benefits to projects authorized prior to enactment of the Federal Water Pollution Control Act Amendments of 1961 (Public Law 87-88). Other examples include recreation as a project purpose for which benefits could be claimed following the enactment of the Federal Water Project Recreation Act (Public Law 89-72). Perhaps the most dramatic switch in the use of existing legislation was the discontinuance of the use of Section 6 of the River and Harbor Act of 1909. During the 1950s and 1960s liberal use was made of this legislation which permitted the Secretary of the Army to authorize replacement locks and dams on the inland waterways. Section 6 was used to replace locks to modern tow sizes and standards until its use was questioned in the courts in the case of Lock and Dam 26 on the Mississippi River. Prior to that time, it had

struction activities peaked in Fiscal Year 1967.[1] In summary, conditions were favorable in the mid to late 1960s for the implementation of Corps projects.

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been used extensively by the Secretary of the Army, most prominently to auhorize the modernization of the Ohio River locks and dams in the 1950s and 1960s.

[1]An analysis of Corps appropriations for the past eighteen years in 1965 dollars indicates that Fiscal Year 1967 was the peak year for civil works construction. However, overall Corps budgets increased during the 1970s as more projects were completed and were operated and maintained by the Corps (and as a result of the impact of inflation).

Flood Damage Prevention and Related Legislation, Programs, and Policies in the Post-NEPA Era

General Setting

At the time of enactment of the National Environmental Policy Act (NEPA) of 1969, flood damage prevention projects, consisting primarily of structural measures, continued to be the major focus of the Corps. A substantial number of multiple-purpose reservoirs had been authorized, designed, and constructed in the post-World War II era. When NEPA was enacted into law, the Corps budget included funds for construction of over eighty flood control reservoirs. The decade of the 1970s, however, witnessed a sharp decline in the number of new flood control reservoirs authorized and on which construction would be undertaken.[1]

Legislation enacted in the 1970s tended to place less of an emphasis on structural solutions to flooding or potential flooding and urged equal consideration of non-structural solutions, without having the Federal government directly responsible for land use planning. The legislation of the 1970s indicated a sensitivity and concern for the natural environment,

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[1]A comparison of the Corps budget for Fiscal Year 1982 vs. Fiscal Year 1972 reveals that the number of flood control reservoirs budgeted for construction had declined by about 50 percent in that decade. Further, of the flood control reservoirs included in the Fiscal Year 1982 construction budget, only twelve were started in the 1970s and only one project, Arcadia Lake, Oklahoma, had been authorized in the 1970s. The remainder had been authorized between 1937 and 1968.

social well-being, and regional development rather than just national economic development. The concern of many over the deterioration of the natural environment and the exhaustion of natural resources contributed to the enactment of environmental legislation which severely curtailed the Corps programs in the 1970s. On the one hand, the legislation required a more open planning forum with increased input from the public and greater sensitivity to differing viewpoints. On the other hand, the implementation of NEPA and other environmental legislation precluded or delayed the authorization and construction of certain projects on environmentally related issues and by the evolvement of more complex and time-consuming planning procedures.

During the 1970s, numerous laws were enacted which were designed to 1) protect the environment, 2) broaden planning objectives, and 3) enlarge types of solutions considered. A number had a significant impact on the flood damage prevention policies and programs of the Corps and are pertinent to the analysis of program outcomes and the evaluation of the findings, as presented in Chapters V and VI, which illuminate several of the research questions. The types of impacts these changes could have occasioned include:

1. Lengthening the planning process and making it more difficult for projects to be authorized and implemented.

2. Changing the Corps organizational structure.

3. Increasing emphasis on non-structural solutions.

4. Increasing environmental sensitivity.

Environmental legislation

Several major environmental statutes that had a bearing on the planning and implementation of Corps flood damage prevention projects were:

1. Public Law 91-190, the National Environmental Policy Act of 1969: This act declared that all agencies of the Federal government shall include in every recommendation for Federal actions significantly affecting the quality of human environment a detailed statement on:

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented.

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.[1]

The act further stipulated that prior to making any detailed environmental statement the responsible Federal official "shall consult with and obtain the comments of, any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved." Two other provisions of the act are of significance to this research. Section 102(A) calls on all Federal agencies to:

> utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment.[2]

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[1]U.S., Congress, National Environmental Policy Act of 1969, Pub. L. 91-190, 83 Stat. 852, 42 U.S.C. 4331.

[2]Ibid., 83 Stat. 853.

Title II of the act created the Council on Environmental Quality (CEQ) to review environmental impact statements and to be an advisor to the President on environmental matters. CEQ can be extremely persuasive, since it enjoys access to the Office of Management and Budget and the President and has had a demonstrated influence on terminating or stopping water projects.

NEPA had a number of immediate as well as long-range impacts on the Corps flood damage prevention program. Several are mentioned without attempting to analyze or evaluate the resultant impacts on program outcomes. The requirement to prepare a draft and final environmental impact statement lengthened the planning process but conversely made the Corps more sensitive to environmental concerns.[1] The cost to plan, design, and construct a project increased, but solutions reflected considerably greater input from the public. The Corps program for public participation was enhanced and the number of environmental specialists on Corps staffs increased almost eightfold during the eight-year period between 1969 and 1977.[2] The focus on non-structural solutions to flooding also increased.

2. Section 309 of the Clean Air Act Amendments of 1970:[3] This section provided that the Environmental Protection Agency (EPA) should review environmental impact statements (EIS) prepared by other agencies and that written comments on the statements should be made public. EPA developed a rating system for their evaluation of impact statements of other agencies to reflect an assessment of the environmental impact of the proposed action on the environment

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[1]For a thorough discussion of the Corps response to NEPA, see Daniel A. Mazmanian and Jeanne Nienaber, Can Organizations Change? Environmental Protection, Citizen Participation and the Corps of Engineers (Washington, DC: The Brookings Institution, 1979).

[2]Ibid., p. 59.

[3]Clean Air Act Amendments of 1970, Pub. L. 91-604, 84 Stat. 1709, 42 U.S.C. 1857h-7.

and to score the adequacy of the statement. The rating and evaluation were generally printed in the Federal Register.[1]

3. Section 102(b) of The Federal Water Pollution Control Act Amendments of 1972: This law was enacted on October 18, 1972, with the objective of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. The act declared it a national goal to eliminate the discharge of pollutants into navigable waters by 1985. This act also established the massive EPA waste treatment grant program. Of particular interest to the Corps in its planning of flood control reservoirs was Section 102(b) of the act, which stated in part that in the planning of any reservoir by a Federal agency, the inclusion of storage shall not be provided as a substitute for adequate treatment or other methods of controlling waste at the source. Section 102(b) went on to permit EPA to determine the need for, value of, and impact of storage for water quality control. This provision of the act has been used by EPA as a virtual veto on Corps projects which otherwise would have included storage for water quality purposes.[2] As a result, multiple-purpose reservoirs for flood control, which did not have initial construction funds appropriated as of 18 October 1972, were formulated without water quality control benefits.[3]

4. Public Law 93-205, the Conservation, Protection and Propagation of Endangered Species Act, and Public Law 95-632, the Endangered Species Act Amendments of 1978:[4] These acts

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[1]The assessment of environmental impact ranged from "LO"--lack of objection, to "EU"--environmentally unsatisfactory. The adequacy of the impact statement ranged from "1"--adequate, to "3"--inadequate.

[2]Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500, 86 Stat. 817, 33 U.S.C. 1251.

[3]The date of October 18, 1972, is the date of enactment of Public Law 92-500. As a reult of an opinion handed down by the Fourth Circuit Court of Appeals on September 18, 1973, in Cape Henry Bird Club and Conservation Council of Virginia, Inc., National Wildlife Federation, Inc., et. al. v. Melvin R. Laird, Secretary of Defense of the United States of America, et al., No. 73-16056 and 73-1607, projects that had received construction funds prior to October 18, 1972, were permitted to continue to include water quality control benefits in the calculation of project benefits.

[4]The Conservation, Protection and Propagation of Endangered Species Act, Pub. L. 93-205, 87 Stat. 884; The Endangered Species Act Amendments of 1978, Pub. L. 95-632, 92 Stat. 3752.

direct Federal agencies to carry out programs to conserve endangered and threatened species and to preserve the habitat of such species. Although the 1978 amendments prescribed a procedure for determining whether exemptions for certain provisions of the act should be granted, the act was used by opponents of Corps projects as a legislative basis for delaying or terminating projects. Reservoir projects, which convert free-flowing streams to lakes and which inundate thousands of acres of land, were most susceptible to delay.

5. Section 404 of Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, and Section 67 of Public Law 95-217, the Clean Water Act of 1977.[1] Section 404 of Public Law 92-500 required the issuance of permits by the Corps after notice and opportunity for public hearings in cases involving the discharge of dredged or fill material into navigable waters. In an effort to reach a decision on issuance of a permit, a public interest review was undertaken by a district engineer. This review was geared toward avoiding actions which would have significant adverse impact on water quality and which would destroy wetlands without offsetting favorable benefits. Since flood control projects frequently involve the discharge of fill material into navigable streams as in the case of a dam or levee, Corps district offices were required to undertake a Section 404 evaluation as part of preconstruction planning. The evaluation could be completed by the district engineer signing a Section 404 evaluation report and filing it in the district office.

The Clean Water Act of 1977 modified Section 404 by prohibiting the discharge of dredged or fill material unless one of the following two conditions were met:

1. Information on the effect of the discharge of dredged or fill material is included in an environmental impact statement (EIS), and the EIS is submitted to Congress before the actual discharge and prior to either authorization of the project or an appropriation of funds for construction.

2. The district engineer obtains from the state a water quality certificate.[2]

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[1]Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500, 86 Stat. 884; Clean Water Act of 1977, Pub. L. 95-217.

[2]Clean Water Act of 1977, Pub. L. 95-217, 91 Stat. 1566.

Following enactment of the Clean Water Act of 1977, the time required to comply with Section 404 on Corps projects was significantly increased, particularly if the EIS was controversial or the state was reluctant to issue a water quality certificate.

Broadening planning objectives

Two sections of Public Law 91-611 indicated congressional intent for the Corps to broaden its planning perspective. These provisions are:

1. Section 122 of the River and Harbor Act of 1970. This section of Public Law 91-611 provided that:

> Not later than July 1, 1972, the Secretary of the Army, acting through the Chief of Engineers, after consultation with appropriate Federal and State officials, shall submit to Congress, and not later than ninety days after submission, promulgate guidelines designed to assure that possible adverse economic, social, and environmental effects relating to any proposed project have been fully considered in developing such project, and that the final decisions on the project are made in the best overall public interest, taking into consideration the need for flood control, navigation, and associated purposes, and the cost of eliminating or minimizing such adverse effects and the following:
>
> (1) Air, noise, and water pollution;
>
> (2) Destruction or disruption of man-made and natural resources, aesthetic values, community cohesion and the availability of public facilities and services;
>
> (3) Adverse employment effects and tax and property value losses;
>
> (4) Injurious displacement of people, businesses and farms; and
>
> (5) Disruption of desirable community and regional growth.

> Such guidelines shall apply to all projects authorized in this Act, and proposed projects after the issuance of such guidelines.[1]

Section 122 guidelines were issued and became an inherent part of the Corps planning process.

2. Section 209 of the Flood Control Act of 1970. This section of Public Law 91-611 established four objectives of Federally financed water resource projects. It states:

> It is the intent of Congress that the objectives of enhancing regional economic development, the quality of the total environment, including its protection and improvement, the well-being of the people of the United States, and the national economic development are the objectives to be included in federally financed water resource projects, and in the evaluation of benefits and cost attributable thereto, giving due consideration to the most feasible alternative means of accomplishing these objectives.[2]

Section 209 established in law the congressional view that benefits and costs of Federally financed water resource projects should be based on the four objectives of regional economic development, environmental quality, social well-being, and national economic development. These objectives were included in subsequent principles and standards for water resource planning promulgated by the Water Resources Council. However, the difficulty in quantifying non-economic benefits and the continued use of traditional benefit-cost analysis as the basis for justifying projects resulted in the Corps considering the four objectives, but using only national economic development to justify projects.

Legislation and policy documents pertaining to non-structural measures

In addition to the emphasis on non-structural alternatives implied by NEPA, other more specific legislation, execu-

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[1]River and Harbor Act of 1970, Pub. L. 91-611, 48 Stat 1246, 12 U.S.C. 1701.

[2]Flood Control Act of 1970, Pub. L. 91-611.

tive orders, and policy statements enhanced the status of non-structural solutions and the sensitivity to flood plain management within the Corps planning process.[1]

A summary of key legislation and executive orders emphasizing non-structural solutions follows:

1. Flood Disaster Protection Act of 1973: This act strengthened the National Flood Insurance Act of 1968 by requiring that flood insurance be purchased and adequate flood plain ordinances be adopted in connection with receiving any form of Federal financial assistance for acquisition or construction purposes in any area that has been identified as having special flood hazards. Communities identified by the Director of the Federal Emergency Management Agency as flood-prone communities have a one-year period in which to enroll in the National Flood Insurance Program or thereafter be denied direct Federal financial assistance for acquisition or construction purposes in identified flood hazard areas.[2]

2. Section 73 of the Water Resource Development Act of 1974: This section of Public Law 93-251 requires that consideration be given to non-structural alternatives in the planning or design of flood protection projects. The intent of Section 73 is for the Corps to formulate "the most economically, socially and environmentally acceptable means of reducing or preventing flood damages." Non-Federal participation was limited to lands, easements, and rights-of-way as required for structural protection, but in no event more than 20 percent of project costs.[3]

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[1]In addition, numerous Corps Engineer Regulations were issued containing implementing instructions. These included ER 1120-2-117 (August 17, 1970), Alternatives in Flood-Related Planning; ER 1105-2-351 (June 13, 1975), Evaluation of Beneficial Contributions to NED for Floodplain Management Plans; ER 1105-2-200 (November 10, 1975), Multi-objective Planning Framework; and ER 1165-2-26 (May 15, 1979), Implementation of EO 11988 on Floodplain Management. All but ER 1165-2-26 have since been rescinded.

[2]Flood Disaster Protection Act of 1973, Pub. L. 93-234, 87 Stat. 975, 42 U.S.C. 4001.

[3]Water Resource Development Act of 1974, Pub. L. 93-251, 49 Stat. 1571; 50 Stat. 877, 33 U.S.C. 701(c).

3. Executive Order 11988, Flood Plain Management: This executive order requires each Federal agency to take into account, when formulating a water resource project, the degree of hazard involved and to consider alternatives to avoid adverse effects and incompatible development in the flood plains.[1]

4. Executive Order 11990, Protection of Wetlands: This executive order exhorts Federal agencies to minimize the destruction, loss, or degradation of wetlands in conducting water and related land resources activities.[2]

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[1]U.S., President, Executive Order 11988, "Flood Plain Management," May 24, 1977.

[2]U.S., President, Executive Order 11990, "Protection of Wetlands," May 24, 1977.

Summary of Major Trends

Figure 3 represents the major Federal water resource trends in the United States. The shape of the curve reflects an increasing complexity and rapidity of change in recent years. Increased complexities result *from* legislation, policies, and increased public participation which frequently reflect the competing objectives prevalent in water resource development. Flood damage prevention activities at the Federal level are illustrative of these changes. Each successive theme did not eliminate or completely supplant prior themes. Rather, the result was a significant change in program orientation.

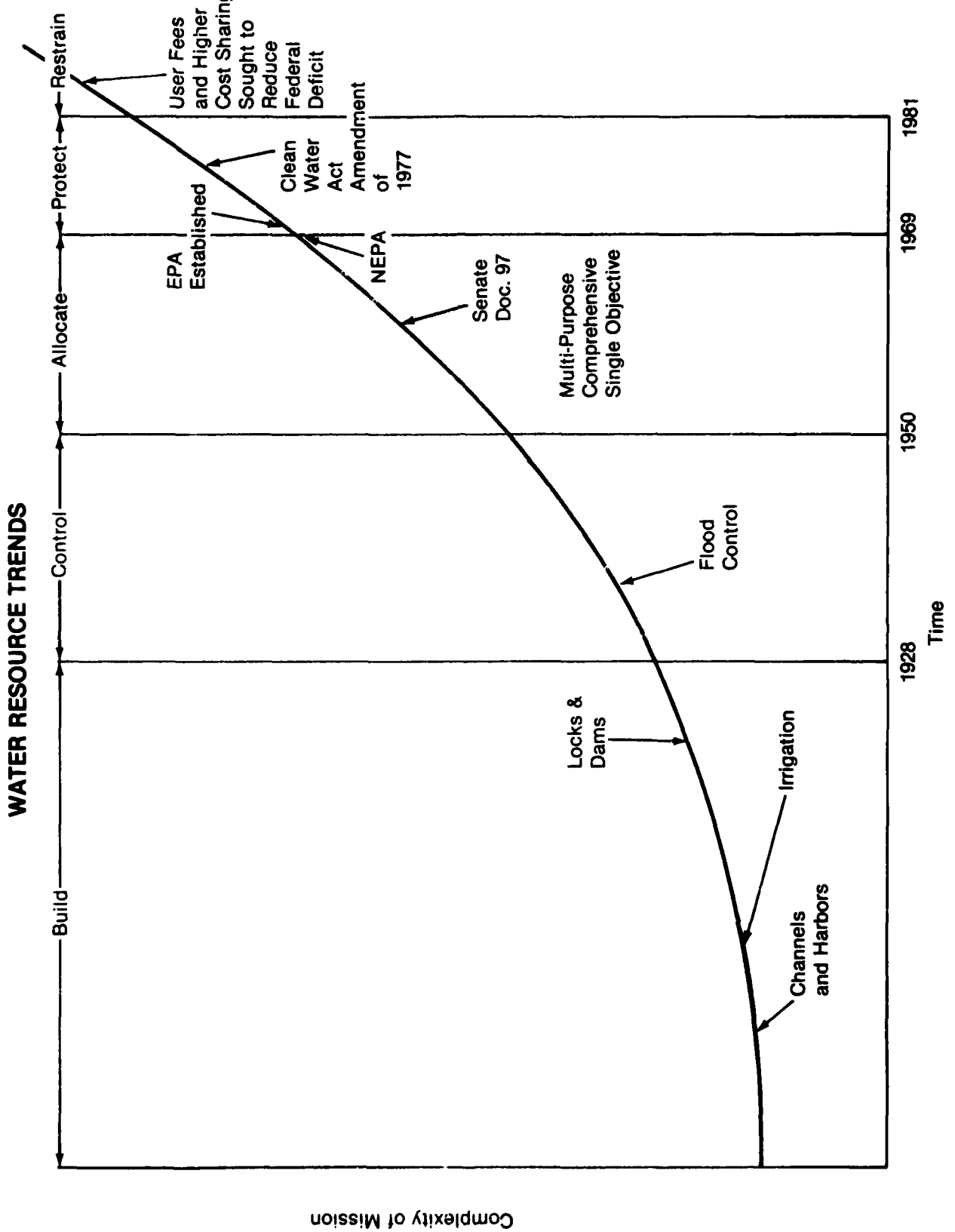
In summary, the eras shown in Figure 3 highlight the dominant theme of the successive periods of time. These themes are restated below in Table 2.

TABLE 2

MAJOR CORPS OF ENGINEERS WATER RESOURCE TRENDS

Pre-NEPA		Post-NEPA	
Period	Major Theme	Period	Major Theme
Prior to 1928	Build	1970-1981	Protect
1928-1950	Control	1981 to Present	Restrain
1950-1969	Allocate		

FIGURE 3


WATER RESOURCE TRENDS
Build
Control
Allocate
Protect
Restrain
1928
1950
1969
1981
Time
Complexity of Mission
Channels and Harbors
Irrigation
Locks & Dams
Flood Control
Multi-Purpose Comprehensive Single Objective
Senate Doc. 97
NEPA
EPA Established
Clean Water Act Amendment of 1977
User Fees and Higher Cost Sharing Sought to Reduce Federal Deficit

Prior to 1928: Build

Prior to the Flood Control Act of 1928, Federal involvement in water resource development focused on the national objective of building the nation. The major roles were navigation improvements, commencing in the nineteenth century, and irrigation in the western states, commencing in 1902. Flood control was not considered a Federal responsibility until 1917 for the lower Mississippi River basin and not until 1936 nationwide.

In early American history, water transportation was the major means of transporting bulk cargo as well as people. To this day, navigable waterways remain a major means of commercial transportation. The opening of the west, the transportation of agricultural and mineral products, and the importing and exporting of goods all have been enhanced by navigation improvements. These improvements included altering the natural flow of rivers by constructing locks and dams or dredging deeper harbors. Building was the main theme in the interest of economic growth.

1928-1950: Control

The major floods in the 1920s and 1930s, and the inability of state and local governments to cope with the problems, led to Federal involvement on a broad scale.[1] Control of rampaging rivers became a major Federal concern, as reflected in the House of Representatives committee report on the Flood Control Act of 1936:

> With the onward march of civilization, the natural reservoirs provided by nature were destroyed. The traditional American attitude toward land has been to develop and exploit it as quickly as possible with little regard for the consequences. This, to be sure, was the natural reaction of a new Nation against the economic restraints of the Old World, and confronted with apparently inexhaustible resources. This procedure has contributed to rapid development and expansion, but at the same time it has been a planless course and one which eventually, if not corrected, will lead to the destruction of one of our Government's most valuable sources of income.[2]

The response to the massive flooding of the 1930s was one of controlling floods by the construction of dams, levees, floodwalls, and channel improvements. It was in response to the nation's "planless course." The emphasis had been on econ-

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[1]The Flood Control Act of 1936 established that flood control on navigable waters or their tributaries is in the interest of the general welfare and is therefore a proper activity of the Federal government in cooperation with the states and local entities. See U.S., Department of the Army, Office of the Chief of Engineers, Engineer Pamphlet 1165-2-1: Digest of Water Resources Policies and Authorities (Washington, DC, 1981), p. 12-1.

[2]U.S., Congress, House, Construction of Certain Public Works on Rivers and Harbors for Flood Control, House of Representatives, H. Rept. 74-1223, 1st sess., 1935, p. 2.

omic growth. America had resources which were abundant and unexploited. Almost any citizen desiring good farming land was given 160 acres. No difficult trade-offs had to be resolved between opposing social interests. The abundance of renewable and non-renewable resources resulted in virtually no social problems limiting physical growth. In fact, growth was the favored solution to social problems.[1]

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[1]Donella H. Meadows and others, "A Response to Sussex," in H.S.D. Cole and others, eds., Models of Doom: A Critique of the Limits to Growth (New York: University Books, 1973), p. 228.

1950-1970: Allocate

The Flood Control Act of 1950 authorized the development of a comprehensive, integrated plan for several river basins and the inventory of resources in others. This action indicated that Congress seriously intended to implement the achievement of comprehensive and coordinated development cited in the Flood Control Act of 1944.

Subsequent acts in the 1950s and 1960s provided the basis for the inclusion of storage for various project purposes, the allocation of costs to these purposes, and the quantification of benefits for these purposes in the calculation of the benefit-cost ratio. A number of policy documents issued during the 1950s and 1960s were indicative of the multiple-purpose and comprehensive policy of Federal water resource development. In 1956, a presidential advisory committee on water resources policy recommended that a policy relating to water

> must look toward an adequate water supply for our people, prevent waste of water, provide for a greater reuse of water, reduce water pollution to the lowest practicable level, provide means for the useful and equitable distribution of available water supply, and take steps to check the destructive forces of water which threaten to injure or destroy land, property and human life.[1]

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[1]Presidental Advisory Committee on Water Resources Policy, Water Resources Policy (Washington, DC: Government Printing Office, 1956), p. 1.

In 1962, President Kennedy approved a statement establishing executive policies, standards, and procedures for uniform application by Federal agencies involved in water resource planning. Multiple-purpose, comprehensive planning is stressed throughout the document.[1] This policy document, commonly called Senate Document Number 97, cites development, preservation, and well-being of all of the people as the overriding determinant in considering the best use of water and related land resources.[2]

The result of a philosophy centered on comprehensive, multiple-purpose planning was the authorization and initiation of construction during the 1950s and 1960s of numerous reservoir projects providing flood damage prevention benefits and other water resource benefits. Legislation, previously described, which permitted the inclusion of reservoir storage for project purposes other than flood damage prevention provided the economic justification of projects where flood damage prevention alone resulted in benefit-cost ratios of less than unity.

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[1]U.S., Congress, Senate, Policies, Standards and Procedures in the Formulation, Evaluation and Review of Plans for Use and Development of Water and Related Land Resources, prepared under the direction of the President's Water Resource Council, S. Doc. 97, 87th Cong., 2d sess., 1962.

[2]Ibid., p. 2. The well-being of all of the people was further defined as concern for hardship and basic needs of particular groups within the general public, but avoidance of resource use and development for the benefit of a few or the disadvantage of many.

1970-1981: Protect

The passage of the National Environmental Policy Act of 1969, on January 1, 1970, was the culmination of years of effort toward obtaining legislation which would place the objective of environmental quality on an equal plane with other planning objectives. This act, and other environmental legislation and policy documents previously discussed, established a framework for the major theme of environmental protection in the 1970s. In 1970, the Environmental Protection Agency was created with the mission of protecting the health and welfare of the American people by controlling pollution hazards.

1981-Present: Restrain

Since the Reagan administration has taken office, a perceptive shift in water resources policy has taken place.[1] The shift has been toward higher user fees and cost sharing, greater emphasis on maximizing net economic development benefits, and increased budget emphasis on maintaining existing facilities as opposed to the construction of new projects.[2] Thus far, there has been a reluctance on the part of Congress to concur in cost-sharing proposals of the Reagan administration or to enact into law any increase in non-Federal financing requirements. However, the following concepts or observations which have relevance to the Corps flood damage prevention program are receiving widespread support:

1. The annual Federal budget deficit needs to be reduced.

2. Discretionary spending, such as the Corps water resource program, is considered a prime candidate for budget cuts.

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[1]This shift is not based on enacted legislation. Rather, it is reflected in proposed legislation introduced in the 97th and 98th Congresses, budget requests, executive orders, and other documents which stress user fees, a higher percentage of non-Federal contributions, and up-front financing by non-Federal sponsers. The central theme of these proposals is viewed as fiscal restraint in the use of Federal funds to finance water resource development projects.

[2]Legislation has been introduced to recover Corps expenditures for Federally operated and maintained projects but not the cost of operating and maintaining flood damage prevention projects. Thus, while the operation and maintenance budget of the Corps continues to grow, serious attempts are being made to enact legislation which would reduce the Federal funding requirements for such work.

3. Direct beneficiaries should pay a greater share of Federal programs, even when the programs produce public goods rather than vendible outputs.

4. The nation's infrastructure is in need of repair.

The five-cent Federal tax on fuel, which went into effect on April 1, 1983, is an example of a situation which is compatible with these concepts and observations. The tax is paid by users of highways, the direct beneficiaries, and will help to pay for repair of highways and bridges. The amount of direct Federal aid will be reduced, while increased funds will be available for infrastructure repair without adverse impact on budget deficits. The same concept has been considered in varying degrees for different types of projects which are under the jurisdiction of the Corps of Engineers. Most notable has been the inland waterway fuel tax enacted in 1978[1] and proposed legislation introduced in the 97th and 98th Congresses to recover a major percentage of capital as well as operation and maintenance costs.[2] With respect to flood damage prevention projects, no attempt has been made to date to recover Federal operation and maintenance costs from beneficiaries. The non-Federal share of the cost of new flood damage prevention projects has remained essentially the same since the 1930s. While legislation increasing the non-Federal share has not been

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[1] Inland Waterways Revenue Act of 1978, Pub. L. 95-502, 26 U.S.C. 4042.

[2] Introduced as S. 810, 97th Cong., 1st sess, 1981, and S. 1554, 98th Cong., 1st sess., 1983.

enacted, there is evidence of a move in Congress toward increased cost sharing.[1]

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[1]Most recently, provisions are included in U.S. Congress, House, A Bill to Provide for the Conservation and Development of Water and Related Resources and the Improvement and Rehabilitation of Nation's Water Resources Infrastructure, H.R. 3678, 98th Cong, 1st sess., 1983; and U.S. Congress, Senate, A Bill to Authorize the U.S. Army Corps of Engineers to Construct Various Projects for Improvements to Rivers and Harbors of the United States, and For Other Purposes, S. 1739, 98th Cong., 1st sess., 1983.

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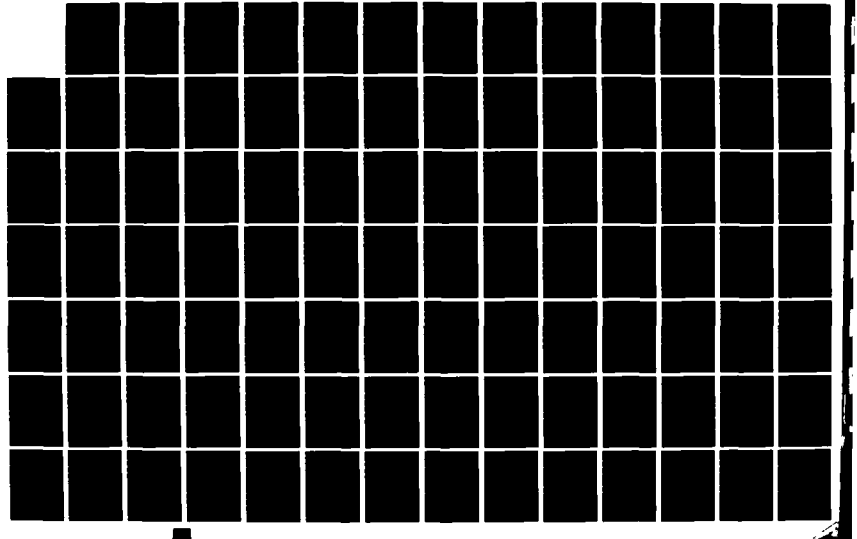
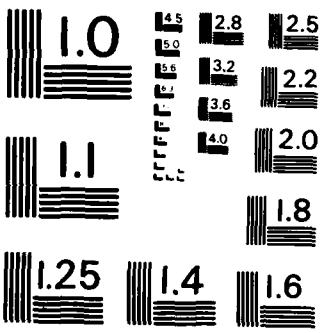




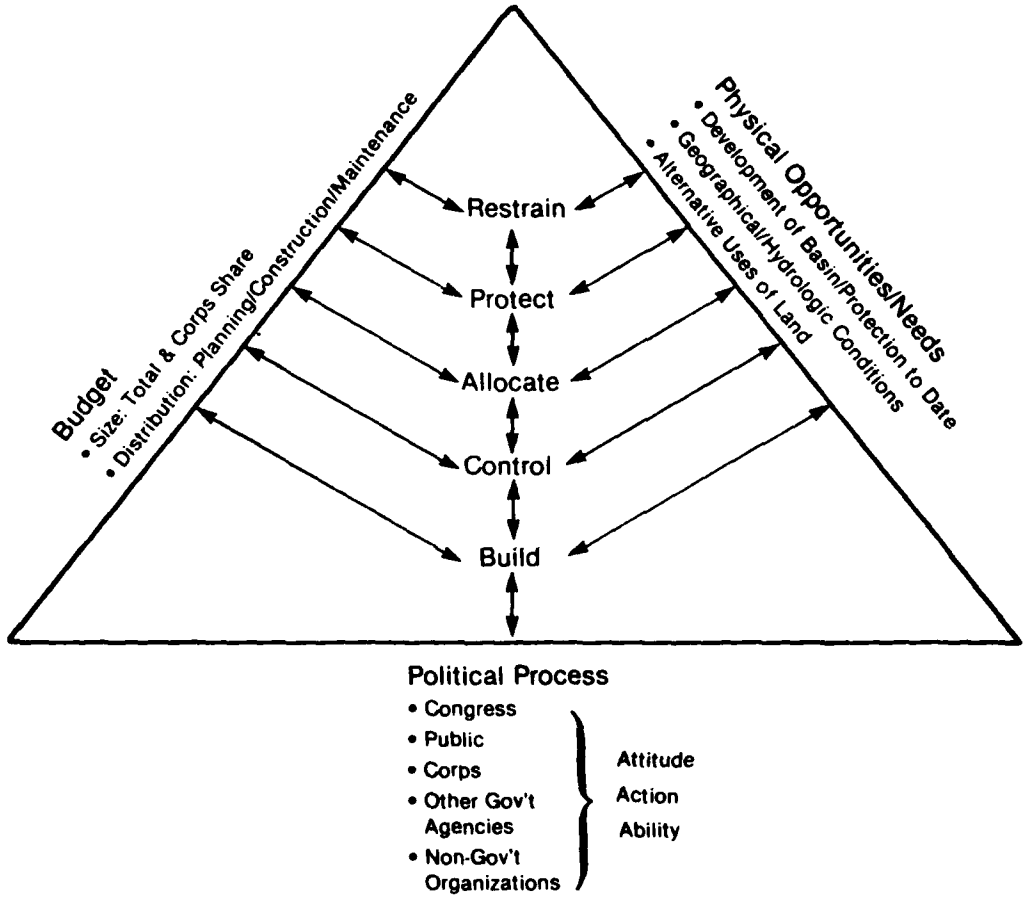
Size and Geographical Distribution of the Corps Flood Damage Prevention Program

The water resource trends of the different periods of American history have been the result of forces which go well beyond the scope of this research. However, at any point in time, three major factors have served to shape the size and geographical distribution of the Corps flood damage prevention program. These factors are the political process, physical opportunities, and the budget,[1] as shown in Figure 4.

[1]While the budget and political process are very much intertwined, an attempt is made here to distinguish between the political process impacting on the actual authorization and construction of projects (or failure to authorize and construct) versus the budget content, including its overall size and rationale for emphasizing or de-emphasizing certain projects, programs, and activities.

FIGURE 4

FACTORS WHICH SHAPE WATER RESOURCE TRENDS RELATING TO FLOOD DAMAGE PREVENTION PROJECTS OF THE CORPS OF ENGINEERS



CHAPTER III

AN OVERVIEW OF THE THEORY BEHIND BENEFIT-COST ANALYSIS AND ITS APPLICATION BY THE CORPS OF ENGINEERS IN FLOOD DAMAGE PREVENTION PROJECTS

Purpose of the Chapter

The purpose of this chapter is to present a theoretical discussion of benefit-cost analysis, to document the application of benefit-cost analysis to the Corps flood damage prevention program, to describe changes in benefit-cost analysis methodology which directly or indirectly impact the program outcomes, and to assess the consequences of these changes.

Benefit-cost analysis has long been recognized as a practical way of assessing the desirability of projects. In the water resources field the Corps has for many years taken into account the benefits and costs in determining the worth of a project. As an offshoot of benefit-cost analysis, the Corps also has developed procedures for allocating costs among project purposes. The importance of cost allocation is that it provides a basis for determining the costs chargeable to local interests when one or more vendible project outputs are involved.

Rationale for the Use of Benefit-Cost Analysis in Investment Decisions

Benefit-cost analysis is both a theory and a technique for assessing the economic utility of a public investment project. The technique can be used to indicate whether a specific expenditure should be undertaken or to determine the appropriate scale of investment. As a normative theory of decision-making, benefit-cost analysis reflects an elementary decision rule--efficiency--under which no rational person could be expected to undertake actions where anticipated costs exceed anticipated benefits. As a technique, it is a practical way for assessing the desirability of projects where it is important to take a long-range view and a broad view which considers many kinds of costs and benefits. It implies the enumeration and evaluation of all the relevant costs and benefits. As a theory and technique, benefit-cost analysis draws on the concepts and calculus of welfare economics, public finance, and resource economics, and welds these components into a coherent methodology for decision-making.

Corps flood damage prevention projects frequently involve major investments and are virtually always designed to last for fifty years or more. The benefits to be derived from such projects also are recognized to occur over a duration of many years. The fact that the capital investment occurs very early in the life of a project and the benefits accrue for many years thereafter makes benefit-cost analysis an appropriate decision-making tool in determining whether a project should be authorized and subsequently

implemented. The objective function, discount rate, and benefit calculation are all critical factors in determining which projects will have a favorable benefit-cost ratio and therefore have a reasonable chance of being authorized and implemented.[1] In addition to factors which are critical in calculating the benefit-cost ratio, there are certain constraints which have a bearing on the likelihood of a project's being implemented even when the benefit-cost ratio is favorable.[2]

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[1]Equally important is the use of benefit-cost analysis techniques in selecting the size of a project to be recommended for authorization. With the objective of maximizing net national economic development benefits, the discount rate, the timing of the realization of the stream of benefits, and the relative magnitude of construction costs to operation and maintenance costs all have a bearing on the selection of the recommended alternative. This alternative need not be the one with the highest benefit-cost ratio.

[2]Jesse Burkhead and Jerry Miner, Public Expenditure (Chicago: Aldine Publishing Co., 1971), p. 214. They describe these constraints as limitations imposed by physical, financial, distributional, political, or legal considerations. The vast number of Corps projects which have been authorized but are not implemented because of various constraints highlights the importance of a project's acceptability beyond benefit-cost considerations.

Steps in Benefit-Cost Analysis

In a general sense, benefit-cost analysis is an attempt to formulate a plan in which the present value of all benefits less that of all costs is maximized.[1] From a practical viewpoint this means that the size of a flood damage prevention project would be guided by a comparison of incremental costs and benefits. For example, would the extra cost of raising a levee a foot be more than offset by the additional benefits the extra protection would provide. As Burkhead and Miner indicate, such a calculation would favor larger projects over smaller projects if one were selecting projects for implementation on the basis of net benefits.[2] They therefore suggest that the benefit-cost ratio, which does not depend upon the size of the project but rather on the ratio of benefits to costs, be used in the ranking of projects.[3] Nevertheless, it will be shown that the selection of one solution to a flood problem over another is a far more complex issue. It is for this reason that rather specific guidance is provided to Corps planners for their use in formulating flood damage prevention projects. This guidance and how it has changed are addressed later in this chapter.

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[1]A.R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey," Economic Journal, December, 1965, p. 686.

[2]Burkhead and Miner, Public Expenditure, p. 220. (Refer to Table 7.1.)

[3]Ibid.

The literature on benefit-cost analysis focuses on several questions, the answers to which constitute the general principles of such analysis. Prest and Turvey discuss four such questions:

1. Which costs and which benefits are to be included?
2. How are they to be valued?
3. At what interest rate are they to be discounted?
4. What are the relevant constraints?[1]

Burkhead and Miner include the selection of the choice set and the determination of a choice model as additional elements incorporated in the framework for project analysis.[2] A discussion of each of the six elements is appropriate for a generic understanding of the principles and techniques of benefit-cost analysis and how they translate into application by the Corps in its flood damage prevention program.

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[1]Prest and Turvey, "Cost-Benefit Analysis," p. 686.

[2]Burkhead and Miner, Public Expenditure, p. 213.

Objective Function

In order to estimate costs and benefits used in an analysis, it is necessary to specify one or more objective functions against which such benefits and costs may be measured.[1] Traditionally, benefit-cost analysis is grounded in formal welfare economics which conceptualizes investment by private competitive markets. In such markets, it is assumed that the consumers strive to maximize their utilities and producers to maximize their profits. In so doing, the highest total utility for any given income distribution will be attained.[2]

Welfare economists are concerned both with efficiency (the equilibrium of demand and supply at full employment) and with its distribution.[3] The emphasis is usually on the former. Ideally, a project is efficient if it will either make everyone better off or at least no one worse off. Such an objective function is impossible to apply in practice. Thus, a less restrictive efficiency criterion has been adopted in benefit-cost analysis. The Kaldor-Hicks criterion proposes approval of decisions if the total gain in welfare were such that the winners could compensate the losers.

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[1]In contrast, the distinguishing factor in systems analysis is that the objectives are not known or are subject to change.

[2]Burkhead and Miner, Public Expenditure, p. 208.

[3]John A. Ferejohn, Pork Barrel Politics: Rivers and Harbors Legislation, 1947-1968 (Stanford, CA: Stanford University Press, 1974), p. 26.

However, procedures for compensation do not ordinarily exist.[1] Therefore, the Kaldor-Hicks criterion is applied in a manner that requires only that the total benefits of a project exceed its total costs, regardless of who receives those benefits.[2]

In order to determine which costs and which benefits are to be included in the benefit-cost calculations, it is necessary to agree on the objective function. Once the objective function is specified, benefits and costs can be determined and a measure of a project's worth can be specified. A benefit-cost ratio may be calculated by determining the present value of benefits and costs and expressing a ratio in which the numerator consists of discounted benefits and the denominator consists of discounted operating and capital costs. If the benefit-cost ratio is greater than unity, the project is a justifiable use of resources. The present value of benefits and costs of a project may also be expressed in a formula in which the project is considered to be a justifiable use of resources, if the stream of benefits over time exceeds costs for a like period and, therefore, yields a positive present value.[3]

Benefit-cost analysis originated in the practices of Federal water resource agencies. These agencies have used benefit-cost analysis in the evaluation of the feasibility of specific projects,

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[1]Aaron Wildavsky, "The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis, and Program Budgeting," in Political Science and Public Policy, ed. by Austin Ranney (Chicago: Markham Publishing Co., 1968), p. 59

[2]Ferejohn, Pork Barrel Politics, p. 28.

[3]Burkhead and Miner, Public Expenditure, p. 208.

for the selection of preferred projects from among a range of possible projects, and for the justification of projects in the budgetary process.[1] The use of benefit-cost analysis for water resource programs demonstrates the difference between benefits which are marketable and those that are public goods. The benefits of water resource projects are measured by the market price of the outputs from the public investment, or by the price that consumers of the outputs would be willing to pay if they could be charged. Such prices are indicators of the relative value that the economy places on the benefits of the investment.[2]

Where competitive characteristics of the economy do not apply, benefit calculations must be modified by means of a surrogate calculation.[3] Ostrom notes that water uses range in a spectrum from those that can be subject to provision in a market economy to those at the other end of the spectrum, such as flood control, that can be provided only as public goods or services.[4]

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[1] Ibid., p. 209.

[2] Ibid.

[3] In the case of flood damage prevention projects, the surrogate calculation is largely the estimate of damages averted with a project vis-a-vis without a project. Other potential costs that could be averted with a project include estimates of emergency costs that would not be incurred and the cost of floodproofing potential new structures within the 100-year flood plain that will not be required with a project. More generally, where prices for output do not materialize in markets, cost savings become surrogate measures.

[4] Vincent Ostrom, "Water Resource Development: Some Problems in Economics and Political Analysis of Public Policy," in Political Science and Public Policy, ed. by Austin Ranney (Chicago: Markham Publishing Co., 1968), p. 127.

Figures 5 and 6 illustrate the aggregation of demand curves for marketable water resource outputs such as irrigation versus public goods such as flood control.[1]

In the case of marketable goods, the quantity of goods produced is obtained by the summation of individual demand curves. On the other hand, the demands for flood control as a public good are complementary rather than competitive. Each individual protected by a flood damage prevention project receives the same degree of protection, e.g., protection against a 100-year flood event or a 200-year flood event. Therefore, the sum total of the willingness to pay by different individuals benefiting from a proposed project becomes the demand price.[2]

Difficulties in quantifying aggregate demand price

Several practical problems arose in attempting to quantify the aggregate demand price. The end result was that the non-Federal share of project construction costs was legislated by Congress. A major complication in attempting to relate non-Federal

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[1]Prest and Turvey, "Cost-Benefit Analysis," pp. 695-696.

[2]Willingness to pay is stressed by the Reagan administration as a more important indicator than the absolute value of the benefit-cost ratio. Willingness of the non-Federal sponsor to pay 35 percent of project costs is a major factor in selecting new construction starts. Thus, projects with a benefit-cost ratio of 1.01 to 1 (Virginia Beach, Virginia) and 1.02 to 1 (Randleman Lake, North Carolina) were recommended as new construction starts in Fiscal Year 1983 by the Assistant Secretary of the Army for Civil Works over projects with higher benefit-cost ratios, but without a willingness of the local sponsor to contribute the 35 percent required by the Department of the Army. The surrogate factor of estimated flood damages averted used by the Corps to quantify flood damage prevention benefits and to calculate the project benefit-cost ratio is given less consideration than willingness to finance the non-Federal share of project costs.

FIGURE 5

DEMAND CURVE: MARKETABLE GOOD

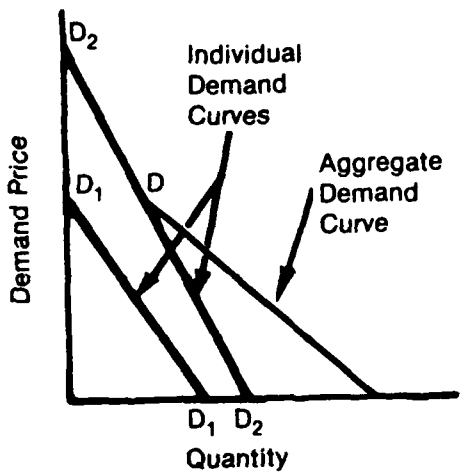
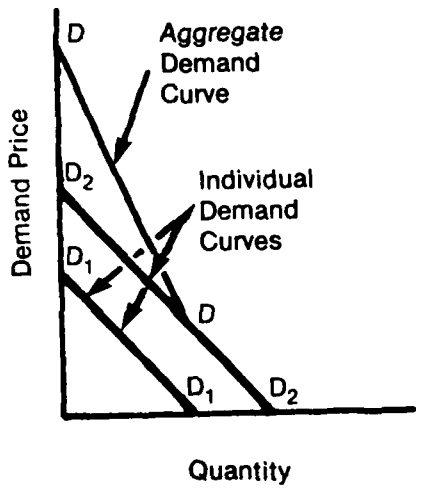


FIGURE 6

DEMAND CURVE: PUBLIC GOOD



costs of a flood damage prevention project to project beneficiaries is that the beneficiaries frequently do not reside in the community or even the state where the project is located. The recognition of this fact in the construction of dams designed to reduce flooding by the storage of runoff water led Congress to eliminate the requirement for state and local governments to share in the costs of such a project. Where the flood damage prevention benefits are widespread, as is usually the case in a reservoir project which reduces the flood crest at numerous locations and varying degrees downstream, the power of the Federal government to exact compensation from beneficiaries is limited. Furthermore, even if the power of the Federal government to secure compensation were unrestricted, estimates of the precise incidence of a project's benefits would be difficult to determine in every case.[1] Finally, the Federal government is constrained to dealings with state and local governments, and their powers to assess beneficiaries are also limited by legal principles and the exigencies of local and state politics. The result is that the Federal government must rely on negotiations or voluntary cooperation of the jurisdictions involved, a difficult task when multiple political jurisdictions benefit from a single project.[2]

In the case of Corps flood damage prevention projects, the requirements of local cooperation established in law were intended

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[1]Mathematica, Inc., The Implications of the Net Fiscal Benefits Criterion for Cost Sharing in Flood Control Projects (Alexandria, VA: U.S. Army Engineer Institute for Water Resources, 1971), pp. 17-21.

[2]Ibid., pp. 20-21.

to simplify the matter. Reservoir projects with widespread benefits required no local funding, but upstream landowners are frequently pressured to sell their lands. On local protection projects the non-Federal sponsor is required to furnish lands, easements, and rights-of-way and is responsible for certain relocations. The difficulty arises when the channel improvement, levee, or floodwall extends into several political jurisdictions. Any relationship between the value of the lands, easements, and rights-of-way provided by non-Federal interests and the benefits a project would provide to the same political jurisdiction is purely coincidental.

In such instances, the state level of government is frequently the most appropriate level for helping to assure that the requirements of local cooperation will be met. For example, the support of the governor of a state is essential when upstream interests oppose a reservoir benefiting downstream interests within the same state.[1] Local protection projects and projects calling for a combination of reservoir and local protection elements which cross political jurisdictions are frequently delayed for long periods of time as some sort of negotiated compromise is sought.[2]

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[1]Recent examples of reservoir projects which were constructed despite opposition by upstream landowners and individual congressmen in whose district the project was physically located are Willow Creek Lake, Oregon, and Stonewall Jackson Lake, West Virginia. These projects were constructed based upon strong support of the governor and senators (who took a statewide perspective).

[2]Two primary examples of areas which could potentially be subject to devastating floods, but which are experiencing substantial delays in achieving agreement by non-Federal sponsors on the scope of the project, are in the Santa Ana River Basin, California, and the Passaic River Basin, New Jersey and New York. These areas are densely populated and urbanized, and construction in the flood plain has made the basins particularly vulnerable to

Trade-offs: macroeconomic efficiency, market efficiency, and other considerations

Quite apart from the aggregation of demand prices for flood damage prevention projects, the Corps, in formulating alternative solutions to a flooding problem, analyzes marginal benefits and marginal costs of increased levels of protection. For example, does an extra foot of levee height provide more benefits than it costs? With the objective of maximizing net economic development benefits, the solution selected would be the one that provides the greatest amount of benefits in excess of costs. Where the non-Federal share of such project costs exceeds the ability or willingness of the local sponsor to finance (i.e., it exceeds the aggregate demand price), then a modification to the size of the project may be necessary. This issue of trade-off between level of protection and ability or willingness of the non-Federal sponsor to finance its share of costs is discussed in greater detail later in this chapter, under the section entitled "Dimensions of Flood Damage Prevention Benefits." However, the point is made here that the level of protection provided by a project ultimately is a complex trade-off across three issues--affordability (not exceeding the aggregate demand price); the macroeconomic considerations of maximizing net

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heavy damages in the event of a major flood. Certain "ideal" solutions from an engineering viewpoint have been unacceptable at the local level because of the requirement that upstream lands protect downstream residents or because of the complexities of getting multiple political jurisdictions to agree to a particular engineering solution.

economic development benefits; and environmental, social, and safety considerations.[1]

Political price

Achieving trade-offs in the form of a modified project is frequently a costly and time-consuming process. Although such costs are very real, they are for the most part excluded from the benefit-cost analysis.[2] However, as Ostrom points out in discussing water resource development, the economic price and the political price need to be totaled to establish an aggregate price.[3] To determine the political price, both decision-making costs and political externality costs need to be considered. Decision-making costs are a function of the number of individuals involved in obtaining agreement and/or the increased opportunities for strategic

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[1]Corps policy on the level of protection to be provided states is that where damages from large floods would be a catastrophe, the standard project flood (SPF) level of protection is the goal. This would apply to high levees, high floodwalls, and rapid-flow channels in urban areas. The need for a policy and/or political trade-off arises when one or more of the following occur: 1) Non-Federal interests cannot afford the costs associated with this level of protection; 2) marginal costs exceed marginal benefits, which is frequently the case, and policy dictates adhering to maximization of net economic development benefits; and 3) opposition occurs on the basis of environmental or social issues. Such issues could include the greater amount of land required for an SPF project, or the excessive height of floodwall may be objectionable.

[2]During the project formulation stage the cost of engineering and design is included as part of the estimated annual costs; however, long and extended delays are not projected in the cost of the project. The administrative and engineering costs which a local sponsor spends and the political costs of trade-offs and benefits foregone are not considered in benefit-cost analysis. Yet these are very real costs which frequently are so great that projects with very favorable benefit-cost ratios are not implemented.

[3]Ostrom, "Water Resource Development," p. 135.

bargaining.[1] In considering a public good such as flood control, each resident of a community would consider his own costs and benefits. Costs may consist of required payments by taxation, while benefits could be the personal flood losses averted as a result of a Corps project. If, however, the amount of benefit received is less than the cost to the individual, an expected political externality cost is incurred.[2] If a limited number of individuals could make the decision for the community, the total externality costs would be quite high. Consequently, it has been proposed that in all collective decision-making problems the price of political action should be considered and that a least-cost position is at the low point on the political cost curve, as shown in Figures 7-9.[3]

The total political costs are dynamic and subject to change. They are frequently time sensitive based upon flood events. It is not uncommon to encounter situations where the total political costs exceed the project benefits and the required non-Federal support of a project is lacking or withdrawn. However, following a significant flood, a larger number of people may approve of the project, and the total political costs decrease to a point where they are less than the project flood damage prevention benefits. It would then be

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[1]Robert L. Bish, The Public Economy of Metropolitan Areas (Chicago: Rand McNally College Publishing Co., 1971), p. 36.

[2]Ibid., pp. 37-39.

[3]Based on James Buchanan and Gordon Tullock, The Calculus of Consent (Ann Arbor, MI: University of Michigan Press, 1962), pp. 60-70. It is also referred to as social interaction costs in Bish, Public Economy, pp. 40-41.

FIGURE 7

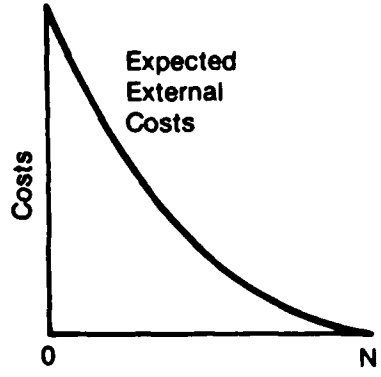


FIGURE 8

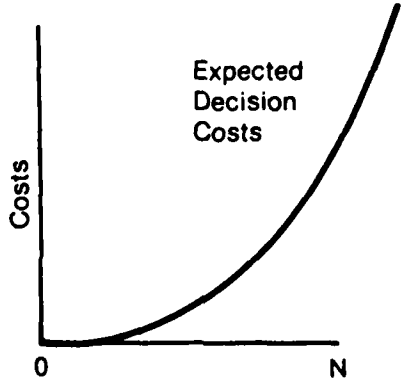
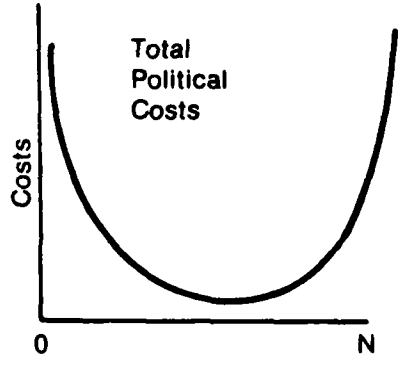


FIGURE 9



Source: Based on James Buchanan and Gordon Tullock, *The Calculus of Consent* (Ann Arbor: University of Michigan Press, 1962), pp. 60-70. It is also referred to as social interaction costs in Bish, *The Public Economy of Metropolitan Areas*, pp. 40-41.

logical for the project to be implemented.[1] A common example of political costs exceeding project benefits occurs when flooding is infrequent, a portion of the community is not in the flood plain, and the non-Federal project costs are substantial and would be derived from state or local general revenues or bonds. This situation could entail payments in the form of taxes or special assessments to individuals in and out of the flood plain. When the expected external costs curve and the expected decision costs curve are combined, they form a total political cost curve with a U-shaped characteristic. Ideally, the least-cost point is somewhere in the mid-range with expectations of sharply ascending costs[2] as power is concentrated with either a single person holding full authority or a single person exercising an ultimate veto. If the least-cost position is at a point below the level of benefits that can be derived from collective action, then a rational group of people should be willing to relax the requirement of the rule of willing consent and to substitute a decision rule that would approximate the least-cost solution.

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[1]This is frequently the case. A major flood event results in the realization by a large segment of the population of the hazards of living in a flood plain without protection. Frequency of flooding and the topography in a community are important factors in the evaluation of total political costs vis-a-vis project benefits. For example, the lower Mississippi valley is subject to frequent flooding and is generally very flat in southern Mississippi and Louisiana. As a result, the total political costs are frequently kept to a minimum in this area as communities and rural organizations realize that it is in their common interest to support flood control projects. This homogeneity of taste minimizes political costs. (See Bish, Public Economy, pp. 48-49.)

[2]The term costs here may also be thought of as deprivation. If, for example, the decision is made by a few, the deprivation costs may extend to those that do not benefit.

This discussion of expected external costs and decision costs is particularly pertinent to Corps reservoir projects recommended for authorization or implementation. Landowners in the reservoir area are required to sell their land even if they are unwilling sellers. They receive few or none of the flood damage prevention benefits. However, when the governor of a state and the congressional delegation in Washington support the project, along with downstream residents, and when the total political costs are less than the project benefits, the project will normally move ahead. When the governor does not support a project, the total political costs are high, primarily in terms of deprivation to those who would benefit from the project.

Choice Set

The notion of a choice set reflects the need to limit the range of possible projects for comparison within a particular benefit-cost analysis. Without such a limitation, benefit-cost studies for the public sector could encompass comparisons among projects of all government agencies. Federal budgeting does not proceed in a manner that permits the evaluation of projects and programs across agency lines.[1] When one looks at the various functions of the Federal government as defined in the Federal budget, there appears to be no evaluation of projects among various functions within a single geographical area. Moreover, within a single function, such as water resources, there is no direct comparison or cross evaluation of projects. A sewage treatment plant funded by the Environmental Protection Agency and, in the same city, a local protection project of the Corps for the reduction of damages from floods are not in direct competition for Federal dollars based upon benefit-cost considerations. Aside from the very real difficulties of comparing projects of different agencies, there are several programmatic reasons that make such comparisons essentially non-existent.

First, a specific project cannot be evaluated in terms of its "absolute merit." It requires evaluation among projects having a common budget constraint or common interdependencies or in compatibilities.[2] The organization of the Federal government, in-

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[1]Burkhead and Miner, Public Expenditure, p. 214.

[2]Ibid.

cluding the agencies proposing projects and those reviewing them in the Office of Management and Budget and the Congress, is such that competition between projects of different agencies generally does not occur.

A second reason for limiting the choice set to a single agency is one of responsibilities. Federal agencies have fairly specific limits to the solutions that can reasonably be expected to receive favorable consideration. The Corps, in studying the water resource problems of a river basin or sub-basin, would not likely recommend a waste treatment plant to be designed and constructed by the Corps nor a single-purpose water storage and treatment project. Legislation and policies designating areas of responsibilities have restricted the types of water resource solutions that an agency can reasonably expect to be approved by the executive and legislative branches.

The choice set for this research focuses on the types of solutions that are considered in the project formulation stage of a study involving considerations of flood damage prevention. In essence, this means either a structural solution or a non-structural solution. Traditionally, recommendations for structural solutions have consisted of dams, levees, floodwalls, channel alterations, and high-flow diversions and spillways. Early flood damage prevention projects were generally single-purpose projects. However, the infusion of multiple-purpose, comprehensive planning in Corps preauthorization studies resulted in structural

solutions providing flood damage reduction benefits as well as other project benefits. These multiple-purpose projects generally are dam and reservoir projects. Although they may provide such benefits as hydroelectric power, water supply, water quality control, or recreation, they are considered part of the choice set when they also provide flood damage prevention benefits.

Non-structural measures may be thought of as falling into two broad categories--those that modify the susceptibility to flood damage and disruption and those that modify the impact of flooding on individuals and the community. Specific measures falling into each group are described in Chapter II of the dissertation. While the Corps has called for non-Federal regulation of the flood plain as part of the requirements of local cooperation in many projects recommended to Congress for authorization,[1] this is not the type of non-structural solution considered for analysis. Hertzler points out that recommendations in Corps survey reports for Corps structural projects include regulation against encroachment of channels, ponding areas, and floodways. These recommendations have been included over many years in the congressional authorization for the projects and thus have become the conditions which must be fulfilled by local interests as part of the Federal project.[2]

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[1]R.A. Hertzler, "Corps of Engineers' Experience Relating to Flood-Plain Regulations," in Papers on Flood Problems, ed. by Gilbert F. White (Chicago: The University of Chicago, 1961), pp. 181-202.

[2]Ibid., pp. 189-200.

The non-structural measures become distinguishable from the structural measures when they involve action by the Corps as part of a congressionally authorized project. This includes such measures as permanent evacuation and relocation, flood proofing, acquiring land or easements thereon to preclude future development in that area, and the provision of equipment devoted exclusively to flood measuring systems or temporary evacuation when these are elements of an overall flood damage reduction plan.[1]

A very limited number of Corps projects or elements thereof, which include such non-structural measures, have been implemented.[2] There has been, however, a marked increase in the emphasis given to non-structural measures during the planning stage;[3] this becomes an important matter in addressing subsidiary research question number 3. In short, the choice set will include the whole range of structural as well as non-structural measures being considered by the Corps during the planning stage in the post-NEPA era.

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[1]William J. Donovan, "The Less Travelled Road: An Overview of Nonstructural Measures in Floodplain Management Planning," a paper presented at the U.S. Army Corps of Engineers seminar on the Implementation of Nonstructural Flood Plain Management Measures, Casey Building, Fort Belvoir, Virginia, 15-17 November 1982, p. 11.

[2]Ibid., pp. 13-17; Alan E. Chin, "Corps of Engineers Implementation of Nonstructural Measures" (unpublished paper prepared for U.S. Army Corps of Engineers, Board of Engineers for Rivers and Harbors, Ft. Belvoir, VA., 1981), pp. 13-21.

[3]Although some consideration was given to Corps implementation of non-structural solutions prior to NEPA, the major emphasis came from such laws, executive orders, and policy statements as the principles and standards (September 1973), Section 73 of Public Law 93-251 (March 1974), Executive Order 11988 (May 1977), and President Carter's water policy message of June 8, 1978.

Pricing Benefits and Costs

The costs and benefits that are calculated in developing a benefit-cost ratio are those that are estimated to be incurred or realized during project construction and over the life of a project and that are germane to the objective function. In the case of structural flood damage prevention projects, the economic life is generally specified as fifty to 100 years. Given an assumed time horizon and an appropriate discount rate, the present worth of costs and benefits can be calculated and evaluated on the basis of comparable price levels. There is general agreement that whether current price levels or inflated costs are used, both benefits and costs should be quantified on a comparable basis. For accuracy and consistency in computing the benefit-cost ratio, benefits, costs, and discount rate should all be inflation free or all be inflated.[1]

Capital costs occur during construction of a project, whereas operation and maintenance costs are incurred over the life of a project. Estimated benefits provided by Corps projects span the life of the project. When no further growth or decrease in

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[1]This point has been made in congressional testimony and is discussed to a degree in the literature. See, for example, U.S. Congress, Joint Economic Committee, Economic Analysis of Public Investment Decisions: Interest Rate Policy and Discounting Analysis, Hearings before a subcommittee on Economy in Government of the Joint Economic Committee, 1968, pp. 34 and 45-46; and Charles W. Howe, Benefit-Cost Analysis for Water System Planning (Washington, DC: American Geophysical Union, 1971), pp. 80-81. The debate over which discount rate is appropriate for use in benefit-cost analysis involving government investment often fails to consider the general issues of pricing costs and benefits. An attempt is made here to relate benefits, costs, and discount rate without inflation as well as under varying assumptions of future inflation.

benefits is projected over the life of a project, the issue of quantifying benefits becomes a matter of measuring the net contribution to a given objective function of a particular project. The estimated annual value of this contribution is then calculated on the basis of its present worth.

In calculating benefits and costs, the Corps uses a methodology which converts benefits and costs to their present worth on a base year which is pegged at the beginning of project operation or the date that project benefits can be realized. By reducing the benefits and costs to the same time basis, and by using a common price level, a valid comparison can be made of the equivalent annual value of each element of benefit and cost.

In calculating the estimated average annual benefits, the stream of benefits over the economic life of the project is brought back to the beginning of project operation using an appropriate discount rate.[1] In the simplest situation, where no growth or decline in benefits is projected over the life of the project, the estimated annual benefits in the first year of operation become the amount used in calculating the benefit-cost ratio regardless of the discount rate used.[2] These benefits are ex-

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[1]A detailed discussion of the appropriate discount rate is contained in the next section of this chapter. While there is no agreement on how the rate should be determined, there is a legal rate prescribed by Congress in Section 80 of Public Law 93-251. The current rate used by the executive branch in evaluating new starts for the Fiscal year 1984 budget is 7-7/8 percent, even where Section 80 calls for the "grandfathered" rate of 3-1/4 percent.

[2]This is so because, theoretically, the present-worth factor used to determine the present value of the periodic, constant, future benefits, is the reciprocal of the partial payment (capital recovery) factor used for annualizing. Conse-

pressed in current dollars rather than future dollars projected to the first year of project operation. The rationale for this is that estimated annual costs, the denominator in the benefit-cost ratio, are expressed on the basis of current dollars.[1] For consistency, the benefit calculations must also be calculated on a comparable basis.

In determining costs, it is important to distinguish between financial costs and economic costs. Financial costs are the initial and recurring outlays of monies for lands, materials, goods, and services that will be incurred over the life of a project in its construction stage and in its operation and maintenance,[2] but not all economic costs are included. Economic costs

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quently, the net effect is to multiply by 1, regardless of the discount rate. The first year annual benefits, therefore, properly reflect the result of the discounting and capitalizing process when those benefits remain constant over the project's life. A more detailed discussion of flood damage prevention benefit calculations, including the calculations of the present worth of benefits which increase over time, is contained in a later section of this chapter entitled "Dimensions of Flood Damage Prevention Benefits."

[1]Since 1980, the Corps has incorporated future inflation in project cost estimates submitted to Congress in support of annual budget requests. However, in calculating benefit-cost ratios, uninflated costs are used. In recognition of the fact that construction of Corps projects generally takes several years, a further change in benefit-cost calculation and presentation was made by the Corps in 1980. Projects under construction no longer had their benefit-cost ratio calculated on the basis of the entire project. Rather, a remaining benefit-remaining cost ratio (RBRCR) is calculated using current price levels. This avoids distortion that would result in calculating a benefit-cost ratio which includes actual costs incurred to date. Secondly, it provides a more meaningful basis on which to evaluate budget requests, i.e., future investments, recognizing that funds spent to date are sunk costs.

[2]U.S., Department of the Army, Engineer Pamphlet 1105-2-45: Planning Economic Considerations (Washington, DC, January 1982), p. 2-1.

include most financial costs, but not all; they include costs pertinent to benefit-cost calculations but which do not require initial or recurring outlays.

An example of a financial cost not considered an economic cost is the relocation, necessitated by a Corps project, of a two-lane highway which will eventually be replaced with a four-lane highway based upon existing or projected traffic. The cost of the additional two lanes is a financial cost; i.e., an appropriation of funds will be required for the full four lanes, but Corps policy excludes such additional costs from the economic costs.[1] The reason for this exclusion is that the water resource project required only relocation of two lanes.

Economic costs, which are not financial costs, include uncompensated adverse effects such as the displacement of recreation use as a result of a project or the erosion of land along streambanks caused by dams that prevent the replenishment of bedload materials. They are in effect external diseconomies which would not occur in the absence of the project.[2] This type of cost is typically calculated as a negative benefit rather than a cost.[3]

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[1] Ibid., pp. 2-1 - 2-4.

[2] U.S., Water Resources Council, Final Rule, "Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning (Level C)," Federal Register IX, Vol. 44, No. 242, December 14, 1979, 72974.

[3] It is important to note that there is a different change in the benefit-cost ratio if the external diseconomies are considered a negative benefit versus an additional cost. However, there is no difference in the net benefits.

Discounting Costs and Benefits

Rationale

Prior to 1950, the Corps did not use discounting procedures in calculating average annual benefits. Benefits were projected for each year of the life of the project, and the average annual benefit was the summation divided by the project life (fifty years was frequently used.) Annual costs were calculated in much the same way as they are today. An interest rate based on long term Federal borrowing was used to estimate annual interest on the investment and the annual charge for amortizing the investment.

The use of interest and discount rates in benefit-cost analysis stems from the need to compare benefits and costs on an equivalent basis, recognizing that the capital investment in a project and the realization of benefits occur at considerably different periods of time. Since most people would prefer present over future goods, a payment in the form of interest is needed to induce savings and compensate for the current consumption that is foregone.[1] Viewed from a different perspective, the demand for savings stems largely from the opportunities for productive use of capital. The prospect of obtaining net returns over costs from the investment in income-yielding goods constitutes a major source of demand for savings. This productivity consideration is a most important reason for discounting. Given a positive rate of return on investment, the resources used in a particular project could be

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[1]Federal Inter-Agency River Basin Committee, Subcommittee on Evaluation Standards, Proposed Practices for Economic Analysis of River Basin Projects (Washington, DC: Government Printing Office, May 1958), p. III. This document is commonly referred to as "The Green Book."

invested elsewhere to yield resources in the future larger than the amount invested.[1] Another reason for discounting, somewhat related to the considerations previously mentioned, pertains to the uncertainty of the future. This means that there is a risk that the projected future benefits may in fact not materialize in the quantities estimated and costs may in fact be different than currently estimated.[2] The risk element could be handled either as an element of the discount rate or in an alternative manner by conservative estimates, e.g., deductions from benefit calculations and adding contingencies to cost estimates.

Dispute over appropriate rate

Much debate has taken place over the appropriate discount rate to be used for government programs. The range of discount rates advocated by the various schools of thought would generally range from about 3 to 15 percent. Historically, those advocating the high end of the spectrum have used as a rationale the opportunity cost of displaced private spending. Under this proposal no public investment would be undertaken which earns a return less than the return on the alternative use of the funds in the private sector which it absorbs.[3]

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[1]Burkhead and Miner, Public Expenditure, p. 228.

[2]Ibid.

[3]A summary of different arguments for determining the appropriate discount rate to be used in evaluating Federal investments may be found in U.S., Congress, Subcommittee on Economy in Government, Joint Economic Committee, Economic Analysis of Public Investment Decisions: Interest Rate Policy and Discounting Analysis, Joint Committee Print, 90th Cong., 2d sess., 1968. Testimony on the issue of discount rates may be found in U.S., Congress, Joint Economic Committee, Economic Analysis of Public Investment Decisions: Interest Rate Policy and Discounting

At the low end of the spectrum is a discount rate based upon the social rate of time preference. In this approach, the private sector is not accepted as the final arbiter of the appropriate discount rate for government programs. Among the arguments put forth to support a lower rate is that the private sector and its complex of rates do not permit future generations to express their preference in the marketplace; the government should act as the guardian of their interests by using a lower than market rate, thereby producing a shift of income into the future. A social time preference, politically determined, would be used for discounting in order that future generations be protected against the short-time horizon of profitability from private investment in this generation. Otherwise, the apparent profitability of private investment may appear to be excessively attractive as compared with the true social profitability of public investment.[1]

A thorough discussion of the arguments over the discount rate serves three purposes. First, it provides background as to the basic factors which are pertinent to the determination of a discount rate. These include risk, tax liability, quality of information, and inflationary expectations. Secondly, it focuses

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Analysis, Hearings before a Subcommittee on Economy in Government of the Joint Economic Committee, Interest Rate Guidelines for Federal Decisionmaking, Hearings before a Subcommittee on Economy in Government, 1968. Other comprehensive discussions of the discount rate in benefit-cost analysis may be found in Burkhead and Miner, Public Expenditure, pp. 206-251, and Prest and Turvey, "Cost-Benefit Analysis," pp. 683-735. Also refer to the bibliography in the last two citations.

[1]Burkhead and Miner, Public Expenditure, p. 236.

on the objectives of Federal investments. By reviewing the debate as to which discount rate is appropriate, some insight is provided as to its meaning when evaluating program outputs against the criteria of equity, efficiency, and responsiveness. Thirdly, new studies take issue with the methodology previously used in determining the rate of return on the alternative use of funds in the private sector. While most studies have considered the range to be between 8 and 13 percent,[1] new studies demonstrate that 8 percent is most likely to be the upper end of the spectrum over a period of time.[2] This finding is important because the current discount rate used in the calculation of benefit-cost ratios is 8-1/8 percent[3] and in all

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[1]For example, J.A. Seagraves, "More on the Social Rate of Discount," Quarterly Journal of Economics, Vol. 84, 1970, pp. 430-450. Seagraves develops an opportunity cost model ranging from 8.0 to 13.2 percent. Also Steve H. Hanke and James Bradford Anwyll, "On the Discount Rate Controversy," Public Policy, Vol. XXVII, Spring 1980, pp. 171-181. Hanke and Anwyll arrive at a range of 8.5 to 10.5 percent. Another frequently cited model is the one developed by Jacob A. Stockfisch in Measuring the Opportunity Cost of Government Investment (Arlington, VA: Institute for Defense Analysis, Research Paper P-490, 1969). Stockfisch arrived at an opportunity cost of 10.4 percent.

[2]James G. Crew "Inflation and Measurement of the Opportunity Cost of Private Capital," unpublished report prepared by Transportation Research and Analysis Center, Inc., for the U.S. Army Engineer Institute for Water Resources, Fort Belvoir, VA, 1982, p. ix.

[3] The current rate (Fiscal Year 1984) authorized in law is based on Section 80 of Public Law 93-251 which refers to the regulation issued by the Water Resources Council and published in the Federal Register on December 24, 1968 (33 F.R. 19170; 18 C.F.R. 704.39). The interest rate specified is based on the average yield during the preceding fiscal year on interest-bearing marketable securities of the United States which at the time the computation is made have terms of fifteen years or more remaining to maturity, provided that in no event shall the rate be raised or lowered more than 1/4 of 1 percent per year.

likelihood it will reach 9-5/8 percent by 1990.[1]

Opportunity cost of displaced private spending

This concept proposed by numerous economists looks to the market for determining the value that the funds channeled into the government would have earned if they had been left in the private sector.[2] Accordingly, a government project is desirable if, and only if, the value of the net benefits which it promises exceeds the cost of the lost productive opportunities which that investment causes. Further, the correct discount rate for the evaluation of a government project is the percentage rate of return that the resources utilized would otherwise have yielded in the private sector.[3] Various models have been developed to calculate the opportunity cost.[4] The Seagraves model is based upon corporate bond yields adjusted for risk and taxes.[5] Stockfisch focuses on

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[1]Crew, "Inflation and Measurement," p. 2. A rate of 10 percent would have already been used, were it not for the 1/4 of 1 percent maximum change per year specified in the Water Resources Council rule. In the absence of a significant reversal of interest rates, it is reasonable to expect continued increases of 1/4 percent for the next several years. Such a growth would result in the use of 9-5/8 percent by Fiscal Year 1990.

[2]For example, see William J. Baumol, "On the Discount Rate for the Public Projects," in Public Expenditures and Policy Analysis, ed. by Robert H. Haveman and Julius Margolis (Chicago: Rand McNally Publishing Company, 1970), pp. 273-290.

[3]Ibid., p. 274.

[4]An analysis and comparison of several opportunity cost models is presented in James Tang and Lloyd G. Antle, "A Review of Discount Rate Models for Evaluating Water Resource Projects" (unpublished paper, U.S. Army Engineer Insitutute for Water Resources, Fort Belvoir, VA, 1982).

[5]Seagraves, "Social Rate of Discount," pp. 440-441.

the pre-tax rates of return from assets in the private sector. He considers corporate manufacturing, public utilities, and the non-corporate sector weighted in proportion to their relative importance as measured by the relative allocation of business investment spending on plant and equipment between 1961 and 1965.[1] Stockfisch then adjusts the estimated weight of return for inflation,[2] an appropriate step since costs and benefit calculations are generally in current dollars when calculating the benefit-cost ratio.

Haveman proposed a model which assumes that public expenditures are financed through taxes and it is the private spending displaced by these taxes which represents the opportunity cost of the public expenditures.[3] Because the incidence of Federal taxes falls on both consumers and businesses, both consumption spending and investment spending get displaced.

The cost of government borrowing

A second rationale for the determination of a proper discount rate is the cost of government borrowing adjusted for taxes foregone. This concept expresses the combined impact of government borrowing on its expenditures in terms of interest outlays and revenues in terms of taxes foregone. The Comptroller General explored this concept and estimated the true cost of bor-

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[1]Stockfisch, "Opportunity Cost," p. 8.

[2]Ibid, pp. 14-15.

[3]Robert H. Haveman, "The Opportunity Cost of Displaced Private Investment," in Water Resources and Economic Development in the West, Conference Proceedings of the Committee on the Economics of Water Resources Development of the Western Agricultural Economic Research Council (Denver, CO, 1968).

rowing to the government, taking into account the tax revenues which the treasury sacrificed in the borrowing process.[1] Implicit in this position is the presumption that the government is an independent organization which should seek the greatest differential between its revenues and outlays, as does a private business.[2]

Social rate of time preference

The argument for a social rate of time preference stresses that observed interest rates in the economy give little guidance in determining the appropriate public rate of discount because of imperfections in the capital market. The primary imperfection cited in defense of this position pertains to the failure of the capital market to reflect the collective desires of citizens to provide for future generations in their private decision making. Such provision, it is argued, can be undertaken only by the nation collectively. Citizens are willing to contribute voluntarily to the attainment of this goal only if they recognize that their fell-

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[1]U.S., Comptroller General, Survey of Use by Federal Agencies of the Discounting Technique in Evaluating Future Programs (Washington, DC: General Accounting Office, 1968), pp. 25-28.

[2]U.S. Congress, Joint Economic Committee, Economic Analysis of Public Investment Decisions: Interest Rate Policy and Discounting Analysis, p. 11. This approach to determining the appropriate discount rate was rejected by the subcommittee. Rather, it was the view of the subcommittee that when the government functions as an investor of capital it should make those worthwhile investments which private investors cannot undertake, fail to undertake, or undertake in insufficient quantity. The government was viewed as an arm of society itself with the aim of achieving the greatest difference between social costs and benefits rather than the arm of maximizing its own net worth. As such, the purpose of the Federal government as an investor was to sustain the private sector and not to exploit private citizens to achieve its own end.

ow citizens are also making a contribution. They fail to do so if they believe themselves to be the only contributor. To provide adequately for future generations, supporters of this position argue that the Federal government should increase the level of public investment. It should do so by choosing a low social rate of interest, thereby expanding the number of public investment projects which appear feasible.[1]

Proponents of this logic stress that the range of private interest rates has no normative significance for public investment.[2] This view, whether expressed by economists such as Marglin or by politicians who oppose the use of the opportunity cost of displaced private spending for other reasons, has received limited support since establishment of the Water Resources Council rules for calculating the discount rate in 1968. This procedure was later confirmed in law in 1974, and few arguments for going to a rate lower than the legal rate have been expressed in recent years.[3]

Use of a low discount rate may also be justified on the grounds that most private investment decisions contain an inherent bias toward short-lived projects. When higher discount rates are

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[1]U.S., Congress, Subcommittee on Economy in Government, Economic Analysis of Public Investment Decisions: Interest Rate Policy and Discounting Analysis, pp. 10-11.

[2]Stephen A. Marglin, "Economic Factors Affecting System Design," in Arthur Maass, Maynard M. Hufschmidt, Robert Dorfman, Harold A. Thomas, Jr., Stephen A. Marglin and Gordon M. Farr, Design of Water Resource Systems (Cambridge, MA: Harvard University Press, 1962), pp. 194-197.

[3]One notable exception is the study by Crew which assesses the opportunity cost rate and points out that the legal rate is at least that high and likely to go even higher.

used, the result may be a systematic underdevelopment of areas of investment in which long-lived projects are called for. The very opportunities which are best suited for public development would be overlooked.[1]

Inflation-free discount rate

An argument for lower discount rates, generally not covered in the literature, focuses on the appropriateness of using an inflation-free rate consistent with the practice of calculating annual benefits and costs at current rather than inflated prices. In 1968, prior to the proposal by the Water Resources Council to change the discount rate from 3-1/4 percent to 4-5/8 percent, congressional testimony by administration officials indicated that the intent was to use a discount rate which would reflect the yield rate of treasury bonds corrected for inflation. Testimony of Mr. Henry P. Caulfield, then chairman of the Water Resources Council, supports the exclusion of expectations for inflation.

> Chairman Proxmire: Now, Mr. Caulfield, while you state the new basis for calculating the rate of interest, you do not state the economic concept upon which this rate is premised. Is it the concept of opportunity cost in the private sector? Do you agree with Mr. Hoffman's conclusions on the rate concept?
> Mr. Caulfield: The Water Resources Council, in developing this proposal, did not adopt any particular theory of the rate of return. Instead, it was reflecting what it believed to be the intent of the President, the intent of the President's words in the budget message, which did not in itself reflect a particular theory, either social time preference or opportunity cost concept, of the proper discount rate.
> Chairman Proxmire: If you follow the current cost theory, obviously it would have to be higher than 4-5/8, would it not?

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[1]Otto Eckstein, Water Resource Development: The Economics of Project Evaluation (Cambridge, MA: Harvard University Press, 1958), pp. 100-101.

Mr. Caulfield: No, not necessarily, in terms of the testimony that you had from Professor Baumol and in connection with the testimony you had from Mr. Hoffman, the point was made that it would be at least the yield rate.

Chairman Proxmire: Professor Baumol indicated that it was not his preference, but you could not find any lower rate than that.

Mr. Caulfield: You are right, pardon me. He said he thought no economists would be in favor of using less than the yield rate. This is the yield rate, in my judgment, corrected for inflation.

Chairman Proxmire: Corrected for inflation?

Mr. Caulfield: Yes. Since 1966, there has been a substantial expectation of inflation.

Chairman Proxmire: Would there be inflation in one area and not in others?

Mr. Caulfield: We have used benefit-cost analysis in terms of constant prices. Therefore, we need a discount rate that does not excessively reflect expectations of inflation, such as the interest rates that have been occurring in the last year or so. As evidence, for example, sir, is the fact that 4 weeks ago, the yield rate was about 5-1/2 percent and now it is just possibly a shade over 5 percent, since the tax bill became law.

Chairman Proxmire: Well, on the assumption that your costs do take into account inflation, I can certainly speak on that. Congress estimated it would cost $65 million to build the new House Office Building and it cost them $160 million. They estimated $20 million for this building and it cost $26 million. They are always underestimating the costs by an enormous margin.

It seems very unusual to assume that they have corrected for inflation in their estimate of costs.

Mr. Caulfield: The point is, they have not corrected for inflation. They have used the prices at the time of the estimate. Those estimates proved wrong because there was inflation between the time when they made the estimates and subsequently. There may also have been mistakes in the estimate.

Chairman Proxmire: I understood you to say that the reason for this 4-5/8 instead of perhaps a higher rate is because inflationary factors were eliminated in its application to water projects. Am I wrong?

Mr. Caulfield: Pardon me. I shall go back now. One could have taken the view, for example, in June, as my testimony indicated, one could have said that the discount rate for 1969 should be based on the average of June prices. That would have turned out at 5.5 percent. We found this not to be appropriate, because, in our judgment, 5.5 percent included a substantial expectation on the part of the public of inflation, and that expectation was reflected in the yields on bonds.

> In consequence, we took a figure of 4-5/8 percent, which was the average, based on the average of daily bid prices in 1966. This happens to be the period just before the substantial rise in the Federal bond market.
>
> Now, we have not taken any fixed figure of 4-5/8, sir. What we have taken is a figure starting with 4-5/8 which can change up or down not more than one-fourth point per year. Thus, it will reflect, we trust-this is the proposal and comments can be made upon it-it will reflect the trend, the deflated trend, hopefully the deflated discount rate or the yield rate on Government bonds, staying within that limitation.[1]

Fred S. Hoffman, assistant director of the Office of Management and Budget, also testified that inflation should not be included in the discount rate if project costs and benefits were in constant dollars.

> Senator Jordan: Do you believe a rate should reflect an incremental factor for inflation?
> Mr. Hoffman: If we estimate costs and benefits in constant dollars, then it would be inappropriate to include an allowance for inflation.[2]

If inflation considerations are removed from the discount rate, we are left with a "real rate of interest." Samuelson notes that real interest rates varied from 0 to 4 percent during the twenty-year period from 1959 to 1979.[3] In his standard text on economics, Samuelson states:

> . . . [the] real interest rate is calculated by subtracting from the nominal long-term interest rate on AAA bonds the annual percentage increase in the Consumer Price Index for the previous five years.[4]

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[1]U.S. Congress, Joint Economic Committee, Economic Investment of Public Investment Decisions: Interest Rate Policy and Discounting Analysis, Hearings, pp. 45-46.

[2]Ibid, p. 34.

[3]Paul A. Samuelson, Economics (New York: McGraw-Hill Book Company, 1980), p. 308.

[4]Paul A. Samuelson, Economics (New York: McGraw-Hill Book Company, 1976), p. 329.

A summary of long-term interest on bonds and percent increase in the consumer price index for the past thirty years is provided in Table 3 along with the calculated real interest rate.[1]

Charles Howe has shown that an accurate benefit-cost ratio is obtained as long as either 1) benefits, costs, and discount rate are all inflation free, or 2) benefits, costs, and discount rate are all inflated.[2] The significance of using an inflation-free discount rate stems from longstanding Corps practice to hold benefits and costs of water resource projects free of inflation. Therefore, the discount rate should also be free of inflation.[3] However, the current discount rate of 8-1/8 percent, which would be higher had it not been limited by the one-quarter percent change per year, contains a built-in estimate for inflation.

A review of the literature indicates that although there is considerable debate over which discount rate is appropriate for

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[1]The real interest rate is obtained by averaging the increase in consumer price index increase over the five previous years and subtracting this average from the interest cost on long term government bonds for the current year. For example, the average CPI increase from 1977-1981 was 9.88 percent, which, when subtracted from the long term cost of government bonds in 1982 (12.23), yields a real interest rate of 2.35 percent.

[2]Howe, Benefit-Cost Analysis, pp. 80-81.

[3]It can be shown that results using the current discount rate of 8-1/8 percent with a 5 percent projection of inflation on future costs and benefits would be approximately the same as using a discount rate of 3-1/8 percent without inflating costs and benefits. Since the Corps does not use inflated costs and benefits to calculate a benefit-cost ratio, it is important to use an inflation-free discount rate. Alternatively, an allowance for inflation of future costs and benefits could be made.

TABLE 3

CONSUMER PRICE INDEX INCREASES, LONG TERM GOVERNMENT BOND RATES, AND REAL INTEREST RATES, 1953-1983

Year	CPI	5-Year Average	Bond Yield	Real Interest Rate	Year	CPI	5-Year Average	Bond Yield	Real Interest Rate
1953	0.8	3.54	2.94	-0.60[a]	1968	4.2	2.00	5.25	3.25
1954	0.5	2.18	2.55	0.37	1969	5.4	2.60	6.10	3.50
1955	-0-	2.48	2.84	0.36	1970	5.9	3.42	6.58	3.16
1956	1.5	2.28	3.08	0.80	1971	4.3	4.26	5.74	1.48
1957	3.4	1.00	3.47	2.67	1972	3.3	4.54	5.63	1.09
1958	2.7	1.24	3.43	2.19	1973	6.2	4.62	6.30	1.68
1959	.8	1.62	4.07	2.45	1974	11.0	5.02	6.98	1.96
1960	1.6	1.68	4.01	2.33	1975	9.1	6.14	6.98	0.84
1961	1.0	2.00	3.90	1.90	1976	5.8	6.78	6.78	-0
1962	1.1	1.90	3.95	2.05	1977	6.5	7.08	7.06	-0.02[a]
1963	1.2	1.44	4.00	2.56	1978	7.7	7.72	7.89	0.17
1964	1.3	1.14	4.15	3.01	1979	11.3	8.02	8.74	0.72
1965	1.7	1.24	4.21	2.97	1980	13.5	8.08	10.81	2.73
1966	2.9	1.26	4.66	3.40	1981	10.4	8.96	12.87	3.91
1967	2.9	1.64	4.85	3.21	1982	6.7	9.88	12.23	2.35
					1983	2.4	9.92	10.60	0.68

[a]A negative real interest rate has no meaning in an economics sense. It would imply a preference for a dollar at some future date over a dollar at the present time.

evaluating Federal water projects, little can be found tying the appropriate discount rate to the methodology for calculating benefits of water resource projects. National economic development benefits are calculated on the basis of current price levels. If the benefits are not expected to accrue immediately, they are discounted back to the present, but on the basis of current price levels, not the inflated value of the future benefit. The Corps presently uses a discount rate of 8-1/8 percent, which includes an element of inflation,[1] but uses current price levels to determine the present value of project benefits. The current discount rate of 8-1/8 percent significantly exceeds real rates of interest as defined by Samuelson and as previously calculated and shown in Table 3.

Appendix B provides a simplified example which demonstrates the method employed by the Corps in calculating the benefit-cost ratio using current price levels for benefits and costs brought to a common point in time, i.e., the year project construction has progressed to the point that benefits can be realized. Also included in the appendix are calculations demonstrating the impact of considering inflation beyond the base year of the realization of benefits and the consideration of lower discount rates with and without allowances for future inflation.

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[1]Although long-term interest rates on government bonds have been high in recent years and percentage increases in the consumer price index have been relatively low in 1982 and 1983 using a five-year average, the real interest rate has remained less than 4 percent. Different theories have been advanced to explain the sudden increase in the substantial difference between increases in consumer price index and bond yield in 1982 and 1983. These include an expectation of renewed high inflation rates, Federal Reserve's tight money policy, growing government and corporate demand to refinance old debts, and growing corporate demand to finance or prevent acquisitions.

Table 4 summarizes an array of benefit-cost ratios calculated at discount rates of 8-1/8 percent and 4 percent using various rates of inflation ranging from 0 to 12 percent applied to benefits and operation and maintenance costs.

According to law, the current discount rate used in water resource planning is tied to the long-term cost of government borrowing. The rate used during Fiscal Year 1984 would be in excess of 10 percent, instead of 8 1/8 percent, were it not for the fact that the law restricts the annual change to 1/4 percent per year. No logical argument can be made for tying the discount rate to the long-term cost of government borrowing. The government pays its debts in inflated dollars, not constant dollars. Benefit-cost analyses, on the other hand, are done in constant dollars. Based upon the real rate of interest of 0-4 percent over the past thirty years, it would appear more realistic to perform benefit-cost analysis using a discount rate no higher than 4 percent. This would have the effect of increasing benefit-cost ratios and justifying more and larger projects.[1] Alternatively, the use of discount rates which are higher than the real interest rate would also appear to be reasonable if future allowances for inflation in the benefit-cost ratio calculation were allowed.

An interesting phenomenon has occurred in the past two years. During the period 1982-1983, the annual rate of growth in the consumer price index has declined significantly while interest rates on long-term government bonds have remained high. This follow-

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[1]In the example described, the net effect of a lower discount rate would be to decrease the annual costs and thereby increase the benefit-cost ratio.

TABLE 4

SUMMARY OF BENEFIT-COST RATIOS

	Conditions								
	Base	1	2	3	4	5	6	7	8
Discount Rate (%)	8-1/8	4	4	4[a]	8-1/8	8-1/8	8-1/8	8-1/8	8-1/8
Inflation Rate (%)									
Benefits	0	0	4	12	3	4	5	8	12
Costs	0	0	4	12	3	4	5	8	12
Benefit-Cost Ratio	2.0	4.1	12.6	39.6	3.1	3.7	4.8	11.5	32.1

[a]Inflation rates in excess of the discount rate are not normally considered sensible. This is because of the implication that a constant dollar today is preferred more than a constant dollar in the future.

ed a period (1976-1978) when the real interest rate was at or near 0 percent. Using the five-year average, however, the real rate of interest in 1982 and 1983 is still well within the long-term range of less than 4 percent. Based on current projections of inflation by the administration for the near term, it will be of interest to see whether high rates of interest prevail on government bonds. In the absence of a drop in the rate of long-term government borrowing and assuming inflation rates do not exceed administration projections, the real rate of interest would exceed 4 percent.

Whether the real rate of interest will remain within its historic range of 4 percent or less is unclear at this time. However, it is clear that the formula for calculating the discount rate, while essentially free of inflation when established in 1968, has had a substantial built-in element of inflation since the early 1970s, reaching 4-7 percent during the past five years.

In the absence of a change in the method of calculating the discount rate for water resources planning (and no serious proposal has been made for nearly ten years), the impact of incorporating estimates of inflation in the benefit-cost ratio calculations has been assessed and is shown in Table 4. For example, by computing the benefit-cost ratio using the legal discount rate, but with inflated benefits and costs, there is a significant impact on the benefit-cost ratio. Using the legal discount rate of 8-1/8 percent and a 5 percent inflation rate, the benefit-cost ratio more than doubled in the example shown on the previous

pages. As the assumed inflation rate becomes larger, the benefit-cost ratio increases by a much greater amount.[1]

Consideration of other objectives

Clearly, the use of higher discount rates is supported by those who wish to reduce the universe of projects which reflect a favorable benefit-cost ratio. The use of higher discount rates combined with stricter rules on benefit calculations achieves this objective. It is, therefore, not surprising that members of Congress who view water projects as important to the economy of their areas or to the social well-being of their constituents favor either the use of lower discount rates or the inclusion of benefits which meet broader objectives than national economic efficiency.

A number of arguments advanced for using non-private sector rates[2] involve consideration of the role of government vis-a-vis the private sector. Several members of the Joint Economic Committee expressed such a view. Congressman Patman objected to the argument that the Federal government's use of a lower discount rate than is used by the private sector would depress the size of the national income and sacrifice potential economic growth. His position was that in order to accept a businesslike approach to

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[1]This occurs because for almost all Corps projects, most costs are incurred prior to the base year and are, therefore, not inflated over the life of the project. On the other hand, most benefits are usually realized in the future and are subject to growth for inflation.

[2]Generally, these have been arguments for using rates lower than those which the opportunity cost of displaced private spending would yield.

discount rates for government projects, the following conditions would have to be met:[1]

1. If the non-economic benefits of government projects could be included in the measure of returns.

2. If the measure of return from government projects could also include all the longer-term indirect economic benefits.

3. If all would agree that the size of our national income was the single and uppermost goal of our society.[2]

Congressman Patman's conclusion that none of these conditions have been met led him to oppose using businesslike discount rates for evaluating government projects.[3]

In a similar vein, Senator Sparkman called for a more thorough and balanced investigation of appropriate discount rates to be used for government projects. He argued that whereas private investment seeks only economic efficiency, public investment seeks a mix of economic and social goals. Too little emphasis had been placed on developing a system for measuring the direct and indirect benefits accruing from public investments designed to meet economic and social goals.[4] Senators Symington, Jordan (Idaho), and Percy also had misgivings about using the higher discount rates until a method of quantifying and evaluating the social benefits of public investments was developed.[5]

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[1]Congressman Patman was making the point that these conditions are not being met.

[2]U.S., Congress, Subcommittee on Economy in Government, Economic Analysis of Public Investment Decisions: Interest Rate Polcy and Discounting Analysis, p. 22.

[3]Ibid., pp. 22-23.

[4]Ibid., p. 24.

[5]Ibid., p. 25.

Consideration of objectives other than national economic efficiency not only has been suggested by a number of economists, political scientists, and planners but also has been enacted into legislation by Congress.[1] Even so, the quantification of benefits which support objectives other than national economic development has not been used to any extent in the justification of water projects recommended to Congress for authorization. Marglin discusses income redistribution as an objective in water resource development.[2] Steiner presents an aggregate social welfare function which considers the distribution of political power and influence as a form of social contract wherein particular public decisions are valid only in terms of certain value judgments.[3] In an effort to reconcile such competing objectives, weighting has been suggested. Weisbrod suggests a grand efficiency measure of the desirability of a project by integrating, through a weighting process, considerations of economic efficiency and distributional equity.[4] Whether referred to as secondary, indirect, or induced benefits as Margolis

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[1]River and Harbor Act of 1970, Pub. L. 91-611, Sec. 122; Flood Control Act of 1970, Pub. L. 91-611, Sec. 209; and Water Resource Development Act of 1976, Pub. L. 94-487, Sec. 140.

[2]Stephen A. Marglin, "Objectives of Water Resource Development: A General Statement," in Design of Water Resource Systems, by Arthur Maass, M. Hufschmidt, et al. (Cambridge, MA: Harvard University Press, 1962), pp. 17-87.

[3]Peter O. Steiner, "The Public Sector and the Public Interest," in Public Expenditures and Policy Analysis, ed. by Robert H. Haveman and Julius Margolis (Chicago: Rand McNally College Publishing Co., 1970), pp. 38-40.

[4]Burton A. Weisbrod, "Income Redistribution Effects and Benefit-Cost Analysis," in Problems in Public Expenditure Analysis, ed. by Samual B. Chase (Washington, DC: The Brookings Institution, 1968), pp. 177-209.

does,[1] or merely a non-efficiency objective as Maass argues,[2] the conclusion is the same. There is more consequence from government programs than the traditional benefit-cost analysis performed in the justificaton of water resource projects. The tendency of the Corps to rely upon the national economic development account in justifying water resource projects continued through the 1970s despite the congressional guidance. While the 1973 principles and standards[3] called for presenting information in planning documents on all four accounts specified in Section 209, a benefit-cost ratio above unity calculated under guidelines which quantify national economic development benefits continues to be a practical requirement before a project is recommended to Congress for authorization. The failure to frame a water policy which recognizes differences in government versus the private sector on the issues of the discount rate, multiplicity of planning objectives, and the scope of benefit measurement has resulted in occasional congressional intervention but, for the most part, inaction by the Congress and the Corps.

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[1]Julius Margolis, "Secondary Benefits, External Economies and the Justification of Public Investment," Review of Economics and Statistics, XXXIX (August, 1957), pp. 284-291.

[2]Arthur Maass, "Benefit-Cost Analysis: Its Relevance to Public Investment Decisions," Quarterly Journal of Economics, XLXXX (May, 1966), pp. 208-226.

[3]U.S., Water Resources Council, "Water and Related Land Resources: Establishment of Principles and Standards for Planning," Federal Register, Vol. 38, No. 174, Part III, September 10, 1973, 24778-24869.

Change in Rate Used by Corps of Engineers

Corps policy on the appropriate discount rate prior to 1969 followed the guidance in "The Green Book," Bureau of the Budget Circular A-47, and Senate Document 97. These documents called for using discount rates based upon the average rate payable by the treasury on long-term obligations with fifteen years or more to maturity.[1] The result was that the Corps used rates ranging from 2-1/2 percent in the 1950s to 3-1/4 percent in 1968.

Although appeals to use higher discount rates had been made for a number of years, it was not until December 1968 that a policy decision was made which resulted in a 4-5/8 percent discount rate being used for the remainder of Fiscal Year 1969 and a gradual climb to 7-7/8 percent by Fiscal Year 1983. The discount rate commencing in 1969 was based on the average yield during the preceding fiscal year of marketable securities of the United States which, at the time the computation is made, have fifteen years or more to maturity. The rate is not raised or lowered more than 1/4 of 1 percent for any year.[2]

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[1]See Proposed Practices for Economic Analysis of River Basin Projects, p. 24; Circular A-47, p. 14; and S. Doc. 97, p. 12.

[2]U.S. Water Resources Council, "Plan Formulation Standards and Procedures," Federal Register, December 24, 1968. This action modified Title 18 of the Code of Federal Regulations, Part 704.39, "Discount Rate." An attempt to revise the 1/4 percent maximum change in rate per year to 1/2 percent and to establish a new base discount of 6-7/8 percent was made in 1973. Nonetheless, the December 24, 1968, rule of the Water Resources Council was enacted into law in 1974 and has since prevailed as the method of determining the discount rate to be used for water resource projects. See U.S., Water Resources Council, "Water and Related Land Resources: Establishment of Principles and Standards for Planning," Federal Register, Vol. 38, No. 174, Part III, Sep. 10, 1973, 24822, which called for a maximum 1/2 of 1 percent change in any given year and a 6-7/8 percent discount rate for

The Water Resources Council policy also established the "grandfathering" principle on the use of a discount rate of 3-1/4 percent, the rate in effect on December 24, 1968, for a substantial number of projects. Grandfathering applied to those projects which had been authorized for construction prior to the close of the second session of the 90th Congress, and where the appropriate state or local governmental agency or agencies had given, prior to December 31, 1969, satisfactory assurances to pay the required non-Federal share of project costs. The discount rate to be used in the computation of benefits and costs for such projects was, and still is, the rate in effect immediately prior to the effective date of the new rule. That rate (3-1/4 percent) continues to be used for such projects until construction has been completed, unless the Congress decides otherwise.[1]

It is interesting to note that the Treasury Department advised the Water Resources Council that for Fiscal Year 1970 the appropriate interest rate should have been 5-1/2 percent based on the council's formula, but was raised to only 4-7/8 percent because of the 1/4 of 1 percent limit in the permitted annual change.[2] Further, when the jump from 3-1/4 percent to 4-5/8 per-

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Fiscal Year 1974. This proposal was negated by U.S., Congress, Water Resources Development Act of 1974, Pub. L. 93-251, Mar. 31, 1974, Sec. 80, which established the December 24, 1968, Water Resources Council rule in law. Nevertheless, the executive branch has consistently used the current discount rate in evaluating the benefit-cost ratio of projects being considered as new construction starts.

[1]Pub. L. 93-251, Section 80.

[2]U.S., Water Resources Council, "Policies and Procedures in Plan Formulation and Evaluation of Water and Related Land Resources Projects: Notice of Change in Discount Rate," Federal Register, Vol. 34, No. 139, July 23, 1969, 12198.

cent was made in Fiscal Year 1969, that one-time adjustment was made notwithstanding the 1/4 percent annual adjustment.

The basic change in computing the appropriate discount rate stems from a different view of how the average yield of the long-term government securities is derived. Prior to December 1968, the discount rate was based on the average rate of interest payable by the treasury on interest-bearing marketable securities of the United States outstanding at the end of the fiscal year preceding such computation which, upon original issue, had terms to maturity of fifteen years or more. This is usually called the "coupon rate," which is obtained by dividing the dividend by the face value of the bond. The new formula is based upon the average yield during the preceding fiscal year for similar marketable securities. This rate is usually called the "yield rate" and equals the dividend divided by the market value of the bond. For Fiscal Year 1969 the yield rate was 4-5/8 percent, and it has risen to 8-1/8 percent for Fiscal Year 1984.[1]. The rates in use since December 1968 have been closer to the average estimated current cost to the treasury of long-term borrowing, whereas the old rate was based upon long-term government securities outstanding at the time the calculation was made. It was President Johnson's concept that the new rate be applied to future projects in order to assure the most effective use of Federal funds in the development of the nation's water resources.[2]

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[1]The Fiscal Year 1984 discount rate would be higher except that it is limited by the 1/4 of 1 percent change per year.

[2]U.S., Bureau of the Budget, Press Release, December 22, 1968.

The Bureau of the Budget announcement of the adoption of the new policy mentions grandfathering of projects for which financial commitments were made by 31 December 1969.[1] The Corps interpretation of "financial commitments," as expressed in policy guidance to its field offices, was that the commitment could be in the form of a "suitable assurance" or a "satisfactory assurance" of local cooperation. This Corps policy guidance to its field offices was based on Section (d) of the Water Resources Council regulation which permits the use of a 3-1/4 percent discount rate "for those authorized projects where appropriate non-Federal agencies provided by 31 December 1969 satisfactory assurances to pay the required non-Federal share of project costs."[2] For purposes of uniformity among projects, this requirement for satisfactory assurances has been construed to apply to any item of local cooperation for which formal assurances would normally be obtained prior to initiation of construction.[3] In the case of local protection projects, this generally referred to assurances by the non-Federal sponsors that they would provide necessary lands, easements, and rights-of-way and would agree to operate and maintain the project upon completion of construction. Multiple-purpose flood control reservoirs generally required an indication that the non-Federal sponsor would agree to repay those costs allo-

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[1] Ibid.

[2] U.S., Water Resources Council, "Plan Formulation Standards and Procedures," Federal Register, December 24, 1968.

[3] Letter from Brigadier General F. P. Koisch, Director of Civil Works, U.S. Army Corps of Engineers, to Division Engineers, February 3, 1969.

cated to vendible project purposes. The Corps policy guidance provided the district engineers with a sample form which, if signed by the appropriate local non-Federal official by 31 December 1969, would constitute a suitable basis for "grandfathering" the discount rate at 3-1/4 percent. This form, properly executed, expressed a willingness to comply with the requirements of local cooperation at the appropriate time and was sufficient to "grandfather" the discount rate.

In the calculation of estimated annual benefits and costs for Corps projects, the appropriate discount rate used is determined by one of the following three rules:

1. If the project was under construction in 1969 or prior, the discount rate used is that in effect when initial construction funds were appropriated. This means 3-1/4 percent, the rate in effect in 1969, or lower rates ranging downward to 2-1/2 percent. The rate remains in effect for the duration of construction.

2. If the project was authorized for construction by the close of the second session of the 90th Congress and adequate assurances of local cooperation were provided to the Corps by 31 December 1969, or if there are no requirements of local cooperation, the discount rate used in calculating annual benefits and costs is 3-1/4 percent. This rate was in effect immediately prior to 24 December 1968. Projects falling into this category are said to have their discount rate grandfathered, i.e., 3-1/4 percent regardless of when construction is ultimately undertaken.

3. All projects not falling into categories "1" and "2" above are said to have a floating discount rate, which in any particular year is the current rate used in project formulation and benefit-cost analysis. This rate generally has climbed 1/4 of 1 percent per year since the second half of Fiscal Year 1969 when the rate was 4-5/8 percent. The rate used for a particular project remains constant once a project receives its initial appropriation of constructon funds.[1]

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[1]U.S., Congress, Water Resources Development Act of 1974, Pub. L. 93-251, March 31, 1974, Sec. 80, and Corps implementing policy guidance. The most recent guidance is contained in U.S., Department of the Army, Engineer Regulation 1105-2-40: Economic Considerations (Washington, DC, Jan. 8, 1982), pp. 3-1 to 3-3.

A summary of discount rates used by the Corps in benefit-cost analysis is shown in Table 5 and reflects the increase from 2-1/2 percent used in the 1950s to 8-1/8 percent used during Fiscal Year 1984.

TABLE 5

DISCOUNT RATES USED IN CALCULATING ESTIMATED ANNUAL BENEFITS AND COSTS ON CORPS OF *ENGINEERS CIVIL WORKS PROJECTS*

Fiscal Year of Analysis	Discount Rate (percent)
1957	2.500
1958	2.500
1959	2.500
1960	2.500
1961	2.625
1962	2.625
1963	2.875
1964	3.000
1965	3.125
1966	3.125
1967	3.125
1968	3.250
1969	3.250/4.625
1970	4.875
1971	5.125
1972	5.375
1973	5.500
1974	5.625
1975	5.875
1976	6.125
1977	6.375
1978	6.625
1979	6.875
1980	7.125
1981	7.375
1982	7.625
1983	7.875
1984	8.125

Note: Discount rates were increased 1/4 of 1 percent each year from the second half of Fiscal Year 1969 when the rate was established at 4-5/8 percent to 7-7/8 percent in Fiscal Year 1983 except for Fiscal Years 1973 and 1974 when the rate was increased by 1/8 of 1 percent. The fiscal year of analysis refers to the point in time when the calculations are actually made and are based on price levels in effect at that time. For example, Fiscal Year 1984 budget data are based on October 1982 price levels, and the benefit-cost ratios presented to Congress for new construction starts were calculated using a discount rate of 7.875 percent, the rate in effect in Fiscal Year 1983, when the Fiscal Year 1984 budget was submitted to Congress.

Consequences of Change

A thorough explanation of the consequences of changes in the discount rate requires a further discussion of the specific methodology with attention to the impact of the discount rate on project formulation. The impact of changes in the discount rate varies significantly as between a single-purpose flood damage prevention project and a multiple-purpose reservoir project. An increase in the discount rate generally results in an increase in such benefits as water supply and hydropower.[1]

Average annual flood damage prevention benefits are affected by the discount rate only when the value of the benefits is expected to grow in the future. When no projected growth is considered, the discount rate has no bearing on the calculated value of the benefits. Nevertheless, the discount rate has a profound effect on the benefit-cost ratio of flood damage prevention projects because the rate affects the annual cost, the denominator in the calculation of the benefit-cost ratio. The annual costs consist of 1) a capital recovery of the sum of the cost of construction and interest during construction, plus 2) an estimate of annual operation and maintenance, plus 3) average annual major replacement costs at current price levels, and 4) an

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[1]The value of benefits provided by these project purposes is a function of the least costly alternative. This generally entails evaluating the cost of the most likely alternative to be implemented in the absence of the Corps multiple-purpose project, e.g., a fossil-fuel power plant. Since the cost of this alternative would be derived using the higher discount rate, the benefit, measured as the savings realized by constructing the hydroelectric power plant, would also increase.

estimate of certain external diseconomies. All of the investment costs are converted to the present worth in the base year of project operation, i.e., the year that benefits theoretically start to accrue. The annual costs of traditional flood damage prevention projects are influenced mostly by the capital recovery factor, which is expressed as

$$\frac{i(1+i)n}{(1+i)^n - 1}$$

The capital recovery factor is actually the sum of a sinking fund factor plus a return on investment. Conceptually, it involves the replacement of the original amount invested plus a return on the investment, both being provided by annual sums during the life of the project. Stated mathematically, it is:

$$P\frac{i}{(1+i)^n - 1} + Pi = Pi\left(\frac{1}{(1+i)^n - 1}\right) + 1$$

$$= \frac{Pi}{(1+i)^n - 1}[1+[(1+i)^n - 1]] = \frac{Pi}{(1+i)^n - 1}(1+i)^n =$$

$$\frac{Pi\,(1+i)n}{(1+i)^n - 1}$$

Where P = the estimated construction cost plus interest during construction;[1] i = the applicable discount rate and n = the economic life of the project.

For the projects of longer life (100 years), the capital recovery factor approximates the discount rate, particularly as the rate increases. For a 3 percent discount rate, the capital recovery factor based upon a project life of 100 years is 0.03165 and for 7 percent, it is 0.07008. For a typical local flood protec-

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[1]The designation P shown here is identical to total investment cost (TIC) shown in the example in Appendix B.

tion project grandfathered at a 3-1/4 percent discount rate, the annual costs would be less than half the annual costs of a project analyzed on the basis of the current discount rate.[1]

The fact that estimated annual costs are dramatically altered by significant changes in the discount rate may result in a different project being formulated when higher discount rates prevail. Mugler discusses in detail the impact of higher discount rates on various purposes provided by Corps projects.[2] In the case of flood damage reduction projects, the discount rate has a bearing on several factors in the formulation of alternative plans and selection of a recommended plan. These include the relative proportion of first costs to annual operation and maintenance costs and the pattern, or "stream," of costs over time compared with the stream of benefits.

In the case of a multiple-purpose reservoir which provides flood damage reduction benefits and other benefits such as water supply, hydroelectric power, and recreation, the use of a higher discount rate during project formulation has a significant bearing on cost allocations and the scale of the project. The capital-intensive nature of a reservoir project and the long life make it sensitive to changes in discount rate. With a high dis-

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[1]Annual operation and maintenance costs are recurring and are not discounted in determining annual costs. However, they generally are a relatively small amount compared with the component of the annual cost derived by multiplying the capital recovery factor times the investment cost (cost of design, lands, construction, plus interest during construction).

[2]Mark W. Mugler, Effect of the Discount Rate on the Civil Works Program. Prepared for the U.S. Army Corps of Engineers, Engineer Institute for Water Resources, Policy Study 82-0900, July 1982.

count rate, the present worth of benefits attributable to water supply deliveries, flood damage reduction, or recreation which begin far in the future will be significantly reduced.[1] Benefits which accrue early in the life of a project will not be as adversely affected. Figure 10 illustrates this point. The present worth of a dollar of benefit which will be realized commencing in the twenty-fifth year of a project life is equal to approximately $0.54 at a 2-1/2 percent discount rate, but only $0.15 using a discount rate of 7-7/8 percent. One dollar of benefits accruing after two years of project life will have a present worth of $0.95 and $0.86 at 2-1/2 percent and 7-7/8 percent, respectively.

The impact of higher discount rates on the benefit-cost ratio should be viewed from several perspectives. Normally, when a project has been formulated, increases in the discount rate used in annual updates of the benefit-cost ratio do not result in a major redesign to maximize net economic development benefits. For example, a project authorized in December 1970, when the discount rate was 5-1/8 percent, which is being considered as a new construction start for Fiscal Year 1984 using a discount rate of 7-7/8 percent, will not necessarily undergo a reformulation to maximize net economic development benefits at the higher discount rate. The fact that the discount rate used does not change by more than 1/4 of 1 percent in any year tends to minimize this potential problem. Even authorized but unstarted projects which are legally grandfathered to use a discount rate of 3-1/4 percent,

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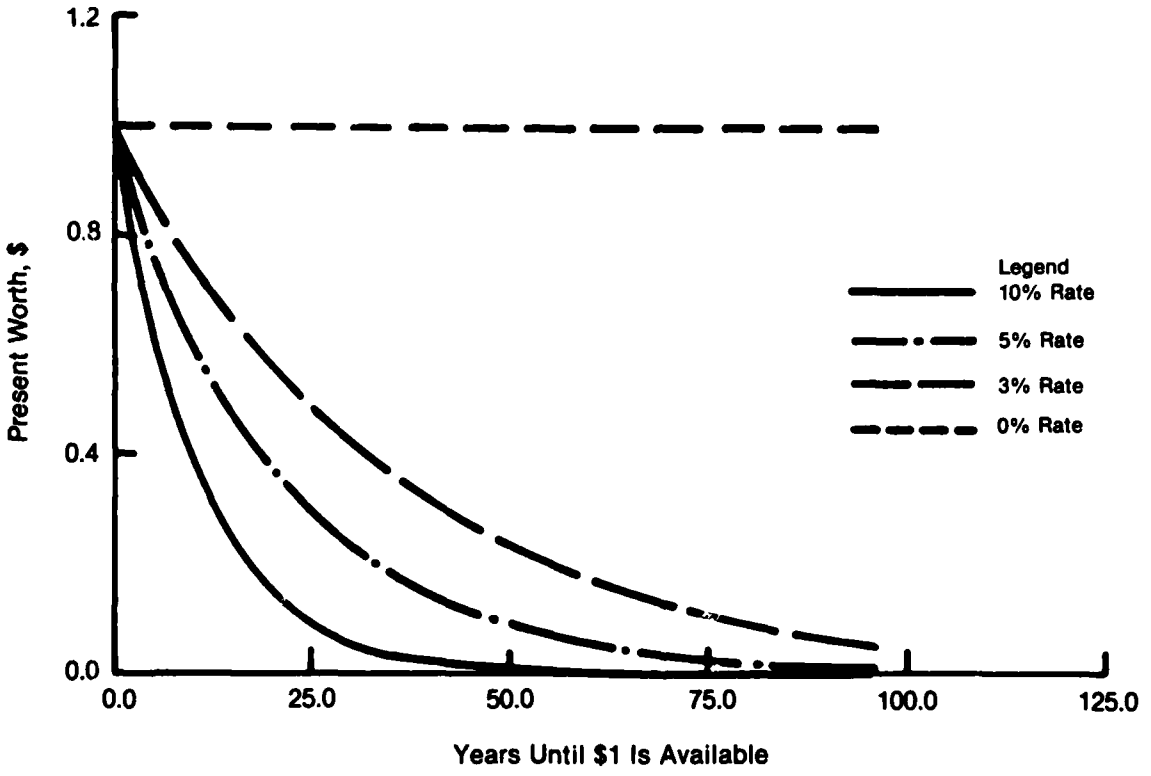
[1] Ibid., p. 10.

FIGURE 10

PRESENT WORTH OF ONE DOLLAR AT VARIOUS DISCOUNT RATES



but which are evaluated at the current rate when considered as potential new construction starts, do not normally undergo a reformulation. Instead a series of calculations are performed at the higher discount rate.[1]

From a theoretical viewpoint, the use of higher discount rates in the project formulation stage may well result in selection of a different project from the project recommended using the legal discount rate. Mugler illustrates the difference in selection of the size of a plant to pump flood waters impounded behind a levee in the Yazoo River basin of Mississippi. Table 6 offers a comparison of plans at the authorized discount rate of 2-1/2 percent and at 7-5/8 percent. The table illustrates that at the lower discount rate net economic development benefits are maximized at a considerably larger pump plan than at 7-5/8 percent. Further, the benefit-cost ratio at the higher discount rate is considerably lower than at the authorized rate.

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[1]The dilemma facing the Corps in such situations is that the legal discount rate supported by the appropriations committee may be 3-1/4 percent, while the rate used to evaluate new starts by the executive branch is the current rate (8-1/8 percent during Fiscal Year 1984). The size of the project and cost allocation could be considerably different when formulating projects using such a disparate discount rate.

TABLE 6

COMPARISON OF PLANS AT TWO DISCOUNT RATES,
YAZOO AREA PUMP STUDY

Plan Capacity (cfs)	2-1/2% Discount Rate: Plan First Cost ($000)	Annual Cost ($000)	Annual Benefits ($000)	Net Benefits ($000)	Benefit-Cost Ratio	7-5/8% Discount Rate: Annual Cost ($000)	Annual Benefits ($000)	Net Benefits ($000)	Benefit-Cost Ratio
10,000	86,800	3,851	14,305	10,454	3.7	8.684	12,666	3,982	1.5
15,000	126,200	5,801	19,902	14,101	3.4	12,828	17,984	4,766	1.4
17,500	147,400	6,787	22,825	16,038	3.4	14,994	20,143	5,149[a]	1.3
20,000	175,400	7,949	25,347	17,398	3.2	17,715	22,368	4,653	1.3
25,000	212,900	9,639	28,310	18,671[a]	2.9	21,493	24,989	3,496	1.2
30,000	250,600	11,142	29,412	18,270	2.6	25,095	25,957	862	1.0

[a]Optimum Plans

Source: Lower Mississippi Valley Division, U. S. Army Corps of Engineers.

Dimensions of Flood Damage Prevention Benefits

While the calculation of average annual costs discussed earlier in this chapter is relatively straightforward, the quantification of average annual benefits is considerably more complex and frequently subject to judgment and assumptions on the part of Corps planners and engineers. The policy guidelines under which flood damage prevention benefits are estimated have undergone notable change in the post-NEPA era. These changes, together with the basic method of calculating benefits from flood damage prevention, are presented to provide a more comprehensive understanding of the Corps flood damage prevention program, to focus attention on the subjectivity involved in calculating flood damage prevention benefits, and to assess policy changes and resultant outputs against the evaluation criteria.[1]

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[1]Since the general principle of measuring benefits is to evaluate the "with" and "without" project conditions, changes in assumptions as to each condition can materially affect the calculations of benefits.

Pre-NEPA Policy Documents

A review of the policy guidance used for estimating benefits reflects profound philosophical changes. Initially, the Corps concern in formulating flood control projects was how to provide structural protection to urban and non-urban areas subject to periodic flooding.

"The Green Book"

In 1950, a report entitled "Proposed Practices for Economic Analysis of River Basin Projects" was prepared by the Subcommittee on Benefits and Costs of the Interagency Committee on Water Resources after consideration of the benefit-cost practices then in use and after an objective analysis of the economics of river basin projects uninfluenced by those practices or by legal and administrative limitations.[1] The report was adopted in 1950 by the Federal Inter-Agency River Basin Committee as a basis for consideration by the participating agencies in their respective fields of activity relating to river basin development.[2] The report was reissued with revisions in 1958 and served as a basis for consideration by participating agencies in the evaluation of river basin developments.[3]

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[1]Federal Inter-Agency River Basin Committee, Subcommittee on Evaluation Standards, Proposed Practices for Economic Analysis of River Basin Projects (Washington, DC: Government Printing Office, May 1958), p. III. This document is commonly referred to as "The Green Book."

[2]Ibid.

[3]Ibid., p. VII.

Circular A-47

In 1952, the Bureau of the Budget issued Circular A-47, entitled "Reports and Budget Estimates Relating to Federal Programs and Projects for Conservation, Development, or Use of Water and Related Land Resources." The circular was intended to bring together certain existing policies of the President and to fashion modified standards for action on project reports. Circular A-47 was intended to provide agencies standards by which the Executive Office of the President would review reports and budget requests of the agencies. The Bureau of the Budget was, in effect, promulgating uniform policies which would be used for establishing priorities for projects yielding the greatest value to the nation and securing effective resources development at minimum necessary cost.[1]

Both "The Green Book" and Circular A-47 defined flood control benefits to be included in the economic evaluation as consisting of the following:

1. Reduction of flood damages, measured as the cost of replacing, repairing, or rehabilitating the affected property throughout the life of the project with and without the project. Where replacement or repair is impracticable or unlikely, the damage would be the reduction in the value of the property. Benefits also could include cost avoidances such as the cost of evacuation and reoccupation of flooded areas; cost of emergency flood protection and flood fighting; cost of relief, care, or rehabilitation of flood victims; and lost income or increased cost of doing business during floods.

2. Increases in the expected net income obtained directly from changed use of the property made possible by any form of flood control. The benefits could be measured by the increased

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[1]U.S., Bureau of the Budget, Circular A-47 (Washington, DC, December 31, 1952), p. 1.

market value or increased income of land with flood protection.[1]

Circular A-47 also laid the groundwork for non-structural solutions as a substitute or as a supplement to traditional flood control structures.[2] Such guidance was not widely used in formulating Corps projects in the 1950s.

Senate Document 97

In 1962, Federal water resource agencies adopted new policies, standards, and procedures to be used in the formulation, evaluation, and review of plans prepared and submitted by the agencies.[3] The planning objectives with respect to flood control or prevention measures were essentially the same as in earlier guidelines. Flood control and prevention benefits were to consist of a reduction in damage from inundation plus increases in the net return from higher use of property made possible as a result of lowering the flood hazard.[4] Senate Document 97 cites as an objective of planning the well-being of all of the people as the overriding determinant in considering the best use of water and related land resources. It exhorts agencies to consider hardship and basic needs of particular groups, while avoiding

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[1]Circular A-47, p. 7, and Proposed Practices for Economic Analysis of River Basin Projects, pp. 37-39.

[2]Circular A-47, pp. 15-16.

[3]U.S., Congress, Senate, Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for the Use and Restoration of Water and Related Land Resources, S. Doc. 97, 87th Cong., 2d sess., 1962, p. 10.

[4]Ibid., p. 10.

resource use and development for the benefit of a few or the disadvantage of many.[1]

The document established a general setting based on "the expectation of an expanding national economy in which increasing amounts of goods and services are likely to be required to meet the needs of a growing population, higher levels of living, international commitments and continuing economic growth."[2] Comprehensive planning was stressed, including full consideration of recreational opportunities, water supply benefits, water quality control benefits, and hydroelectric power benefits. The implication clearly was a framework in which multiple-purpose reservoir projects were desirable solutions to flooding and other water resource needs.

Senate Document 97 supported the development of larger projects than justified by traditional economic analyses where the threat to lives, health, and general security is posed by larger floods.[3] Long-range needs were to be considered, even when foreseeable, only in general terms and when enlargement would be more costly.[4]

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[1] Ibid., p. 2.

[2] Ibid., p. 5.

[3] Ibid., p. 8. This is consistent with Corps policy that subsequently evolved urging standard project flood (SPF) level of protection in urban settings involving levees, floodwalls, and high-velocity channels.

[4] Philosophically, this guidance urged Corps planners to view water supply and electric power needs well into the future and to maximize physical opportunities of reservoir sites.

Senate Document 97 was the basic guideline used in formulating and evaluating Corps projects in 1970. It was supplemented by Corps regulations providing a greater degree of specificity in calculating benefits and costs and in allocating them to various project purposes. Corps Engineer Regulation (ER) 1120-2-113 specified in somewhat greater detail guidelines for presenting benefits in survey reports that recommended improvements for flood control and hurricane protection.[1] Of particular importance was the allowance of additional benefits resulting from development potentials created by the project. Schultze points out the growing tendency in the 1960s to justify flood control projects on the basis of protecting land for future development.[2] A comparison of benefits of Corps projects authorized in the Flood Control Act of 1941 versus the Flood Control Act of 1965 reveals that less than 10 percent of the flood control benefits in 1941 were derived from increased development compared with over 40 percent in 1965.[3]

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[1]U.S., Department of the Army, Engineer Regulation 1120-2-113: Presentation of Flood Control Benefit and Hurricane Damage Prevention Estimates in Survey Reports (Washington, DC, June 16, 1968).

[2]Charles L. Schultze, The Politics and Economics of Public Spending (Washington, DC: The Brookings Institution, 1968), p. 108; Charles L. Schultze, Edward K. Hamilton, and Allen Schick, Setting National Priorities: The 1971 Budget (Washington, DC: The Brookings Institution, 1970) p. 166; and Charles L. Schultze, "The Role of Incentives, Penalties, and Rewards in Attaining Effective Policy," in Public Expenditures and Policy Analysis, ed. by Robert H. Haveman and Julius Margolis (Chicago: Rand McNally College Publishing Company, 1970), p. 149.

[3]U.S., Congress, House, A Unified National Program for Managing Flood Losses, H. Doc. 465, 89th Cong., 2d sess., 1966, p. 10.

Post-NEPA Policy Documents

Aside from the higher discount rate, there were several changes in the post-NEPA period which generally tend to make the economic justification of a project more difficult. These changes pertain to assumptions as to the without-project conditions and to the validity of or method of calculating certain types of benefits. Two major changes were the treatment of benefits based on future development and granting to the Environmental Protection Agency in 1972 the responsibility for determining "the need for, the value of and the impact of, storage for water quality control" in Corps reservoirs.[1]

Future flood damage prevention benefits

Prior to 1973, benefits for protection of future development in an area being considered for a flood damage prevention project were more broadly calculated. Corps planning guidance permitted inclusion of benefits attributable to:

1. Prevention of damage to additional development anticipated during the period of economic analysis even if flood protection were not provided.

2. Development potentials created by the project, normally resulting from changes or intensification in land use made possible by the project.[2]

In evaluating these benefits, the without-project conditions were left to the discretion of the Corps planners. For example, the assumed development of vacant land in the flood plain

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[1]Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500, 86 Stat. 817, 33 U.S.C. 1251.

[2]U.S., Department of the Army, Engineer Regulation 1120-2-113: Presentation of Flood Control Benefit and Hurricane Damage Prevention Estimates, p. 2.

without the project may have been reasonable based upon experience elsewhere or based upon market pressures for certain land uses.

However, the view grew that such development may actually be an unwise use of the flood plain. The recognition that annual losses from floods were increasing, while at the same time the development of property with exposure to flood damage was being financed to a degree by the Federal government, led to enactment of the Flood Disaster Protection Act of 1973.[1] One purpose of this act is to require states or local communities, as a condition of future Federal financial assistance, to participate in the flood insurance program and to adopt flood plain ordinances with effective enforcement provisions consistent with Federal standards to reduce or avoid future flood losses.[2]

The Corps continued to allow the inclusion of benefits based upon future development until 1975. Engineering Regulation (ER) 1105-2-351, dated 13 June 1975,[3] superseded ER 1120-2-113 and, in effect, prohibited Corps planners from including future flood control benefits in the flood plain when not consistent with strategies for flood plain management and the Flood Disaster Protection Act of 1973. This significant change occurred because it was now assumed that there would be strategies for flood plain management by means of the adoption and enforcement of land use regu-

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[1]Flood Disaster Protection Act of 1973, Pub. L. 93-234.

[2]Ibid., 87 Stat 976, Sec. 2(b).

[3]U.S., Department of the Army, Engineer Regulation 1105-2-351: Evaluation of Beneficial Contributions to National Economic Development for Flood Plain Management Plans (Washington, DC, June 13, 1975).

lations.[1] The without-project condition is based upon the assumption that individuals will undertake certain measures anyway to reduce flood hazards by flood proofing or elevating new structures to at least the 100-year flood level. This means that undeveloped land on the fringes of an urban area may be assumed to be developed in the future as appropriate. However, by providing flood protection, the only benefit that may be claimed within an area that formerly was within the 100-year flood plain is the savings in flood proofing or elevating of structures which will no longer be needed with a flood control project.

The basic assumption is that any development in vacant land within the 100-year flood plain with a Corps project would be compatible with Executive Orders 11988 and 11990 and Public Law 92-234. The rationale for this policy is straightforward. It is based upon the fact that the flood hazard has increased in recent years despite the construction of billions of dollars of flood protection works in the past four decades. People have moved into flood-prone areas faster than flood protection works have been built. Further, there is a separation of costs and benefits. The general public bears most of the costs of flood control projects while individuals in the protected area receive the benefits.[2] By applying pressure on communities that already have a flooding problem, prompting them to purchase flood insurance and to adopt sound land use and control measures, the emphasis was placed on fu-

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[1] Ibid., p. 5-4.

[2] U.S., Congress, Senate, Flood Disaster Protection Act of 1973, S. Rept. 583 to Accompany H.R. 8449, 93d Cong., 1st sess., 1973, pp. 3-4.

ture construction or improvement within the 100-year flood plain. Flood insurance for existing development in the 100-year flood plain could be purchased at subsidized rates. However, financial assistance for acquisition or construction purposes would only be made by the Federal government in cases involving an activity within the 100-year flood plain if flood insurance were purchased in an amount at least equal to its development or project cost.[1] Furthermore, any new construction undertaken in the 100-year flood plain would be required to apply flood proofing, elevating of structures, or other flood protection measures to new construction or rehabilitation.[2]

In December 1979, revised and more specific guidelines for evaluation of national economic development (NED) benefits were issued by the Water Resources Council. The procedures were to be used for Level C studies,[3] which generally are the basis for authorization of Corps projects by Congress. These guidelines were designed to provide Federal agencies with a set of procedures which would ensure that NED benefits and costs are estimated using the best current techniques and are calculated accurately, consistently, and in compliance with the principles and standards as

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[1]Flood Disaster Protection Act of 1973, Pub. L. 93-234, 82 Stat. 572, 42 U.S.C. 4001.

[2]U.S., President, Executive Order 11988, "Flood Plain Management," May 24, 1977.

[3]Level C studies are those which lead to the preparation of reports which become the basis for the authorization of projects. They are distinguished from Level A and B studies, which are more concerned with basin-wide water resource problems but are not project oriented.

well as other economic evaluation requirements.[1] Of primary importance was the reiteration that the same conditions underlie the with-project and without-project conditions. Executive Orders 11988 and 11990 and Public Law 93-234 were to be considered under each condition. Further, several specific non-structural measures were to be considered fully and equally with structural alternatives.[2]

In 1983, the Reagan administration announced the repeal of the principles and standards and their replacement with principles and guidelines.[3] The actual NED benefit evaluation procedures for potential flood damage reduction projects remained essentially the same;[4] they are described in some detail later in this chapter and in Appendix C.

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[1]U.S., Water Resources Council, Final Rule, "Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning (Level C)," Federal Register, IX, Vol. 44, No. 242, Dec. 14, 1979, 72931-72937.

[2]Ibid., p. 72931.

[3]U.S. Water Resources Council, Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (Washington, DC: Government Printing Office, 1983), pp ii-v.

[4]A comparison of the flood damage prevention benefit evaluation procedures in the 1979 principles and standards versus the 1983 principles and guidelines reveals virtually no substantive change. However, in the principles and guidelines there appears to be an implied recognition of the limitations in which non-structural solutions would be economically feasible. The principles and standards called for "full and equal consideration" to be given to structural and non-structural alternatives. The principles and guidelines merely call for consideration of both types of alternatives. (Compare the with-project conditions described under NED benefit evaluation procedures for urban flood damage in the principles and standards versus the principles and guidelines).

An important change in the principles and guidelines is the emphasis placed on selection of the national economic development plan. While the principles and standards encouraged selection of the NED plan, an alternative other than the NED plan could be recommended. This would be appropriate to achieve a greater level of service to the environmental objective or to satisfy other project-scaling criteria such as those used to determine project design flood in the interest of greater safety for the lives and property of the people protected.[1] The principles and guidelines permit recommending an alternative to the NED plan. However, approval of an alternative may be granted by a secretary of a department or agency head, but only when there are overriding reasons.[2]

Water quality storage benefits

For a number of years prior to passage of Public Law 92-500, the Corps included storage for water quality control, where appropriate, in design of multiple-purpose reservoir projects. "The Green Book," Bureau of the Budget Circular A-47, and Senate Document 97 all treated water quality control benefits as legitimate benefits. This view was based on the contribution to public health, safety, economy, and effectiveness in use of and enjoyment of water for all purposes which are subject to detriment or betterment by vir-

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[1]Federal Register, Dec. 14, 1979, p. 72916.

[2]Principles and Guidelines, p. v. This is a major philosophical change in formulating urban flood damage prevention projects. Recommending a level of protection greater than the NED plan was encouraged or at least recognized as a justified measure in policy documents for many years. See, for example, Senate Document 97, page 7. Corps policy also has called for a high degree of protection.

tue of change in water quality.[1] The Corps and other Federal water resource agencies were encouraged by legislation to include storage for regulation of streamflow for the purpose of water quality control, with the proviso that it not be a substitute for adequate treatment or other methods of controlling waste at the source.[2] Public Law 87-88 differed from Public Law 92-500 in that the former placed the responsibility of determining the need for storage in Federal reservoirs with the water resource agency (based on advice from the Secretary of Health, Education and Welfare);[3] Public Law 92-500 stated that the need for such storage was the responsibility of the Environmental Protection Agency.[4]

During the 1960s, the size of Federal grants programs for waste treatment plants was relatively small compared with the massive infusion of Federal funds that followed the passage of Public Law 92-500. Generally, the Secretary of Health, Education and Welfare, and subsequently the Secretary of Interior, supported Corps recommendations calling for the inclusion of water quality control storage in Corps reservoirs when proposed for congressional authorization. Since the enactment of Public Law 92-500 in 1972, EPA has consistently used its veto power and has not approved

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[1]See Circular A-47, p. 9; "The Green Book," p. 45; and especially S. Doc. 97, p. 9.

[2]U.S., Congress, Federal Water Pollution Control Act Amendments of 1961, Pub. L. 87-88, Sec. 2.

[3]Ibid.

[4]Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500, Sec. 102(a)(3).

the inclusion of storage for water quality control in Corps multi-purpose reservoirs. The reason that EPA has not approved water quality storage in Corps reservoirs since the enactment of Public Law 92-500 is based upon the difference in objectives between the Federal Water Pollution Control Act Amendments of 1961 versus the 1972 amendments. The 1961 amendments merely established a basis for inclusion of water quality control storage and benefits in Corps multiple-purpose reservoir projects. The 1972 amendments, however, stated that the objective of the act "is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." In order to achieve this objective, one of the goals of the act was "that the discharge of pollutants into the navigable waters be eliminated by 1985."[1] Based on EPA's expectation of meeting that goal through its grant program for waste treatment works and through the control of sources of pollutants entering streams, water quality storage in Corps reservoirs was not deemed necessary. Philosophically, EPA administrators were of the opinion that the approval of water quality control storage in Corps reservoirs would detract from the emphasis EPA was placing upon the construction of waste treatment plants for handling municipal and industrial wastes. Water quality control storage implied dilution of pollution.[2]

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[1]Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500, Sec. 101(a)(1).

[2]In a memorandum dated January 16, 1973, to all regional administrators from William D. Ruckelshaus, administrator of the Environmental Protection Agency, a new policy consistent with Public Law 92-500 on storage and releases for water quality

More than nine years after enactment of Public Law 92-500, there appears to be a considerable shortfall in meeting the national goal of eliminating the discharge of pollutants into navigable streams by 1985. The General Accounting Office estimated in 1977 that less than 50 percent of the pollutants entering the nation's waterways were from regulated point sources and municipal treatment plants. The remaining pollutants enter navigable waters from nonpoint sources and cannot reasonably be controlled by the construction of waste treatment plants.[1] The Council on Environmental Quality stated in its 1980 Annual Report:

> . . . nonpoint source water pollution is among the most challenging of pollution problems. In contrast to the important progress made during the 70's in controlling industrial point source discharges and in upgrading municipal sewage treatment facilities, progress with nonpoint sources is negligible.[2]

The report goes on to say that "if the nation is to achieve clean water goals, currently uncontrolled nonpoint sources must be

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control in all reservoirs planned by Federal agencies was announciated. While the guidelines recognized that not all pollutants could be reasonably treated or controlled at the source, particularly those in nature, the emphasis was on a policy requiring pollutant reduction from at-source controls or treatment methods prior to consideration of reservoir storage and releases for water quality control. Reservoir storage was generally considered a poor substitute for at-source pollution control measures. Since that time, water quality control storage has not been approved for Corps reservoirs.

[1]U.S., Comptroller General, National Water Quality Goals Cannot be Attained without More Attention to Pollution from Diffused or "Nonpoint" Sources, Report No. CED-78-6 (Washington, DC: General Accounting Office, 1977), pp. 15-30.

[2]U.S., Council on Enviromental Quality, Environmental Quality--1980, The Eleventh Annual Report of the Council on Environmental Quality (Washington, DC: Government Printing Office, 1980), p. 133.

controlled."[1] After nine years of implementing Public Law 92-500 and total expenditures of over $30 billion, the EPA program appears to be falling far short of achieving its objective. Furthermore, sophisticated waste treatment plants frequently create an excessive financial burden on municipalities as they operate and maintain the plants.[2]

Despite the EPA veto since 1972, the Corps position remains: dilution can make a contribution toward the solution of pollution and, conversely, the treatment option is a partial solution to pollution. Water quality storage can be used to augment flows during a variety of critical instream water quality conditions. These include:

1. Providing firm flows during drought or near-drought conditions to dilute treatment plant effluent and nonpoint source pollution.

2. Providing dilution flows as an economically preferred trade-off to costly and/or impractical levels of advanced treatment.

3. Providing dilution flows for accidental pollutant overloads, including toxic spills.[3]

These dilution flows combined with urban and rural land use management practices can be complementary to wastewater treatment systems.[4]

The EPA decision to exclude water quality control storage from Corps reservoirs has had adverse consequences on the Corps

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[1] Ibid.

[2] Ibid., pp. 122-123.

[3] U.S., Department of the Army, Corps of Engineers, Office of Policy Staff Paper, Dean Pappas, "Water Quality Storage in Corps Reservoirs?," October 1981, pp. 7-8.

[4] Ibid.

flood control program. A number of multipurpose reservoirs that had been authorized with flood control as a project purpose were no longer economically justified without the water quality control benefits. In many instances the flood control benefits that would be provided were for small towns and agricultural areas; separate flood control measures such as levees were not an economic substitute. To date, no Corps reservoir projects that were adversely affected by Section 102(b) of Public Law 92-500 have been constructed. On balance, opposition to such projects on other grounds frequently contributed to the failure of the project to be implemented.[1] In contrast, those reservoir projects with water quality storage benefits that were grandfathered by virtue of having received construction funds by October 18, 1972, generally have been implemented and are producing their intended benefits.[2]

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[1]Refer to the analysis of project data in Chapter V which points to the general withdrawal of public support for new reservoir projects.

[2]An analysis of these projects is discussed in Chapter V.

Types of Benefits

Since flood control became a Corps responsibility on a national scale in 1936, benefits have been calculated virtually entirely in accordance with the national economic development (NED) objective. The NED account accepts only those benefits which increase the value of the nation's output of goods and services and improve national economic efficiency. Flood damage prevention projects contribute benefits to this objective by increasing the productivity of the land or by reducing the costs of using the land resources, thereby releasing resources for production of goods and services elsewhere. NED benefits are categorized according to their effect: inundation reduction benefits, location benefits, or intensification benefits.[1]

Inundation reduction benefits

Inundation reduction benefits capture the value of reducing or modifying the flood losses to the economic activity using the flood plain without a project. The economic losses that can be expected to occur without the project are compared with those with the project. The value of the property is of primary importance in quantifying this benefit. The protection of an expensive house results in a greater benefit than the protection of a more modest one. When extended to entire communities, the difference in benefits can be of great magnitude. Similarly, when protection is rendered to rural areas, the difference in the market value of the

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[1]U.S., Department of the Army, Engineer Regulation 1105-2-351: Evaluation of Beneficial Contributions to National Economic Development for Flood Plain Management Plans (Washington, DC, June 13, 1975), Chapter 4.

land with and without a project is a key factor in estimating the value of inundation reduction benefits.

Location benefits

Location benefits are the value of making flood plain land available for new uses by reducing flood hazards to activities which would use the flood plain only with protection. The benefit is the increase in net income of the new activities less the decrease in net income of the displaced activities. An example is when a plan permits industrial use of a flood plain which would be in agricultural use or vacant without the plan.

Intensification benefits

Intensification benefits are a measure of the value of a plan to activities which are enabled to use their land more intensely. An example in an urban setting would be homeowners' reluctance to renovate older homes or to utilize land available for expansion because of a flood threat. The removal of the threat results in an intensification benefit. In an agricultural setting, an example of an intensification benefit is where the reduction in the risk of flooding permits a user to invest additional labor or capital in the land, thereby producing higher crop yields or converting woodland or pasture to crops.

Basis for Evaluation

The evaluation procedure currently used in computing urban flood damage prevention benefits involves ten steps as indicated in Figure 11. The steps are designed primarily to determine land use and to relate such use to the flood hazard from a perspective of national economic development.[1]

Appendix C is a detailed description which helps to focus on the steps leading up to the tenth step, the actual computation. A favorable benefit-cost ratio, generally a requirement for the authorization and implementation of a Corps project, critically depends upon how the benefits are evaluated and calculated. Does the methodology for calculating and evaluating benefits favor certain areas over others based upon geography and hydrology, degree of urbanization, or market value of land and improvements? If the benefit estimates are influenced by such factors, it would be appropriate to assess such impacts against the criteria of equity, efficiency, and responsiveness. Such an assessment should compare changes in flood damage prevention benefit calculations since enactment of NEPA.

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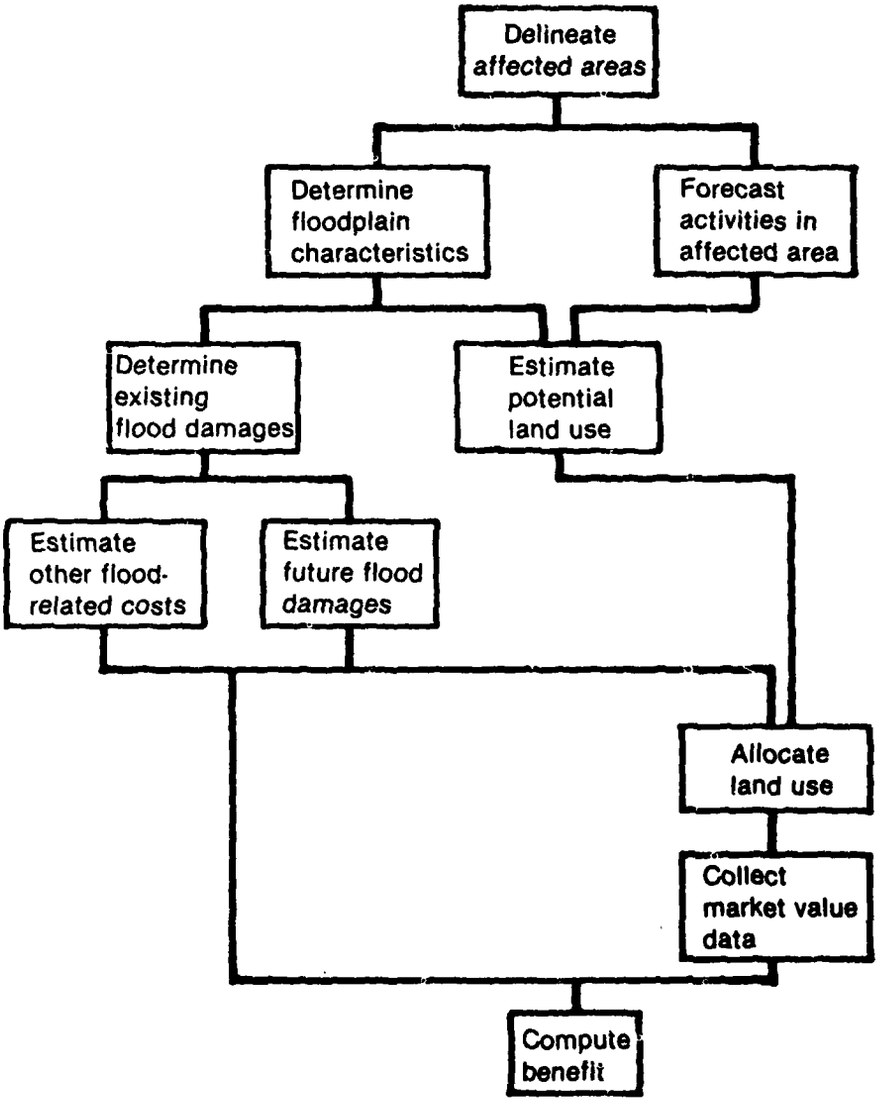
[1]U.S., Water Resources Council, "Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning (Level C)," 72931-72937.

FIGURE 11

FLOWCHART OF URBAN FLOOD DAMAGE BENEFIT EVALUATION PROCEDURES



CHAPTER IV

EQUITY, EFFICIENCY, AND RESPONSIVENESS--CRITERIA FOR ASSESSING THE PROVISION OF GOVERNMENT SERVICES

Purpose of the Chapter

While Corps policy documents stress the objective of national economic development[1] as the overriding determinant in formulating projects to meet water resource needs, this research reaches beyond the concept of economic efficiency. Equity and responsiveness as well as efficiency are viewed as appropriate criteria in assessing the provision of government services. Equity, efficiency, and responsiveness mean different things to different people. This chapter summarizes various concepts behind these criteria, as found in the literature, in an effort to surface those definitions most suitable for evaluating the impact of policy changes on the Corps flood damage prevention program.

This study differs in certain respects from other analyses of municipal services by local government. Aside from being a public good, services to prevent flood damage are being provided directly by the Federal government. The issues at the local level pertain to the payment of the non-Federal share, the responsiveness of the project to local needs, and the degree of equity in the solution to

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[1]This objective is akin to certain definitions of economic efficiency discussed later in this chapter.

the flooding problem. Achieving equity in program outcomes may be in conflict with efficiency; equity is also often dependent upon responsiveness to individual demands. Policy attempts at being responsive to the public may tilt outcomes toward either equity or efficiency. In some instances outcomes may be deemed neither equitable nor efficient, in which case the outcomes would be unresponsive. It is in this vein that *policy changes and resulting outputs* are analyzed and evaluated in the next two chapters.

Equity Concepts

General Discussion

The notion of equity in public services has to do with the distribution of government services, i.e., who gets the benefits in relation to who pays, and the distribution of their respective and cumulative effects. Equity is concerned with the relative condition of individuals in society.[1] Are people worse off, better off, or just the same as a result of public action (or inaction)?[2]

In discussing the dimensions of social equity, Chitwood reduces the basic distribution pattern to 1) equal services to all, 2) proportionally equal services to all, and 3) unequal services to individuals corresponding to relevant differences.[3] Providing purely equal services to all is limited to those services termed pure public goods. These are services that share the characteristic of being enjoyed or consumed by all members of a community in common. The enjoyment of peace and security, once provided to a community or nation, is available for all to enjoy. Similarly, once the Corps provides, through a completed project, a high level of

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[1]Frank S. Levy, Arnold J. Meltsner and Aaron Wildavsky, Urban Outcomes (Berkeley, CA: University of California Press, 1974), p. 200.

[2]Astrid E. Merget, Achieving Equity in an Era of Fiscal Constraint, paper prepared for the conference on "Municipal Fiscal Stress--Problems and Potentials," sponsored by the Center for Urban Policy Research, Rutgers University, and the U.S. Department of Housing and Urban Development, March 7-9, 1979, Miami Beach, FL, p. 11.

[3]Stephen R. Chitwood, "Social Equity and Social Service Productivity," Public Administration Review, XXXIV, No. 1, January-February 1974, p. 31.

flood protection to a community, such protection is available equally to all inhabitants within comparable areas of the flood plain. Hence, all individuals benefit equally within the locational parameters of the project, but, between locations, areas protected as distinct from those unprotected may exhibit inequities. The question remains, however, whether procedures and policies followed by the Corps in formulating its projects give consideration to more than the physical parameters of the flood problem, the value of property to be protected, and the cost of engineering solutions to reduce the magnitude and frequency of flooding.

Distribution of other than pure public goods on a proportionally equal basis poses several problems. The problem is in selecting the characteristic which determines the amount of service to be provided and in calculating the proportional amount of service to be given in relation to the specified characteristic. Practically speaking, distribution of services on a proportionally equal basis is further complicated by the virtual impossibility of determining the extent to which potential recipients possess the specified characteristic and then providing a corresponding quantity of services.[1]

Chitwood also discusses a concept of social equity based upon willingness and abilitv to pay for public services and the results to be achieved through those services. This concept of equity is

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[1] Ibid. An example cited by Chitwood is the number of uniformed policemen (public service) assigned to patrol a particular city precinct which may vary in direct proportion to the crime rate (specified characteristic) of that precinct.

most appropriate where public services can reasonably be provided on a user charge basis; where exclusion can operate, benefits are appropriable. Government services, such as national defense, which benefit the nation as a whole or programs which provide special assistance to needy or vulnerable groups are generally accepted as legitimate non-user fee functions of government.[1] However, where specific users of services provided by government are subsidized or receive the benefits without direct payment, an inequitable condition would prevail. The argument that most water resource projects constructed by the government benefit individuals or select groups has long been used in support of greater payments by the recipients of the outputs when such outputs are furnished at subsidized costs or without charge. In a general sense, this concept has been referred to as market equity, wherein an agency distributes resources to the public in proportion to the tax revenues they pay. The agency produces services but does not engage in redistribution, essentially a market approach.[2] Proponents of this concept of equity would argue that when specific beneficiaries, able to pay for the services, are provided subsidies, inefficiencies such as excessive demand result. Taxpayers would be supporting projects that may not be cost effective. This market concept of equity is closely aligned with concepts of economic efficiency.[3]

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[1] Ibid., p. 32.

[2] Levy, Urban Outcomes, p. 240.

[3] U.S., Congress, Office of Technology Assessment, Coal Exports and Port Development: A Technical Memorandum (Washington, DC: Government Printing Office, 1981), pp. 19-29.

A standard of equity based on equal opportunity has its foundation in the equal protection clause of the Fourteenth Amendment to the Constitution. This argument has been used in court suits involving discrimination in the provision of basic municipal services.[1] This standard of equity would provide equal inputs of resources to each citizen or neighborhood facility. Some degree of income redistribution is implied here since taxes paid to finance the services are somewhat proportional to income.

Equal opportunity, however, does not guarantee equal results. A standard of equity based on equal results goes further toward redistribution than does equal opportunity. Equal results require that the effects of past inequalities be mitigated as opposed to equal opportunity that deals with current inequalities.[2] Equity based upon equal results implies a sense of fairness and distribution in accordance with the idea of justice. In a Rawlsean sense, this means a sense of noblesse oblige with the efforts of the public administrator geared toward enhancing the condition of the less advantaged in society.[3]

In dealing with rewards for one's efforts, the concept of equity is sometimes used in a manner similar to the concept of equity based upon equal results. Equality is measured in terms of sameness of results not solely in terms of opportunity. It is not an

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[1]Merget, Achieving Equity, p. 56.

[2]Levy, Urban Outcomes, p. 241.

[3]David K. Hart, "Social Equity, Justice, and the Equitable Administrator," Public Administration Review, XXXIV, No. 1, January-February 1974, p. 8.

end state, but a direction or trend of a social process. Gans argues that income and power are the most important resources to be considered for equalization.[1] Equity in a sense of fairness concerns the relationship between one person's work or other effort and the reward for that effort relative to another person's effort and reward. When one person works harder than another but gets less reward, a condition of inequity prevails, as in the case of women or minorities receiving less pay than white males for similar work.

Equity judgments are difficult to define; they require agreement about the major values of a society. It is a more subjective concept, because what people deem to be fair depends upon their own evaluation of their effort as compared with that of others. Equity and equality are not necessarily mutually exclusive. Equality is deficient without equity, and equity is deficient without equality. Equity requires some degree of equality, for inequality is unfair. Conversely, more equality would itself bring about greater equity, and once major inequalities were removed, individual cases that might require some new inequalities in the name of equity could then be dealt with more easily.[2]

In dealing with rewards for one's efforts, the key point is that Americans are probably more concerned with equity than with equality. They want society to be fair, not necessarily equal where equality connotes sameness. This concept, tied closely to the sanc-

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[1]Herbert J. Gans, More Equality (New York: Pantheon Books, 1973), pp. 73-74.

[2]Ibid., pp. 74-77.

tity of the work ethic, chooses to ignore why people are not able to obtain productive work or produce meaningful outcomes. Our inability to clearly define "productive" or "important" roles in our economy in clear ways often means that effort exerted is not used as a yardstick for rewards; equity (fairness) becomes a more difficult objective to achieve. However, in terms of services to the public, the concept of equality, as used here, and equity based on equal results are analagous.

Merget explores three dimensions of equity as a norm in the provision of municipal services. These are equity as a moral imperative, equity as a legal principle, and equity as a decision rule in public policy.[1] From a public policy perspective, the test according to Merget is simply: "What difference does public policy make in the relative condition of people? Are they worse off, better off or just the same as a result of public actions (or inaction)"?[2]

In a moral sense, equity pertains to the relative condition of individuals in society. In a Rawlsean sense, rules of justice, fairness, and equity are bound up in principles which permit the redistribution of resources in order to improve the relative condition of those worse off, even at the expense of the better off. A moral concept of equity stresses results over procedures and the rechanneling of funds to the needy.[3]

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[1]Merget, Achieving Equity, p. 5.

[2]Ibid., p. 11.

[3]Ibid., pp. 9-11.

Little has been done to establish rules or procedures which would bring policy making in line with a concept of moral equity. The strongly entrenched belief in equal opportunity but not necessarily equal results and the heterogeneous nature of our society may make this concept unachievable. As a result, the courts have assumed a greater role in determining the fairness or equity in the provisions of municipal services.

The landmark court decision in Hawkins v. Town of Shaw established a standard of equity which calls for minority citizens in a community to receive roughly the same quality and quantity of services as are received by its white citizens.[1] In the Shaw case, both inputs and outputs had been recognized as being discriminatory. The issue becomes more complex when outputs are unequal, even though inputs may be greater in poorer geographical areas.

In Beal v. Lindsay, the court ruled in favor of the City of New York in a case involving a poorly maintained and staffed park serving a predominantly black and Puerto Rican population. The city contended that it was spending proportionately more on the park in question and pointed to higher rates of vandalism in the adjacent community. By ruling in favor of the city, the court adopted an input standard of equity, while in Shaw, outputs, at least of an interrediate nature, such as fire hydrants, paved roads, and street lights, were involved.[2] Court decisions seem to provide some prog-

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[1] Ibid., pp. 13-31.

[2] Ibid., pp. 15-16.

ress toward a concept of equal outputs and outcomes in education by rulings that permit variable inputs. However, when it comes to other types of municipal services, including those that might be provided by the Corps, court decisions have been less meaningful. For example, proof of discrimination would be difficult to establish on the basis of race or even wealth in the case of flood control. In the absence of flood control, the richest and poorest residents of an urban area whose homes are at comparable elevation will be subjected to floodwaters of comparable magnitude. Inequity may still occur in this situation but would be difficult to prove as intentional. It would be necessary to establish a connection between a disparity and some harmful, undesirable social consequence and relate such consequences to inequity based on inputs.

A more likely outcome of equity is through the decision-making process. The public choice approach begins with a focus on individuals who are seen as self-interested, but in a manner which may include a personal concern for the welfare of others. The provision of public goods and services through governmental organizations enables citizens to communicate their preferences. Government is viewed as a coercive means of seeing that each individual contributes a fair share for the provisions of public goods and services. What is a fair share and how to accommodate different citizen preferences will depend upon the criteria against which outputs are measured.[1] Bish and Ostrom discuss least-cost

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[1]Robert L. Bish and Vincent Ostrom, Understanding Urban Government: Metropolitan Reform Revisited (Washington, DC: American Enterprise Institute for Public Policy Research, 1973), pp. 18-21

solutions as a measure of efficiency and the capacity of governmental organizations to satisfy the preferences of citizens as a measure of responsiveness. Although they recognize equity as a criterion which should apply in evaluating governmental activities, they discount it as a criterion that can be used to measure comparative performance.[1] This study will attempt to define equity in a manner that will overcome such an obstacle.

Shoup describes equity in the public finance school of thought as falling in two general categories. The first one meets consensus criteria and the other conflict criteria. He identifies six aspects of consensus criteria as relevance, certainty, impersonality, continuity, uniformity of mispayment, and uniformity of cost of compliance.[2] In essence, this view of equity means equal treatment of equals before the law without conflict. Since equity, as used in this study, implies a degree of redistribution, or at least consideration of measures not based on economic efficiency, it may well be that equity is in conflict with efficiency.

Shoup's second category of equity criteria specifies certain kinds of distribution of benefits or burdens among income classes or other groupings and involves conflicts of interest.[3] The five conflict of interest criteria which are distributive in nature are:

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[1]Ibid., p. 22.

[2]Carl S. Shoup, Public Finance (Chicago: Adline Publishing Co., 1969), p. 23.

[3]Ibid., p. 33.

1. Distribution of burdens progressively, and of benefits regressively, by income or wealth.

2. Distribution that takes account of type of income, size and composition of family, and use of income.

3. Geographical distribution in favor of depressed areas.

4. Distribution of benefits or burdens in a manner that does not discriminate against ethnic, color, or status groups.

5. Distribution of tax burdens by methods that promote widespread tax consciousness.

In a general sense this implies that policies are equitable when they favor implementation of flood control projects in poorer geographical areas for poorer segments of the population over the more wealthy. Also, a distribution of burdens and benefits would be more equitable if the more wealthy (or the American taxpayer in general) paid a greater share of the cost of projects, whereas benefits of flood damage prevention were realized by less wealthy segments of the population.

AD-A160 627 FLOOD DAMAGE PREVENTION SERVICES OF THE US ARMY CORPS OF ENGINEERS: AN EV..(U) ARMY ENGINEER INST FOR WATER RESOURCES FORT BELVOIR VA B STEINBERG FEB 84 3/5

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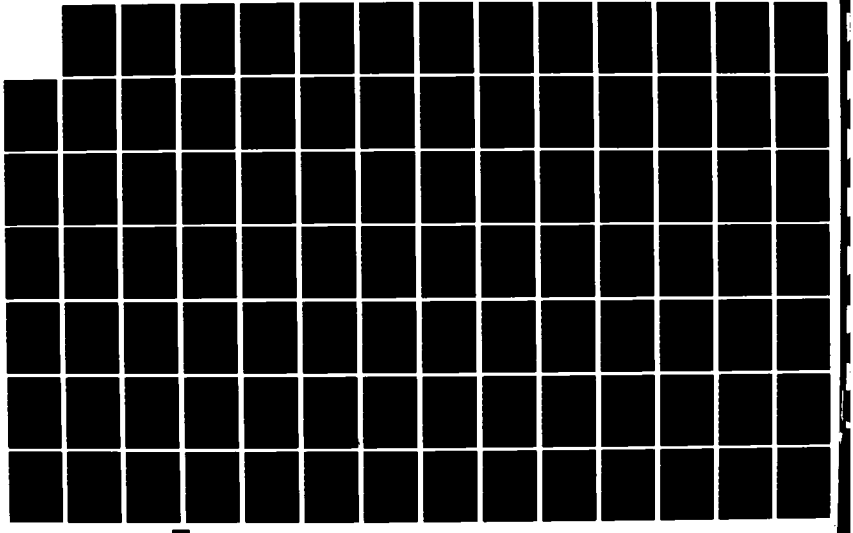

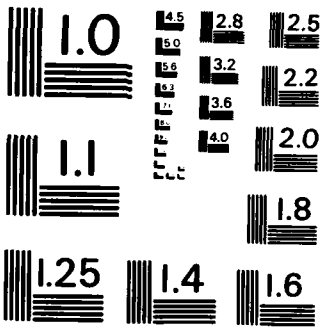

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS - 1963 - A

Concepts Considered

The dimensions of equity that recur in these diverse discussions can be categorized according to interpersonal, jurisdictional, group, and market comparisons. A brief description of each dimension follows, along with a discussion of the rationale for including or excluding each from more detailed consideration in this study.

Interpersonal equity

The interpersonal equity concept includes vertical and horizontal equity.[1] Vertical equity is based upon a distribution of costs progressively by income and wealth, with services targeted[2] in favor of the poor. Horizontal equity requires that all people possessing like amounts of a characteristic determining the provision of a particular public service receive the same amount of that service. In assessing the horizontal equity aspects of interpersonal equity, the distribution of costs and benefits evenly among similar individuals is of primary concern.[3] All people residing at

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[1]Discussions of vertical and horizontal equity have traditionally been used in connection with tax structures (revenues). See, for example, James A. Maxwell, Financing State and Local Governments (Washington, DC: The Brookings Institution, 1969), pp. 95-104 and 130-133. However, as Chitwood points out, and as discussed in this study, vertical and horizontal equity appear equally valid in appraising the distribution of public services.

[2]The term "targeted" is used in a broad sense to include situations where benefits within a community accrue to the poor on a greater percentage than their share of non-Federal costs. This would occur when the poor live in the most flood-prone areas and receive a high degree of flood protection by virtue of the construction of a Corps project. However, the share of the non-Federal project construction costs paid by these same beneficiaries is relatively small compared with the benefits realized.

[3]Chitwood, "Social Equity," pp. 33-34

a given flood plain elevation in a particular community receive the same degree of protection once a Corps flood damage prevention project has been constructed. The concept of horizontal equity, therefore, is extended to communities of comparable needs. How did each fare based upon policy changes considered in this study?

Jurisdictional equity

Jurisdictional equity is based upon the distribution of costs and benefits in a manner that favors depressed regions. This concept envisions extending an extra degree of consideration to poorer communities in the provision of flood damage prevention services.[1] Accordingly, it is an appropriate concept of equity to be given further consideration.

Group equity

Group equity envisions the distribution of benefits in a manner that does not discriminate against ethnic, color, or status groups. The decision as to whether a project warrants authorization and subsequent construction is most frequently dependent upon a favorable benefit-cost ratio and ability or willingness of the local sponsor to pay the non-Federal share rather than considerations of color or ethnic origin. The benefit-cost ratio in turn is highly dependent upon the value of property to be protected; hence there may be a built-in bias toward one part of a jurisdiction over another

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[1]Waiving the traditional benefit-cost ratio calculation or requiring a lower non-Federal cost for poorer communities than for more affluent communities would be examples of jurisdictional equity being considered in providing a flood damage prevention project.

rather than a bias in favor of or aginst a particular group.[1]

Market equity

There is a market analogue for defining equity in the public sector wherein an agency distributes services to the public in proportion to the tax revenues paid.[2] This concept is more appropriately covered in the discussion of economic efficiency presented later in this chapter.

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[1]However, to the extent that local wealth--property or otherwise--is correlated highly and positively to either race or ethnicity, there is the probability of implicit race or ethnicity inequity.

[2]In the case of a local protection project, this would refer to the non-Federal share of the project construction costs.

Efficiency Concepts

General Discussion

In its broadest sense, the concept of efficiency denotes the taking of the shortest path or the cheapest means toward attainment of desired goals.[1] Efficiency is neutral as to what goals are to be attained. When considering several alternatives which lead to the same accomplishment, the least costly alternative should be selected. Thus, in a broad sense, the "administrative man" and the classical "economic man" both seek efficient ends.[2] The maximization of certain ends with the minimum use of scarce resources in an administrative sense is synonymous with the maximization of profits in a market sense.

Macro and microeconomic efficiency and the theory of public goods

Since this research is concerned with non-vendible public goods supplied by an agency of government, a discussion of the inability of decentralized private markets in certain instances to attain economic efficiency and consequently the need for government intervention is considered appropriate. In such a situation, the microeconomic theory of supply and demand in the marketplace does not function. A discussion of market failure should commence with the role of public goods and the types of non-market decision-making

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[1]Herbert A. Simon, Administrative Behavior (New York: The Free Press, 1976), p. 14.

[2]Ibid., p. 39.

arrangements that are presented in public economics as distinguished from market economies.[1]

Public, or collective, goods are distinguished in terms of infeasibility of excluding potential consumers, or at least making their exclusion uneconomical. In addition, increased consumption of the good by one individual does not diminish the amount available to others.[2] The failure of the marketplace in providing pure public goods arises as a result of the absence of price exclusion since private producers would not be able to limit consumption of their products to those who pay for them. No one would have to buy in order to consume, and producers would have no way of covering their costs--effectively, a microeconomic breakdown. A pure public good, therefore, involves the double-polar conditions of joint supply and inability to exclude.[3] National defense is such an example of an activity not subject to price exclusion, and the provision of national defense by the private sector is in effect eliminated. Shoup identifies this type of government service as one necessary to maintain the identity of the nation state against the threat of aggression from abroad or of secession or insurrection at home. The individual is not given a choice whether to purchase and in what quantities, even if that were feasible.[4]

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[1]Jesse Burkhead and Jerry Miner, Public Expenditure (Chicago: Adline Publishing Co., 1971), pp. 102-103.

[2]Mancur Olson, The Logic of Collective Action: Public Goods and the Theory of Groups (Cambridge, MA: Harvard Univeristy Press, 1974), p. 14 n.

[3]Burkhead and Miner, Public Expenditure, pp. 31-32.

[4]Shoup, Public Finance, p. 66.

Shoup uses the term "group-consumption good"[1] to characterize those services provided by government because they can be supplied in a given amount to a given group of households or firms in a given area more efficiently under a non-marketing technique of production and distribution. Efficiency is equated to lower cost per capita. Yet, it is recognized that the provision of goods by government agencies rather than the private sector is not necessarily based upon efficiency or non-exclusion considerations. The existence of externalities is recognized as a justification for governmental action. The concept of externalities, however, is not a sporadic and distinct consideration from non-exclusion.[2]

Bish defines externalities as the results of an economic action that affects parties not directly involved in the transaction.[3] Externalities generally are classified in three categories. They can be positive or negative, non-relevant or relevant, and marginal or non-marginal.[4] From an economic efficiency sense, non-relevant or non-Pareto relevant externalities are not important

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[1]Shoup uses the term "group consumption goods" and "collective consumption goods" in lieu of "public goods" since some collective consumption goods are marketed. A collective consumption good is characterized by the fact that the total cost of producing the good does not increase as the numbers served increase. The cost of forecasting the weather is an example.

[2]Shoup, Public Finance, pp. 66-68.

[3]Robert L. Bish, The Public Economy of Metropolitan Areas (Chicago: Rand McNally College Publishing Co., 1971), p. 18.

[4]A positive externality can be the pleasure derived from passersby of an attractively landscaped area, whereas a foul odor emanating from a mill is a negative externality to individuals who must tolerate it. Non-relevant externalities are those too unimportant to stimulate a desire for action. Relevant externalities

whether positive or negative, marginal or non-marginal.[1] In a market sense, non-relevant externalities produce no demand for change and non-Pareto relevant externalities generate an insufficient demand for at least one party to improve his position; no one is deprived in the process. The maximum the affected party is willing to pay for a change is less than the minimum the individual generating the externality is willing to accept to change his actions which produce the externality. Economic transactions can be expected to occur in cases of Pareto-relevant externalities when at a minimum no one is placed in a worse position.

The nature of public goods is such that individuals interested in minimizing their costs would have no incentive to pay their fair share of the costs of providing the goods. Most public goods would not be provided if financed on a voluntary basis.[2] Each person would calculate his own individual cost and ignore the social costs imposed upon others. Ultimately, the social costs would yield an economic loss for the community of users. Individualistic

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exert a strong enough influence to incite individuals to action, either to reduce the effects of a negative externality or to increase the effects of a positive externality. A Pareto-relevant externality is a special case of a relevant externality in which affected parties are willing to pay an amount which exceeds the minimum the generator of the externality is willing to accept to alter his action. Such externalities provide an opportunity for action wherein both parties are better off, or at least one of the parties is better off while the other is no worse off. Marginal externalities occur when a small change in the level of activity generating the externality alters the magnitude of its effect. Under non-marginal externalities, an all-or-none situation exists over some range of changes in the level of the externality. See Bish, Public Economy, pp. 18-25.

[1] Ibid., pp. 20-21.

[2] Vincent Ostrom, The Intellectual Crisis in American Public Administration (University of Alabama: The University of Alabama Press, 1974), p. 56.

decision making applied to common property resources or public goods can generate destructive competition.[1]

Combined with the overuse of the common-property resources is the concept of the "hold out" or "free rider" in the absence of some coercion in the form of tax or user fee. It is in just such situations, when the private sector does not have the power or authority to charge for the service, that government must have a role in providing the product or service.[2]

Administrative efficiency

Aside from market considerations of efficiency, and surrogate considerations in the public sector, there is the concept of efficiency in the classical public administration paradigm. This concept is referred to as administrative efficiency. As espoused by Wilson[3] nearly a century ago, it calls for a separation of administration from politics. It envisions a neutral, competent civil service to counter political manipulation in the public domain. It emphasizes rational analysis and a scientific approach. Wilson envi-

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[1] Ibid., pp. 57-58. Such a situation applies to natural resources and public facilities. Thus when urbanization in one political jurisdiction creates potential for flooding in another jurisdiction, recourse must be sought to a larger jurisdiction or a higher unit of government. This realization was a significant factor in the expansion of the Federal role in flood damage prevention activities.

[2] In addition to the high transaction costs and "free rider" consideration which cause market failure, two other factors are described by Schultze. These are large uncertainty and high information costs. Several of these factors are often present in combination. See Charles L. Schultze, The Public Use of Private Interest (Washington, DC: The Brookings Institution, 1977), pp. 32-43.

[3] Woodrow Wilson, "The Study of Administration," Political Science Quarterly, No. 2 (June 1887), p. 196.

sioned a politico-administrative system in which there would be no danger of civil servants becoming an independent class. Rather, they would be responsive to political officials. The dichotomy between politics and administration was that politics has to do with guiding or influencing of government policy, while administration has to do with the execution of that policy.[1]

Much has been written to disprove the existence of the dichotomy between politics and administration.[2] As Yates points out, in citing Altshuler, there is an ideal type of administrative process (administration as efficiency) which is sharply different from the political process (understood as democratic bargaining and group adjustment).[3] According to Yates, this normative view of politics and administration makes bureaucracy a positive institution that serves to strengthen and fulfill the workings of the democratic process.[4]

At least since the New Deal, Yates argues, the model of administrative efficiency in government has gained greatly in prom-

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[1]Douglas Yates, Bureaucratic Democracy: The Search for Democracy and Efficiency in American Government (Cambridge, MA: Harvard University Press, 1982), p. 47, quoting Frank J. Goodnow, Politics and Administration (New York: Macmillan, 1900), pp. 22, 14.

[2]Many of the books and articles criticizing the policy-administration dichotomy were written in the 1946-1960 period. For a discussion of significant contributions on this issue, see James W. Fesler, "Public Administration and the Social Sciences: 1946 to 1960," in American Public Administration: Past, Present, Future, ed. by Frederick C. Mosher (University of Alabama: The University of Alabama Press, 1971), pp. 104-113.

[3]Yates, Bureaucratic Democracy, p. 47, citing Alan Altshuler, "The Study of American Public Administration," in The Politics of the Federal Bureaucracy, ed. by Alan Altshuler (New York: Dodd, Mead, 1968), p. 62.

[4]Ibid.

inence at the expense of the model of pluralist democracy. He cites as examples reliance on the model of administrative efficiency and away from the model of pluralist democracy during such major challenges as the depression, mobilization for war efforts, the war on poverty, regulation in environmental areas, and the complex areas of energy and inflation.[1]

Despite these arguments on the ascendancy of administrative efficiency in recent decades, it has long been argued that the Corps of Engineers, although an agency of the executive branch, has shown strong ties to the Congress and interest groups supporting water resource development projects. Maass describes the close relationship between the Corps and the Congress. The Congress considers the Corps to be directly responsible to it, and the Corps calls themselves "the engineer consultants to, and contractors for, the Congress of the United States."[2] The relationship is reinforced by the requirement for the authorization of individual studies and projects and reflects greater input from individual congressmen and the public than from review by the President and his staff.[3] Ferejohn describes this relationship between the Corps and the Congress as a community of interest in opposition to the cold and frugal Budget Bureau, which seems unaware of the improvements in human life wrought by water projects.[4]

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[1]Ibid., pp. 49-50.

[2]Arthur A. Maass, "Congress and Water Resources," The American Political Science Review, XLIV (June, 1950), 579-581.

[3]Ibid., p. 580-581.

[4]Ferejohn, Pork Barrel Politics: Rivers and Harbors Legislation, 1947-1968 (Stanford, CA: Stanford University Press, 1974). p. 9.

Perhaps the strongest evidence of this relationship has been the failure of several executive branch proposals to reorganize the Corps of Engineers by creating new departments which would have jurisdiction over the Corps civil works program. Congressional support for the status quo has, on each occasion, contributed to the neutralization of such efforts.[1]

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[1]For example, while many recommendations of the First Hoover Commission transmitted to Congress by President Truman were approved, the recommendation to place the Corps water resources program under a new Water Development Service was not approved. The Ash Commission recommendations twenty years later to create a Department of Natural Resources, of which the Corps would be a part, also failed to receive congressional approval.

Concepts Considered

The dimensions of efficiency have been categorized according to macroeconomic, administrative, and microeconomic consideration. Each of these concepts is of importance in this research. A brief description of each criterion follows, as it applies to this study.

Macroeconomic efficiency

Dealing with benefits and costs must be done in relation to an objective function.[1] The Corps has chosen the objective function of national economic development. The quantifiable benefits included in benefit-cost analysis of Corps projects generally have been limited to those which contribute to the national economic development. This objective is closely related to the macroeconomic concept of efficiency. Quantifiable benefits of projects formulated on this basis include those which increase the value of the nation's output of goods and services. Economic efficiency is achieved by producing the maximum value of such goods and services at the lowest possible cost per unit of output. Thus, policies which call for formulating projects strictly on the basis of maximizing net economic benefits may be thought of as enhancing the objective of economic efficiency. On the other hand, consideration of environ- mental, social, regional, or safety factors may result in the formu- lation of considerably different projects, frequently at greater cost than a project designed to maximize economic efficiency. The greater emphasis on public participation also has a bearing on macroeconomic efficiency. Where a solution to a flood problem reflects modifications for aesthetic or

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[1]Burkhead and Miner, Public Expenditure, p. 207.

environmental reasons because public support for the project would be lacking without the modifications, there is a decrease in macroeconomic efficiency.

Several policy changes during the post-NEPA era had a direct bearing on this objective. Examples include the application of principles and standards,[1] the use of higher discount rates, and compliance with the environmental legislation. Recently, the issuance of principles and guidelines[2] by the Reagan administration reversed the trend of the 1970s when the enhancement of environmental quality was considered a valid planning objective on par with national economic development.[3]

Administrative efficiency

There are two significant dimensions of the administratve efficiency concept used in this research. First, it serves as a contrast to the pluralist democracy model of policy making and power as indicated in Figure 12.

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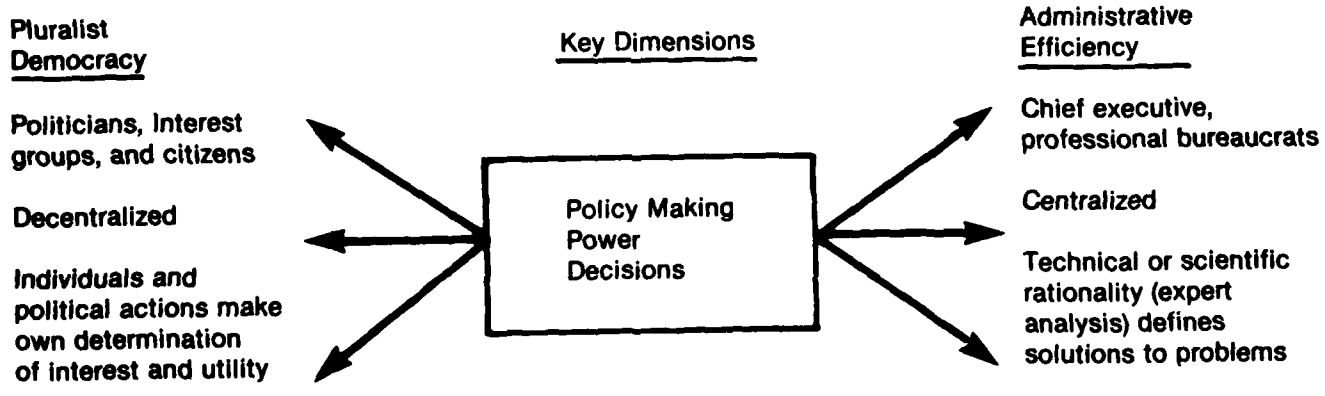
[1]U.S., Water Resources Council, "Water and Related Land Resources: Establishment of Principles and Standards for Planning," Federal Register, Vol. 38, No. 174, Part III, Sept. 10, 1973, pp. 24778-24869.

[2]U.S., Water Resources Council Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

[3]Ibid., p. iv. The principles and guidelines prescribe a single Federal objective of water and related resources planning. The objective is "to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements." The emphasis is on national economic development, with variance acceptable for compliance with sound environmental practices and environmental legislation.

FIGURE 12

A COMPARISON OF MODELS
PLURALIST DEMOCRACY VS. ADMINISTRATIVE EFFICIENCY



This concept of administrative efficiency stresses a concentration of power in the chief executive and his political appointees. When the views of executive appointees conflict with professional opinions of the Corps, it may be assumed that the views of the political appointees more closely reflect the administrative efficiency concept.[1]

The weakening of congressional support for Corps projects and programs would tend to shift greater control to the chief executive. Prior to NEPA, Congress enacted authorizing legislation more frequently and new construction starts were more plentiful. Under these circumstances, it would appear that Congress and the pluralist democracy model were in a stronger position to influence policy making and decisions. The erosion of congressional support characterized by the lack of authorizing legislation, the paucity of new construction starts, and opposition on environmental and geographical distribution grounds all serve to shift the balance of power back to the chief executive.

A second dimension of the administrative definition of efficiency is based upon a concept of neutral treatment of flood problems in formulating and implementing Corps projects. This concept, from the point of view of the Corps, reflects the neutral treatment implicit in benefit-cost analysis. Departure from benefit-

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[1]In certain instances the views of Corps technical experts and those of the Assistant Secretary of the Army for Civil Works (a political appointee) conflict. An example is the standard project flood level of protection preferred by Corps experts when constructing levees or floodwalls in urban areas, compared with a level of protection which maximizes national economic development benefits preferred by the Assistant Secretary.

cost rules could be construed as a symptom of decreased efficiency. When policy changes or decisions are made that favor a particular type of project or a particular geographical area regardless of benefit-cost calculations computed in accordance with the national economic development objective, neutral treatment, and hence administrative efficiency, is diminished.

Policies exempting projects from the use of benefit-cost calculations in justifying projects for authorization or implementation detract from neutral treatment. Similarly, favoring urban flood control projects over rural ones would decrease administrative efficiency.[1]

Microeconomic efficiency

The microeconomic concept of efficiency is based upon a philosophy that benefits to the rich are as valid as benefits to the poor as long as the service provided is paid for; it is the aggregate net addition of these individual benefits to social welfare that counts. On the cost side, this concept of efficiency stresses willingness of the project beneficiaries to pay a higher share of project costs.[2]

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[1]Assuming that projects meet benefit-cost analysis consistent with macroeconomic efficiency concepts, favoring projects according to geographic area or whether the flooding occurs in an urban or rural area detracts from a concept of neutral treatment. Similarly, the authorization of projects despite the lack of a favorable benefit-cost ratio, calculated according to the macroeconomic efficiency concept, reflects a lack of neutral treatment and thus a decrease in administrative efficiency.

[2]Of particular interest are the proposals by the Carter and Reagan administrations calling for a fixed percentage of non-Federal cost sharing. Generally, the percentages were higher than those prescribed by the traditional non-Federal requirements of lands, easements, and rights-of-way for local protection projects.

Once a project has been constructed, the public good that a flood damage prevention project assures does not distinguish between rich and poor. All in the protected area receive the flood damage prevention benefits; however, when a project is being formulated or being considered for initiation of construction, the benefit-cost methodology employed by the Corps stresses the value of property protected in deriving the dollar value of flood damages averted. Policies that support this methodology would enhance microeconomic efficiency, while consideration of flood protection needs on the basis of benefits that do not provide national economic development benefits would detract from microeconomic efficiency.

An extension of this concept of efficiency relates to the cost and financing of projects. In providing an equal level of flood protection for a number of urban areas, the total construction cost of each project is based more upon physical and engineering considerations than upon wealth of the community. Existing legislation calls for the non-Federal sponsors of local protection projects to bear the cost of lands, easements, and rights-of-way and relocations as necessary. This requirement results in non-Federal costs ranging from less than 10 percent to as high as 50 percent of total project costs. Attempts to alter the non-Federal share of project costs to specific percentages have a bearing upon this concept of efficiency. In some cases the fixed percentages would result in significant increases in the non-Federal share, while other propo-

sals could decrease non-Federal costs.[1] Specific proposals of the Carter and Reagan administrations and congressional reaction will be evaluated in the context of projects proposed for authorization and new construction starts. Where non-Federal costs are increased, it would appear that market efficiency is enhanced. Reductions in non-Federal costs would be viewed in the opposite light.

The practice of equating benefits to damages averted is actually a surrogate for a market mechanism such as willingness to pay for the service.[2] Further, the dollar value attributed to the estimated benefits from flood damage prevention is based on statistical probabilities and projections of future conditions. Willingness of the non-Federal sponsor to pay a higher share of project costs implies a greater degree of validity and certainty in the financial feasibility of a project than the calculation of benefit-cost ratios. This concept of willingness to pay a higher share as it applies to water resources is stressed by Fox and Herfendahl who see the market as weighing certain values more validly and certainly than calculations of benefits.[3] In a similar

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[1]A Carter administration proposal in 1978 called for a flat 25 percent cost sharing (of which 5 percent was a state contribution), sometimes equal to less than the cost of lands, easements, and rights-of-way. More recently a proposal of the Assistant Secretary of the Army for Civil Works called for 35 percent non-Federal cost sharing on flood damage prevention projects or the cost of lands, easements, and rights-of-way, whichever is greater.

[2]Henry G. Hart, "Toward a Political Science of Water Resources Decisions" in Man and Water: The Social Sciences in Management of Water Resources, ed. by Douglas L. James (Lexington, KY: Kentucky Water Resources Institute, University of Kentucky), p. 128.

[3]Irving K. Fox and Orris C. Herfendahl, "Attainment of Efficiency in Satisfying Demands for Water Resources," American Economic Review 54 (May 1964), 198-206.

vein, Ostrom describes the potential yield of a water resource system in a spectrum ranging from those that can be subject to provision in a market economy to those that can be provided only as public goods and services.[1] While flood control falls into the latter category, pricing becomes important when projects are multiple purpose and when one takes into consideration the political price.[2]

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[1]Vincent Ostrom, "Water Resource Development: Some Problems in Economic and Political Analysis of Public Policy," in Political Science and Public Policy, ed. by Austin Ranney (Chicago: Markham Publishing Co., 1968), p. 127.

[2]Ibid., pp. 134-141. A discussion of political price is included in Chapter III.

Responsiveness Concepts

General Discussion

Responsiveness has been defined as the capacity of a governmental organization to satisfy the preference of citizens. The notion implies that individuals are the best judges of their own interests. Whereas efficiency may be thought of in terms of outputs (benefits) exceeding inputs (costs), such solutions tell us little of consumer satisfaction. User preferences must be satisfied if genuine efficiency is to be obtained.[1] Bish and Ostrom state that in the final analysis benefits can be calculated only in relation to user preferences; i.e., efficiency and responsiveness are interdependent, and the criterion of efficiency must include responsiveness.[2] In this sense, user preference is analagous to demand in the marketplace. They further note that the difficulty of measuring and evaluating public goods and services requires considering efficiency and responsiveness as separate but related criteria in evaluating performance of public agencies.[3] Since this research deals with equity as well, it is useful to consider the three criteria on a spectrum with responsiveness a measure of public preferences for more equity or more efficiency.

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[1]The economic concepts of efficiency, previously discussed, deal with such technical issues as least costly solutions, supply and demand, and willingness to pay. In the final analysis, satisfaction with the solution must be considered as a genuine measurement of efficiency.

[2]Bish and Ostrom, Understanding Urban Government, p. 22.

[3]Ibid., p. 22.

Preferences for public goods and services can be expressed through voting, lobbying, public opinion polls, petitions, public hearings, demonstrations, court proceedings, political party organizations, violence, and civil disobedience. The expression of preferences represents input to the decision-making process but does not assure responsiveness of outcomes. Furthermore, if the public good is heavily subsidized from the point of view of the individual citizen or community, preferences are difficult to establish. The costs are on others than those receiving the benefits.[1]

Responsiveness to citizen preferences requires that those preferences be expressed. In the case of flood control, the situation may be clear when frequent floods hit a community. On the other hand, when flooding is rare but unwise development takes place, there are frequent differences of opinion as to the desirability for Federal intervention. Some groups will desire no Federal intervention, a laissez-faire approach, while others may opt for Federal technical assistance on flood plain delineation or local ordinances controlling development. In many locations, the Corps has a monopoly on the provision of flood control by means of structural solutions. A monopolistic position of an agency can adversely affect its responsiveness to the public because organizations operating under monopoly conditions have little incentive to innovate or reduce costs.[2] There are several ways, however, that competition or other measures can constrain monopolistic behavior of public officials. One way is to elect different officials in the

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[1] Ibid., pp. 22-23

[2] Ibid., p. 29.

hope that the replacement will cause the quality or level of outputs provided by the agency of government to improve. Other means of creating competition include moving to another location or seeking alternatives in the private sector or through other levels of government. These options are costly and may not be feasible in many instances.[1] Competing forces and checks and balances can result in responsiveness even in the absence of active participation by the public through its various institutional mechanisms. The desire of Corps engineers to provide engineering solutions to flooding problems or the objective of an administration to reduce unemployment can expedite implementation of projects as much as can strong local support and in the absence of such support may still result in implementation of a project and, hence, identical outputs.

Studies of responsiveness in the delivery of municipal services have been made on the basis of socioeconomic and ethnic distributions, with varying findings depending upon the type of municipal service vis-a-vis the distribution variable. Such studies can only evaluate responses to complaints or requests actually expressed, rather than the "silent majority," and the percentage of such citizen contacts is low.[2] Lineberry concludes that bureaucra-

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[1] Ibid., pp. 30-31. For a comprehensive discussion of options available to consumers when dysfunctional behavior of organizations occurs, see Albert O. Hirschman, Exit Voice and Loyalty: Responses to Decline in Firms, Organizations and States (Cambridge, MA; Harvard University Press, 1970). The options of exit and voice as well as loyalty, which as a rule holds exit at bay and activates voice, are discussed in relation to private and public goods.

[2] Kenneth R. Mladenka, "Citizen Demand and Bureaucratic Response: Direct Dialing Democracy in a Major American City," in The Politics and Economics of Urban Services, ed. by Robert L. Lineberry (Beverly Hills, CA: Sage Publications, Inc., 1978), pp. 19-22.

cies, which operate according to their own internal logic, determine the service outputs and degree of responsiveness to constituents. Furthermore, the voting booth as a mechanism for preference has little applicability to institutional bureaucracies. The internal decision-making logic of an agency frequently is the dominant force in the day-to-day operation of the agency.[1] But, as Ingram and others have shown, Corps decision rules are changing to reflect a greater sensitivity to external forces.[2] Over a period of time, changes in decision rules become institutionalized. It is, therefore, appropriate to identify the impact of such decision rule changes on Corps services, particularly flood damage prevention services, and to determine whether decisions being made in the early 1980s are more responsive to the Corps constituency than they were prior to 1970.

The degree of responsiveness can be viewed from the level of government providing the service. The Corps may be the best qualified agency to reduce flooding in large river basins, where multiple externalities spanning or transcending political boundaries exist. However, the Federal government is ill equipped to control development in the flood plain. State and local governments are better suited to this task. Each level of government can have a role in providing public goods or services, and responsiveness should

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[1]Robert L. Lineberry, "On the Politics and Economics of Urban Services," in The Politics and Economics of Urban Services, p. 8.

[2]Helen Ingram, "The Changing Decision Rules in the Politics of Water Development," Water Resources Bulletin, American Water Resources Association, Vol. 8, No. 6, December 1972, pp. 1177-1188.

be measured at each level. Since this research effort focuses on the Corps of Engineers, the responsiveness criteria will be evaluated against the types of services which the Corps itself is authorized to provide.

Many bureaucracies operate without the benefit of elected officials. Furthermore, the services being provided, at least at the Federal level, are frequently far from the physical location of the office actually providing or delivering the service. Responsiveness can be a problem. Lowi criticizes bureaucracies as "relatively irresponsible centers of power," implying a desire to rectify the balance between elected authority and bureaucratic authority. The paradox may occur when making bureaucracies more responsive to their clients would probably make them less responsive to higher authority.[1] In the Federal arena, the Congress serves as a check and balance when responsiveness to the public is less than desired. Often, the congressional pressure for a particular action is in conflict with executive branch policies. It is this conflict that is frequently at the root of the perceived unresponsiveness, either to the public or to a higher authority, depending upon one's perspective.

When considering a public good or service that requires many years from identification of needs to implementation of a solution, timeliness becomes an important measure of responsiveness. For example, it is not uncommon for two decades to pass before a flood

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[1]Robert L. Lineberry, Equality and Urban Policy: The Distribution of Municipal Public Services (Beverly Hills, CA: Sage Publications, Inc., 1977), p. 161.

damage prevention study is completed and a project authorized, designed, and constructed.[1] The longer the time required to complete a study and to obtain authorization of a recommended project, the less responsive the Corps is to the public.

In summary, responsiveness focuses on the degree of support for a project by congressional, state, and local interests; on the degree to which the public supports the recommended solution and perceives such a solution as solving the problem; and, finally, on the time required for authorization and implementation of projects. Even within this range of definitions of responsiveness, there can be conflicts. By involving the affected public more intimately in the planning process and by considering numerous alternative solutions, both in an effort to be more responsive, timeliness may suffer. During the period covered by this research effort, many of the planning changes involving the public were designed at least in part to be more responsive. Nevertheless, the failure of the executive and legislative branches to agree on such issues as cost sharing and the project review process, along with the absence of recent major authorizing legislation, have resulted in current flood damage needs going unmet. Responsiveness in terms of timeliness is suffering despite recommended solutions which are strongly supported by the affected public and its elected representatives.

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[1]For an excellent summary of studies of times associated with project development, see Gerald E. Galloway, Jr., Impediments in the Process for Development of Federal Water Resource Projects: Why All the Delay and What Can Be Done About It? (Washington, DC: U.S. Water Resources Council, 1981), pp. 15-17.

Concepts Considered

These various notions of responsiveness can be categorized according to several perspectives--citizen, political, timeliness, and technical. While all of these concepts are of importance in a comprehensive analysis of responsiveness, technical responsiveness is not given further consideration in this research. Technical responsiveness reflects the degree to which a flood damage prevention project or technical assistance solves a perceived problem. In order to evaluate responsivenesss on this basis, an ex post evaluation of completed projects would be required. Such an evaluation is beyond the scope of this research effort.

The other three aspects of responsiveness are described in further detail as to how they facilitate this study.

Citizen responsiveness

This measure of responsiveness is the degree to which citizens' preferences are considered in solutions. Solutions to flooding problems have traditionally been based upon engineering and economic considerations evaluated and developed in Corps district and division offices. In recognition of the greater emphasis placed on public participation and sensitivity to their input during the 1970-1983 period, it is appropriate to review the projects reaching the authorization and implementation stage to determine whether changes in the types of solutions recommended for authorization and those implemented reflected greater citizen responsiveness. For example, the dramatic shift away from reservoir projects to local protection projects is a point that is evaluated in greater detail. The marked decrease in new reservoir projects being implemented and

being recommended for authorization is analyzed in detail to ascertain whether the public's attitude combined with the more open planning process were major factors responsible for the decline in new reservoir starts. Each reservoir project authorized for implementation or for the Phase I stage of advance engineering and design is reviewed to determine why they were not constructed. By virtue of their authorization for implementation or for Phase I planning, there obviously was support for these projects at one point in time. That support receded and no longer was adequate to result in construction of these projects. The issue of reservoir projects also is discussed below in connection with the political definition of responsiveness.

Political responsiveness

Political responsiveness is another measure of achieving results consistent with citizen preferences. Results are measured in terms of authorization and implementation of projects when supported at the local level. Where projects are opposed at the local level, political responsiveness implies non-implementation of projects. Although elected officials generally support their constitutents, the political process calls for bargaining and negotiation, which, while departing from constituent proposals, may be necessary to achieve results. Political responsiveness is therefore considered an added dimension of responsiveness, of particular importance in view of the dramatic shift in attitudes and actions toward Corps projects in recent years, both as to degree of

support and ability of Congress to enact authorizing legislation.[1]

Much has been written about the close relationship between the Corps and Congress in obtaining authorization and funding for water resource projects. Such books as Muddy Waters,[2] Water Resources Investment and the Public Interest,[3] and Pork Barrel Politics: Rivers and Harbors Legislation 1947-1968[4] were all critical of this close tie. These books were based on pre-NEPA conditions. The period since 1970 has seen a bold shift in political support, undoubtedly reflecting to a degree the perception and priorities of the constituents of elected representatives. The inherently stable distributive policy arena in which water resource decisions were made no longer seems to function smoothly. As Ingram notes, the prevailing patterns of use have reached physical limitations which the pattern of politics heretofore refused to acknowledge.[5] Environmental interests are also insisting on participat-

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[1]See Ingram, "The Changing Decision Rules," for an incisive view of changes in local and political support and increased conflict in policy and decision making. The changes discussed by Ingram more than ten years ago appear to be continuing as discussed in Charles Yoe, The Declining Role of the U.S. Army Corps of Engineers in the Development of the Nation's Water Resources (Fort Collins, CO: Colorado Water Resources Research Institute, Colorado State University, 1981), Ch. 3, pp. 32-74.

[2]Arthur Maass, Muddy Waters (Cambridge, MA: Harvard University Press, 1952).

[3]Robert H. Haveman, Water Resource Investment and the Public Interest (Nashville, TN: Vanderbilt University Press, 1965.

[4]John A. Ferejohn, Pork Barrel Politics: Rivers and Harbors Legislation, 1947-1968 (Stanford, CA: Stanford University Press, 1974.

[5]Helen Ingram and J.R. McCain, "Federal Water Resources Management: The Administrative Setting," Public Administration Review, XXXVII, No. 5, September-October 1977, pp. 450-451.

ing in water resources decisions, and their views are frequently in direct conflict with traditional pro-water resource development projects.[1]

The inability of Congress to enact a water resource development act since 1976 illustrates the conflicting interests prevalent in the water resource field. Where a project is supported by local interests but Congress is unable to authorize it for implementation, a lack of responsiveness is implied on the part of Congress. The same would apply to the funding of a project. At the project level, political support or lack of it should reflect the attitudes of the congressional constituency. In analyzing individual projects, it would be of interest to determine whether there has been a marked shift in traditional support for Corps projects. Opposition to a project by a congressional representative need not be construed as a lack of responsiveness. On the contrary, where the views of the affected public and political representatives are in harmony but at odds with the Corps view, it might be said that the Corps attitude may be unresponsive. It would appear appropriate to consider political responsiveness in a generic sense; i.e., the evaluation of political support for the Corps water resources program,[2] and on a project level; i.e., an analysis of political support for individual projects compared with Corps and citizen preferences.

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[1] Ibid., p. 451.

[2] An interesting variation of the political responsiveness theme is manifested in the Corps lack of authority to design and construct single-purpose water supply projects or to rehabilitate old systems where the state or city is financially unable to accomplish this. This type of water resource project, while having strong political support in certain areas such as New York City and

Timeliness as a measure of responsiveness

When people experience flooding, it is discouraging for them to be told that it will be more than a decade before the problem can be solved. That is precisely what happens when the solution involves a Corps project requiring congressional authorization.[1] By evaluating policy changes and specific projects as they move through the formulation, authorization, and implementation stages, it will be possible to draw conclusions as to the impact of policy changes on timeliness in providing solutions to flooding problems. The failure of Congress to enact a water resource development act since 1976, the fact that Section 201 authority used extensively from 1970-1977 has not been used in over five years, and the impasse between the executive branch and legislative branch over cost sharing--all would suggest a failure of the system to be responsive. From the point of view of the communities in need of flood protection, it would be difficult to argue to the contrary. However, there are those needing flood protection that benefit from these impasses. For example, projects on which construction has been

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Philadelphia, is beyond the authority of the Corps. However, the Corps failure to respond to such needs has resulted in a fragmentation of political support for traditional Corps new work, relatively little of which is being considered for New York City and Philadelphia. This situation, while pertinent to an overall assessment of responsiveness, is beyond the scope of the current research effort.

[1]Small projects in continuing authorities programs can be authorized by the Chief of Engineers. These projects, which must meet similar economic and engineering considerations, generally can be planned, designed, and implemented in a shorter period of time. However, they are not being considered in this research, since they are limited as to dollar value and reflect about 5 percent of the Corps investment in flood damage prevention projects.

initiated are able to receive funding on a more efficient construction schedule and a usable project is available to the community more quickly than would probably be the case had there been no impasses over the authorization of new projects.

Timeliness as a dimension of responsiveness cannot be divorced from the citizen and political concepts of responsiveness. The three measures of responsiveness may be thought of as being interrelated. It is essential that timeliness be a consideration where citizen and political support exists for authorization and construction of a project. Where such support exists, timeliness can be measured in terms of results. Ultimately, responsiveness reflects the degree to which a community or geographical area which has a flooding problem has the situation studied and, more importantly, has an acceptable solution authorized and implemented. Figure 13 illustrates the relationship between local interests, the Congress, and the Corps, and the three definitions of responsiveness.

In short, the three criteria against which policy inputs and program outputs are to be evaluated may be viewed on a spectrum as shown in Table 7.

FIGURE 13

MEASURES OF RESPONSIVENESS

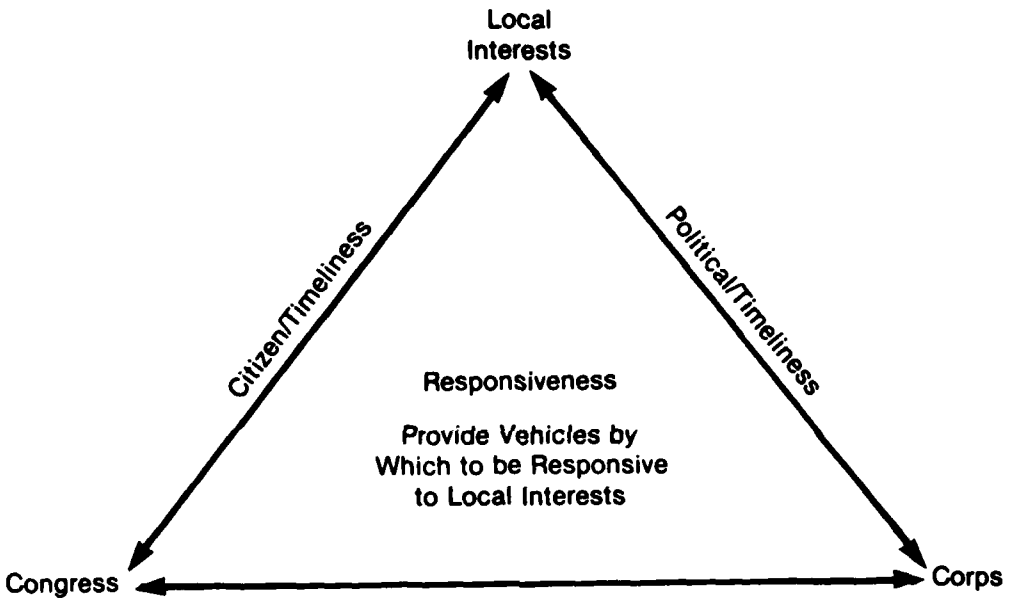

TABLE 7

CONCEPTS OF EQUITY, EFFICIENCY, AND RESPONSIVENESS

EQUITY	RESPONSIVENESS	EFFICIENCY
Interpersonal	Citizen	Macroeconomic
o Distribution of costs progressively by income and wealth; services targeted in favor of poor (vertical equity).	o Degree to which citizens' preferences are considered in solutions.	o National economic benefits must exceed costs for project to be valid.
o Distribution of costs and benefits evenly among similar individuals (horizontal equity).	Technical	o Maximize net economic benefits (as opposed to providing standard project flood protection for safety reasons).
Jurisdictional	o Degree to which projects or technical assistance solves the perceived problem.	
o Distribution of costs and benefits in a manner that favors depressed regions.	Political	Administrative
Group	o Degree of political support for project at local, state, and Federal level.	o Concentration of power in the chief executive and his political appointees in contrast to the pluralist democracy model.
o Distribution of benefits in a manner that does not discriminate against ethnic, color, or status groups.	Timely	o Neutral treatment of flood problems in formulating and implementing Corps projects.
Market	Timeliness of solution.	Microeconomic
o Distribution of to the public in proportion to the to the tax revenue paid.		o Benefits to the rich are as valid as benefits to the poor as long as the service provided is paid for.
		o Willingness of the beneficiaries to pay a higher share of project costs.

CHAPTER V

ANALYSIS OF PROJECT DATA AND RESULTING PROGRAM OUTPUTS

Purpose of the Chapter

The purpose of this chapter is to analyze the seven categories of projects described in Chapter I. The status of each project category is discussed along with the impact that policy changes had on program outputs. The analyses are essentially of a before-and-after variety with the information coming from the following sources:

1. Printed documents, including numerous hearing records, laws, and bills pending in Congress.

2. Project data files available in the Programs Division, Planning Division, and the Office of Policy in the Office, Chief of Engineers.

3. Interviews with Corps personnel.

4. Policy documents issued by successive administrations and by the Corps.

For consideration of equity, information was obtained as indicators of the comparative wealth of communities which received new starts as opposed to those awaiting authorization. The census data used for the new starts category and the projects awaiting authorization are as follows:

1. 1980 median value of owner-occupied dwellings.

2. 1980 median income of individuals living in each community or county.

This information was obtained for most of the seventy-three flood damage prevention projects in Washington undergoing review prior to authorization and nearly 200 flood damage prevention projects which were funded as new construction starts since Fiscal Year 1968. Using a common base (1980 census data), comparisons were made as to the relative wealth of communities in the two categories.

For the most part, the outputs resulting from policy changes are evaluated against the criteria of equity, efficiency, and responsiveness in Chapter VI. At this point, the relationship between policy changes or proposed policy changes and the ensuing outputs are interpreted in a subjective manner. The intent is to highlight the relative magnitude of the specific policy changes on outputs for the various types of projects.

The seven categories of projects include over 1,000 authorized and unauthorized projects. As indicated in Chapter I, some of the authorized projects were implemented while others were not. Some of those that have not been constructed are no longer viable and are being considered for deauthorization. Approximately 170 await congressional authorization in order to be implemented.[1] The relationship between the type of project analyzed, policy factors considered, and specific research question is shown in Figure 1 (Chapter I). For each of the seven categories which are listed below the status and the impact of policy changes are evaluated. For example, the recomputation of benefit-cost ratios, the review of project justifications, the support of local interests,

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[1]Approximately seventy of these projects are local protection projects and are analyzed in greater detail.

and the time saved or lost based upon policy changes are all reviewed in conjunction with specific policy changes which influenced programs outputs. A separate analysis was made of non-structural solutions which received considerable attention during the post-NEPA period. The limited number of non-structural projects authorized and implemented or awaiting authorization is a matter of concern, given the emphasis this type of solution received in the planning process.

Categories of Projects Analyzed

The seven categories of projects analyzed are listed below in the order presented in this chapter. Certain policy changes affected one category of project in an entirely different way than they did another. For example, disagreement over cost sharing and the failure of Congress to enact authorizing legislation since 1976 resulted in a slowdown and eventual cessation in the appropriation of funds for new construction starts. Projects which are under way, however, were more apt to receive an optimum allocation of funds in the budget process. The categories of projects analyzed are as follows:

1. Phase I projects.

2. Reservoir projects with water quality control storage budgeted for construction in Fiscal Year 1979.

3. Active projects placed in the deferred and inactive category.

4. Section 201 projects approved for implementation by House and Senate committee resolutions pursuant to the provisions of Section 201 of the Flood Control Act of 1965.

5. Authorized projects funded for construction.

6. Other active authorized projects not funded for construction.

7. Reports in Washington recommending authorization of projects for implementation by the Corps.

Phase I Project Data

Of the sixty projects authorized for the Phase I stage of advance engineering and design in 1974 and 1976, forty were projects which, if const ced, would provide some degree of flood damage prevention benefits. Progress on these projects may be classified as follows:

1. Those on which Phase I studies have produced favorable recommendations to proceed with construction (fifteen projects).

2. Those on which Phase I studies are under way, but progress to date has not resulted in a recommendation (ten projects).

3. Those which are no longer supported or needed or where an economic justification is lacking (fifteen projects).

The forty projects may be classified as either primarily reservoir projects with some storage for flood damage prevention or local protection projects, as shown in Table 8.

TABLE 8

FLOOD DAMAGE PREVENTION PHASE I PROJECTS

Major Feature of Project	Favorably Recommended	Under Way	No Longer Supported, Required, or Feasible	Total
Water Resource Development Act of 1974				
Reservoir	0	1	8	9
Local Protection	4	2	3	9
Water Resource Development Act of 1976				
Reservoir	1	2	1	4
Local Protection	10	5	3	18
Total	15	10	15	40

Completed Phase I Reports With Favorable Recommendations

Fifteen Phase I projects with at least some flood damage prevention benefits have been recommended favorably for authorization to proceed to construction; they are currently undergoing the Washington level review. These projects were authorized during a period of intense change in policies and public perception pertaining to water resource projects. The large number of studies which had been started prior to NEPA, and which resulted in the authorization of projects that were no longer implementable, led to the decision by Congress in 1974 and 1976 to authorize projects for the Phase I stage of advance engineering and design in lieu of construction. Such an action was consistent with measures taken by the Corps on projects authorized in previous omnibus legislation, generally prior to NEPA.[1]

A decade after the Congress first authorized Phase I projects, only one such project with flood damage prevention benefits has been authorized for construction. It is the Tug Fork valley, Kentucky and West Virginia, project. On the basis of traditional economic analysis, there is little doubt that flood damage prevention projects in the flood-prone communities of the valley would not be economically justified. Nevertheless, Congress authorized a major flood damage project for the Tug Fork valley, declaring:

> Sec 202.(a)The Secretary of the Army, acting through the Chief of Engineers, is authorized and directed to design and construct, at full Federal expense, such flood control measures at or in the vicinity of-
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> (1) Pikesville, Kentucky, and of Grundy, Virginia, on the Levisa Fork of the Big Sandy river,

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[1]U.S., Department of the Army, Engineer Regulation 1110-2-1150, Change 3: Engineering and Design: Post-Authorization Studies (Washington, DC, 1972).

(2) Pineville, Kentucky, on the Cumberland River, and

(3) Williamson and Matewan, West Virginia, on the Tug Fork of the Big Sandy River, as the Chief of Engineers determines necessary and advisable to afford these communities and other flood damaged localities and their immediate environs on both the Levisa and Tug Fork of the Big Sandy River and Cumberland River a level of protection against flooding at least sufficient to prevent any future losses to these communities from the likelihood of flooding such as occurred in April 1977, at an estimated cost of $284,000,000.

(c) The Congress finds that the benefits attributable to the objectives set forth in section 209 of the Flood Control Act of 1970 exceed the cost of the flood control measures authorized by this section.[1]

This action by Congress was done in full recognition that consideration of national economic development benefits alone would not result in a favorable recommendation by the Corps. The situation in the Tug Fork, Levisa Fork, and upper Cumberland River flood-prone communities was such that there was little likelihood that they would receive a favorable Corps recommendation. The factors which contributed to the inability of the Corps to justify a project included:

1. The geography of the region is one of narrow valleys and steep hills requiring high levees and floodwalls for adequate protection. This makes the construction rather expensive.

2. The areas subject to flooding were low income areas with the average value of housing well below the national average. This has a bearing on the quantification of flood damage prevention benefits and the ability of the communities to pay the non-Federal share of construction costs.

3. The continued rise in the discount rates under which the Phase I studies were conducted had a further detrimental impact on the benefit-cost ratio.

The authorization of the flood damage prevention project for Tug Fork, Levisa Fork, and the upper Cumberland River is the most

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[1] Energy and Water Development Appropriations Act, 1981, Pub. L. 96-367, 96th Cong., 2d sess., 1980, Sec 202.

notable example of congressional intervention since 1970; it set aside traditional benefit-cost analysis as a basis for a water resource development project in favor of consideration of social well-being and equity.

Many of the changes in project formulation that occurred since the Phase I projects were authorized were necessary to comply with new legislation or were within the discretionary authority of the Chief of Engineers. As such, the changes probably could have been incorporated in the project during the preconstruction planning stage had the project been authorized for construction in 1974 or 1976. Where reservoirs were a part of the recommendations in the Phase I authorization of 1974-1976, they have either since been dropped from the current recommendation (e.g., Arkansas River above John Martin Dam, Colorado and Nonconnah Creek, Tennessee), or they continue to be recommended but are subject to controversy (e.g., Santa Ana River, California [Mentone Dam]).

The level of protection recommended in the completed Phase I reports was generally as high as when the projects were authorized in 1974 or 1976. In a number of instances involving urban locations, the level of protection was increased to the standard project flood (SPF) level. Although the completed Phase I reports have been undergoing Washington level review for upwards of three years, only one has been transmitted to Congress for authorization.[1] The delays have been the result of several factors which illustrate philosophical differences between the Carter and Reagan administra-

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[1]The Phase I report for a flood damage prevention project at Rochester, Minnesota, was transmitted to Congress with a favorable recommendation in May 1979.

tions. The Carter administration emphasized environmental quality and enhancement and fish and wildlife mitigation and enhancement. The current administration is less inclined to concur in such project features where they are costly and not consistent with the national economic development (NED) plan or otherwise required by law. Greater emphasis is placed by the Reagan administration on the NED plan and on the reasonableness of the assumed "without-project" conditions; that is, what local interests are likely to do in the absence of a Federal project. Table 9 provides a summary of the Phase I projects with favorable reports. It highlights the long period of time required for review in Washington prior to transmittal to Congress for authorization and changes in the recommended level of protection.[1]

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[1]When no controversy is involved, the Washington-level review can be completed within one year. This is evidenced by the numerous completed studies which recommend no Federal action. These reports go through the identical review process as reports with favorable recommendations and generally are transmitted to Congress within a year of their arrival in Washington from Corps division offices.

TABLE 9

PHASE I FLOOD DAMAGE PREVENTION PROJECTS WITH
FAVORABLE RECOMMENDATIONS UNDERGOING
WASHINGTON LEVEL REVIEW

Project	Dates of Washington Level Review							Level of Protection		Remarks
	Division Commander Notice	BERH/MRC Action	To States & Agencies	COE Report	To OMB	OMB Comments	To Congress	1974-76	Current Recommendation	
Rochester, MN				Feb 79	Mar 79		Apr 79	100	200	Report transmitted to Congress during Carter administration.
Bushley Bayou, LA	Aug 78	Aug 78	Mar 79 Suppl.	Apr 80 Aug 82						
Arkansas River & Tribs. above John Martin Dam (Fountain Creek Interim), CO	Jun 80	Feb 81	May 81	Dec 81	Jun 83			SPF	200	Decreased level of protection based on channel improvement and levees in lieu of dam.
Lock Haven, PA	Sep 80	Feb 81	May 81	Dec 81				170	SPF	
St. Johns Bayou & New Madrid Floodway, MO	Sep 80	Jan 82	Jul 82	Jan 83				10 yrs or less	10 yrs or less	
Richmond, VA	Feb 81	May 81	Jul 81	Nov 81	Jul 83			250	SPF	
Santa Ana River Basin, CA	Feb 81	May 81	Jul 81	Jan 82				SPF	SPF	
Horn Lake Creek & Tribs., incl. Cowpen Creek, TN and MS	Aug 81	Jan 82	Jul 82	Jan 83	Sep 83			100	50	
Nonconnah Creek, TN	Sep 81	Jan 82	Jul 82	Dec 82				100	100	
Wyoming Valley, PA	Feb 82	Sep 82	Dec 82					370	370	

TABLE 9--Continued

Project	Dates of Washington Level Review							Level of Protection		Remarks
	Division Commander Notice	BERH/MRC Action	To States & Agencies	COE Report	To OMB	OMB Comments	To Congress	1974-76	Current Recommendation	
Little Calumet River, IN	Oct 82	Sep 83						200	200	
Park River, Grafton, ND	Feb 83	Jun 83						SPF	SPF	
North Branch Chicago River, IL	Sep 83									
Others										
Walkill River (Black Dirt Area), NY & NJ	One portion of the project was constructed as a Section 205 project under the continuing authorities of the Chief of Engineers. No other projects are feasible.									
Weare Creek, MO										

Abbreviations:

BERH The Board of Engineers for Rivers and Harbors. This organization has the responsibility for reviewing reports submitted by division engineers.

MRC Mississippi River Commission. The commission reviews reports within its jurisdiction, performing the same function as BERH does for projects located in other parts of the nation.

COE Chief of Engineers.

OMB Office of Management and Budget.

Phase I Projects No Longer Supported or Feasible

A review of the Phase I projects which are no longer supported or feasible indicates that reservoir projects are most prominent in this category. The withdrawal of support or lack of economic justification is consistent with the dramatic shift away from reservoir projects that has occurred since NEPA. Most of the Phase I reservoir projects were actually formulated prior to or shortly after enactment of NEPA. By the time they were authorized for Phase I studies in 1974 and 1976, support for such projects had already declined. While attempts were made by the Corps to justify several of these reservoir projects, particularly where water supply was a project purpose, the higher discount rate, the lack of local support, and environmental objections resulted in their no longer being considered viable projects.[1]

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[1]For a discussion of the problems facing the Corps in its attempts to formulate and obtain authorization of acceptable reservoir projects in the 1970s see Helen Ingram and J.R. McCain, "Federal Water Resources Management: The Administrative Setting," Public Administration Review, XXXVII, No. 5, September-October 1977, pp. 448-455, and Charles Yoe, The Declining Role of the U.S. Army Corps of Engineers in the Development of the Nation's Water Resources (Fort Collins, CO: Colorado Water Resources Research Institute, Colorado State University, 1981), pp. 32-74.

Phase I Projects Being Reformulated

The third group of Phase I projects are those which Corps planners are currently reformulating in an attempt to develop projects which could be authorized for construction. Higher discount rates, changes in planning guidance, and potential changes in cost sharing formulas are factors complicating the completion of these studies. In several instances, the Phase I projects involve numerous political jurisdictions, often making agreement on an acceptable plan most difficult, even if the planning policies and guidance were stable (which they are not).[1] Where the Phase I authorizations encompassed major engineering works with construction cost estimates in the hundreds of millions of dollars, Corps planners have found it more feasible to focus attention on limited portions of the problem area.[2] These interim reports stand a better chance of receiving the required non-Federal support which is frequently the most difficult part of the planning process. Furthermore, the cost of projects recommended in the interim reports is much more modest and therefore more readily acceptable when reviewed by the executive and legislative branches prior to authorization.

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[1]Examples are the Passaic River, New Jersey, and the Chicagoland underflow plan, Illinois. Reformulation of these two Phase I projects involves an expenditure of about $25 million over a ten-year period with no assurance that recommended projects will be authorized and implemented.

[2]For example, in the Passaic River basin, several interim reports are scheduled to reach Washington in 1984-1985, and one interim report developed from the Chicagoland underflow plan study is scheduled to be completed in 1984.

Projects Reclassified From the Active to the Inactive or Deferred Categories

A review was made of over 100 flood damage prevention projects reclassified since 1972 from the active authorized category of Corps projects to the inactive or deferred category.[1] The vast majority of these projects were authorized prior to 1970 and were formulated based on pre-NEPA planning guidance.

A further review was made of the flood damage prevention projects proposed for deauthorization in H.R. 3678.[2] Most of the projects reclassified during the 1972-1983 time frame are also included in this bill for deauthorization. The most frequent reasons given for the reclassification and potential deauthorization of the flood damage prevention projects were as follows:[3]

1. Lack of economic feasibility: Based upon conditions prevailing at the time of the evaluation, including then-current

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[1]The review consisted of reading the correspondence between Corps district and division offices and the Office, Chief of Engineers, as well as letters to senators and congressmen explaining the rationale for the reclassifications. The correspondence is available in the Programs Division, Civil Works Directorate, Office, Chief of Engineers. In addition, a separate analysis was made of all inactive and deferred projects considered as potential candidates for deauthorization in H.R. 3678. For each such project, Corps districts had categorized the reason the project was no longer supported. The project lists and reasons for non-support were placed in a data base which was reviewed in detail. For the most part, however, the correspondence was considered to contain the more accurate reasons for reclassifications.

[2]H.R. 3678, Title X. More than 300 projects with an estimated cost in excess of $11 billion are proposed for deauthorization. Approximately one-half of them are flood damage prevention projects.

[3]The reasons were culled from a review of pertinent correspondence and a data base developed by the Office, Chief of Engineers, with input from its field offices. See note 1, above.

price levels and guidance on the calculation of benefits, the benefit-cost ratio was below unity. While the low benefit-cost ratio was the primary reason for these reclassifications, local support for these projects was found in only a few instances.[1] For the most part, the projects were authorized prior to NEPA and the fact that they had not been constructed at an earlier date was evidence of the limited support the Corps received from non-Federal sponsors or their elected congressional representatives.[2]

2. Lack of local support: Many of the reclassified projects with a favorable benefit-cost ratio using the legal discount rate were no longer supported by the non-Federal sponsor. In some instances, this reflected inability to finance the non-Federal share. In other cases, the required non-Federal investment was considered too great when compared with the benefits that would be realized. Many of these projects were simply outdated and did not meet current or prospective needs. Solutions to persistent flooding problems would require new authorizations.

Several other points pertaining to the reclassified projects became apparent.

1. Reservoir projects are generally not supported financially or politically by the states and local interests, even under traditional cost sharing and when economically feasible. Opposition from landowners whose property would be required, but who would not derive benefits from a project, was a factor in the withdrawal of state support.

2. Many local protection projects, even those with grandfathered discount rates, are no longer economically feasible based upon current physical conditions of development and land use. In some instances, this reflects more rapid increases in construction costs than in estimated benefits.

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[1]This statement is based upon a review of the pertinent correspondence. The implication is that where the benefit-cost ratio drops below unity because of higher discount rates, increased cost estimates, or decreases in estimated average annual benefits, there may also be a lack of serious support for the project. Had there been serious current support for a particular project, a re-analysis of benefits would probably have been performed or a reformulation of the project accomplished, very possibly resulting in a favorable benefit-cost ratio.

[2]Most of the reclassified projects authorized prior to NEPA have a legal discount rate of 3-1/4 percent. Even at this discount rate, many projects have been reclassified to the inactive or deferred category based on the benefit-cost ratio dropping below unity.

3. Higher priorities within the limited financial capabilities of non-Federal interests, opposition on environmental grounds, and preference for non-structural solutions are chief among the reasons local interests no longer support a number of projects that may otherwise be economically feasible.

Occasionally, local sponsors change their views and decide to resume support for a local protection project previously placed in the inactive or deferred category. This change in predisposition generally occurs after a major flood that caused damage which could have been prevented with the project. If the issue of classification is limited to a favorable indication from a sponsor, then the project can be reclassified to the active category; it is eligible then to be funded for advance engineering and design and subsequently construction.[1] This reclassification to the active category can be accomplished by correspondence and does not require further congressional action.[2]

The long list of projects placed in the inactive and deferred categories over the years tends to indicate that when projects are not constructed within a reasonable period following their authorization, there is less likelihood that they will ever be constructed. Since so many of these projects experienced a withdrawal of non-Federal support, it may be assumed that physical conditions in

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[1]Two recent examples are the projects at Great Bend, Kansas, and Fairfield County, California. Great Bend was reclassified to the deferred category in July 1977 based on a lack of assurance of local cooperation. Following floods in June 1981 and passage of a bond issue in April 1982, the project was reclassified to the active category. Similar events occurred in the area of the Fairfield County streams project. This project was proposed as a new construction start in Fiscal Year 1984.

[2]Letters of support from the non-Federal sponsor and a favorable recommendation by district and division engineers are generally sufficient for approval by the Office, Chief of Engineers.

the communities, as well as public perception and priorities vis-a-vis other urban needs, have changed. It is also reasonable to recognize that the National Flood Insurance Program provides a means for people in the flood plain to receive payment for at least part of their loss in the event of a flood. This alternative prompts communities to accept greater risk when their financial resources are limited and other demands are pressing.

Withdrawal of Support for Reservoir Projects

The numerous reservoirs with flood control storage which were reclassified from the active to the inactive or deferred categories and the dearth of new reservoirs authorized for construction after 1970 are indicative of the withdrawal of support for this type of structural solution. A review of correspondence involving reclassifications of reservoirs between 1972 and 1983 revealed the unwillingness of states and local jurisdictions to accept this traditional solution to flood problems. Other reservoir projects which remained active but unstarted during the same period experienced the same sort of reaction but were not reclassified for one reason or another.[1] In contrast, since Fiscal Year 1976, only four reservoir projects have been funded for initiation of construction and are actually being built.[2]

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[1]Over twenty reservoir projects remained active but unstarted as of 1983. They are experiencing the same type of opposition. It is unlikely that very many of these reservoirs will ever be built.

[2]The projects are Aquilla Lake, Texas; Applegate Lake, Oregon (completed); Little Blue River Lakes, Missouri; and Arcadia Lake, Oklahoma.

Reservoir Projects With Water Quality Control Benefits

The ensuing discussion of water quality control storage as a project purpose in Corps reservoirs is intended to highlight the effect of policy changes on the economic viability of such projects. Projects that were initiated prior to the policy changes are reanalyzed as though they were considered as new construction starts subsequent to the policy changes. The recalculations demonstrate the depressing effect on the benefit-cost ratio of reservoir projects that result when water quality benefits were excluded from the benefit stream and higher discount rates were used.

Of course, other issues have contributed to the failure of a number of multiple-purpose reservoirs to be implemented. Many of them would not have been undertaken after 1972 even had the policy change on water control not occurred.[1] On the other hand, those reservoir projects with water quality storage benefits that were grandfathered by virtue of having received construction funds by October 18, 1972, have generally been implemented and are producing their intended benefits.

A review of the Fiscal Year 1979 construction budget of the Corps revealed that twenty-eight multiple-purpose reservoir projects with water quality benefits were being funded. These projects all had received initial construction funds prior to October 18, 1972, the date Public Law 92-500 was signed. Table 10 furnishes a list of

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[1]The same basic reason presented in the discussion of reservoir projects placed in the inactive and deferred category applies here. As a matter of fact, a number of reservoir projects reclassified to the inactive and deferred categories originally were justified with the inclusion of water quality control benefits. However, subsequent withdrawal of state support was based on a degree of opposition that exceeded prior support.

TABLE 10

PROJECTS IN CORPS OF ENGINEERS FISCAL YEAR 1979
CIVIL WORKS BUDGET WITH WATER QUALITY
CONTROL BENEFITS

Project	Year Auth.	Fiscal Year Received First Const. Funds	Benefit-Cost Ratio FY 1979 Budget	Auth. Disc. Rate	Est. Annual Benefits in FY 1979 ($ in millions) Total	Water Qual. Control	Percent Water Qual. of Total	Percent of Total Est. Annual Benefits: Flood Control	Water Supply	Hydro-Electric Power	Recre-ation	Other	Approx. Benefit-Cost Ratio Under Current Guidelines
Long Branch Lake, MO	1965	1972	1.7	3 1/4	1.80	0.36	20.0	12	51	-	17	-	1.3
Smithville Lake, MO	1965	1972	1.2	3 1/4	4.75	0.012	0.3	32	36	-	32	-	0.9
Pappillion Creek & Tribs., NE	1968	Land Acquisi-tion 1971 Construction 1972	2.4	3 1/4	5.91	0.016	0.3	61	-	-	39	-	1.3
B. Everett Jordan Dam & Lake, NC	1963	1967	1.8	3 1/8	8.10	0.78	9.6	39	4	-	43	4	0.8
Falls Lake, NC	1965	Land Acquisi-tion 1970 Construction 1971	1.5	3 1/4	6.66	0.80	12.0	21	9	-	54	4	0.7
Caesar Creek Lake, OH	1938	1967	2.4	3 1.8	7.24	0.55	7.6	47	7	-	35	3	1.2
East Fork Lake, OH	1938	1967	2.4	3 1/8	7.63	0.38	5.0	46	6	-	40	3	1.2
Copan Lake, OK	1962	Land Acquisi-tion 1970 Construction 1971	1.4	3 1/4	3.54	0.29	8.2	82	4	-	4	2	0.7
Skiatook Lake, OK	1962	1973	2.0	3 1/4	6.25	2.15	34.4	36	13	-	16	1	0.8
Waurika Lake, OK	1963	Land Acquisi-tion 1969 Construction 1970	1.7	3 1/4	5.02	0.88	17.5	11	50	-	19	2	0.8
Applegate Lake, OR		Land Acquisi-tion 1973 Construction 1976	1.3	3 1/4	4.48	0.45	10.0	57	-	-	24	9	0.6

TABLE 10 -- Continued

Project	Year Auth.	Fiscal Year Received First Const. Funds	Benefit-Cost Ratio FY 1979 Budget	Auth. Disc. Rate	Est. Annual Benefits in FY 1979 ($ in millions) Total	Water Qual. Control	Percent Water Qual. of Total	Percent of Total Est. Annual Benefits: Flood Control	Water Supply	Hydro-Electric Power	Recre-ation	Other	Approx. Benefit-Cost Ratio Under Current Guidelines
New Melones Lake, CA	1944/ 1962	1966	1.9	3 1/8	27.8	0.18	0.6	12	-	60	10	17	1.4
Patoka Lake, IN	1965	Land Acquisition 1968 Construction 1972	2.6	3 1/4	7.55	0.50	6.6	39	16	-	35	3	1.3
Saylorville Lake, IA	1958	1964	2.7	2 7/8	9.89	0.38	3.8	66	-	-	30	-	1.2
El Dorado Lake, KS	1965	Land Acquisition 1970 Construction 1971	1.6	3 1/4	5.59	0.62	11.1	13	48	-	26	2	1.1
Hillsdale Lake, KS	1954	1973	1.2	3 1/4	2.96	0.58	19.6	24	48	-	8	-	0.8
Cave Run Lake, KY	1936/ 1938	1965	1.7	3	7.39	0.37	5.0	41	-	-	51	3	0.8
Paintsville Lake, KY	1965	1971	1.2	3 1/4	2.40	0.79	32.9	24	-	-	29	14	0.5
Taylorsville Lake, KY	1966	1971	1.7	3 1/4	5.78	0.63	10.9	24	-	-	60	5	0.8
Bloomington Lake, MD & WV	1962	Land Acquisition 1968 Construction 1970	1.7	3 1/4	10.61	4.19	39.5	19	31	-	1	9	0.7
Tallahala Creek Lake, MS	1968	1973	1.2	3 1/4	3.50	0.36	10.4	24	10	-	48	8	0.7
Little Blue River Lake, MO	1968	Land Acquisition 1970 Construction 1977	1.6	3 1/4	8.65	0.59	6.8	73	-	-	20	-	0.8

TABLE 10--Continued

Project	Year Auth.	Fiscal Year Received First Const. Funds	Benefit-Cost Ratio FY 1979 Budget	Auth. Disc. Rate	Est. Annual Benefits in FY 1979 ($ in millions) Total	Water Qual. Control	Percent Water Qual. of Total	Percent of Total Est. Annual Benefits: Flood Control	Water Supply	Hydro-Electric Power	Recreation	Other	Approx. Benefit-Cost Ratio Under Current Guidelines
Lost Creek Lake, OR	1962	1967	2.1	3 1/8	13.48	Included in Other Benefits	Included in Other Benefits	54	4	20	11	11	1.4
Blue Marsh Lake, PA	1962	Land Acquisition 1969 Construction 1973	1.6	3 1/4	4.82	1.01	21.0	24	34	-	21	-	0.9
Gathright Lake, VA	1946	1967	1.4	3 1/8	5.09	1.39	27.3	50	-	-	15	8	0.6
Burnsville Lake, WV	1938	Land Acquisition 1968 Construction 1971	1.5	3 1/8	2.82	0.30	7.2	55	-	-	25	13	0.7
R. D. Bailey Lake, WV	1962	1967	1.13	3 1/8	7.62	0.56	7.3	74	-	-	8	11	0.5
Stonewall Jackson Lake, WV	1966	Land Acquisition 1970 Construction 1971	1.3	4 5/8	6.01	2.13	35.4	34	2	-	22	7	0.7

these projects and the estimated annual benefits they would supply. Of particular interest are two facts: the authorized discount rate for all but one of the twenty-eight projects was 3-1/4 percent or less; the water quality control benefits constituted as high as 40 percent of the total annual benefits presented to Congress in support of the Fiscal Year 1979 annual budget request. Of the twenty-eight projects with water quality control benefits included in the Corps Fiscal Year 1979 construction budget, all but one project are under construction or are complete and in operation.[1]

All of the projects would have lower benefit-cost ratios if water quality benefits were eliminated and the current discount rate was used. Only eight of the projects would have a benefit-cost ratio greater than unity. Under Corps policy such projects would not be recommended for initiation of construction.

Had these projects not been grandfathered,[2] the ground rules for computing the approximate benefit-cost ratio effect when the Fiscal Year 1979 budget was prepared would have been altered in the following ways:

1. Water quality control benefits were not permitted by EPA.

2. The discount rate used in calculating annual costs and benefits would have been the rate in effect when the Fiscal Year 1979 budget was prepared (in Fiscal Year 1978); that rate was 6-5/8 percent.

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[1]The one exception is Tallahala Creek Lake, Mississippi. Discovery of oil in the reservoir area and increased costs based on more detailed engineering make it unlikely that the project will be built.

[2]Grandfathered with respect to counting water quality control benefits, using a lower discount rate (generally 3-1/4 percent or less), and not requiring recreation cost sharing if authorized prior to enactment of Public Law 89-72 in 1965.

3. Water supply and hydroelectric power benefits would have been higher using a discount rate of 6-5/8 percent rather than the lower authorized rates; however, flood control and recreation benefits would have been the same or less at 6-5/8 percent.

4. Annual costs would have been significantly increased by the higher discount rate.

5. Although no reduction in the benefit-cost ratio would have occurred on the basis of an analysis of recreation benefits, it could be argued that some reduction would have occurred for two reasons. First, seventeen of twenty-eight projects were authorized prior to the enactment of Public Law 89-72 in 1965. These projects are grandfathered under pre-Public Law 89-72 rules which called for full Federal construction and operation and maintenance of recreation facilities. However, had they been authorized in 1965 or later they would be subject to cost sharing and non-Federal operation and maintenance. This change tends to limit the extent of development compared with projects at which the recreation facilities are entirely financed by the Federal government. The second argument for reducing the benefit-cost ratio, particularly where recreation benefits claimed are substantial, is that the value of a visitor-day did not change while construction costs did. Recreation benefits tended to stay constant for a number of years at a time.[1] Since the comparison of benefit-cost ratios is being made on the basis of Fiscal Year 1979 data and since the Corps has a practice of computing a remaining-benefit remaining-cost ratio (RBRCR) effective with the Fiscal Year 1980 budget, a reduction was not made.

The fate of reservoir projects with water quality control storage that had not been funded for construction by October 18, 1972, is also dramatic. None of those projects has been constructed; a number have been deauthorized or placed in the inactive or deferred categories.

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[1]For example, budget justification material submitted to Congress in support of the Fiscal Year 1979 and 1982 budgets reflected the identical value per visitor-day for the estimated annual recreation benefits. Yet, construction costs escalated more than 25 percent during this period.

Analysis of Section 201 Projects

Review of the Use of Section 201

As indicated in Chapter I, the purpose of the Section 201 authority was to expedite the authorization of relatively small water resource development projects. It was the intent of Congress that relatively minor projects should not have to wait for action of the whole Congress. Under Section 201, these relatively small projects could be authorized, constructed, and put into operation quickly, once the project was recommended for authorization following the normal survey procedures.[1] Accordingly, all projects authorized under the provisions of Section 201 had undergone the full review procedure and had been recommended for implementation by the Secretary of the Army. A House or Senate document served as the basic authorizing document. The approval of each project for implementation was accomplished by adopting resolutions by the congressional authorizing committees. For each project authorized by Section 201, the letter of transmittal from the Department of the Army contained the following statement: "Since this project meets all the requirements of Section 201 of the Flood Control Act of 1965 and involves little or no controversy, I recommend that the project be approved for appropriation."[2]

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[1]U.S., Congress, House, Committee on Public Works, River and Harbor, Beach Erosion, Flood Control Projects and Water Supply, H. Rept. 973, 89th Cong., 1st sess., 1965, p. 12.

[2]Refer to letters from the Department of the Army transmitting the reports to Congress. These letters are contained in the House or Senate documents which were cited by the committee resolutions in the authorization of the projects.

When President Johnson signed Public Law 89-298, he objected to Section 201 as encroaching upon the responsibilities of the President by vesting project authorization responsibilities with committees instead of both houses of Congress.[1] Between October 27, 1965, when Public Law 89-298 was signed, and July 14, 1970, the Secretary of the Army acted consistently with President Johnson's statement when he signed the bill and did not choose to recommend any projects for authorization under the provisions of Section 201. But after July 14, 1970, a new signal was sent by the Nixon administration indicating a willingness to recommend projects using the Section 201 authority.

The first projects to be recommended by the Secretary of the Army for authorization were two urban flood control projects. These were Four Mile Run, Virginia, and Minot, North Dakota. There was severe flooding in Alexandria and Arlington, Virginia, and Minot, North Dakota, during the 1960s. Also the Nixon administration was willing to recommend that the projects be authorized under the provisions of the Section 201 authority. Together, these events prompted the Secretary of the Army to make such recommendations in July 1970. The Senate Public Works Committee by resolution, dated July 14, 1970, approved the reports submitted by the Secretary of the Army, and the two projects were thus eligible to receive appropriations for advance engineering and design and construction.[2]

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[1]U.S., President, "Omnibus Rivers and Harbors Bill Statement by the President Upon Signing the Bill," Weekly Compilation of Presidential Papers, Nov. 1, 1965, Vol. 1, No. 14, pp. 432-433.

[2]U.S., Congress, Flood Control Act of 1965, Pub. L. 89-298, October 27, 1965.

Between July 1970 and June 1978, the authorizing committees adopted resolutions permitting eighty-four Corps water resource projects to be eligible for advance engineering and design appropriations and subsequently construction.

Once a project has been authorized under the provisions of Section 201, the fact that the Federal cost of the project ultimately becomes more than the $10 million limit established in 1965 or the $15 million limit established by law for projects authorized after October 1976 generally does not affect the validity of authorization. Two exceptions to this statement occurred in the early 1970s and required special authorizing legislation in the Water Resource Development Acts (WRDA) of 1974 and 1976.[1] In both cases, subsequent engineering and design data indicated that the original Federal cost estimates should have been over $10 million had the more detailed design been available at the time the public works committees approved the projects in 1970. Where the Federal cost of construction exceeded the $10 million limitation due to price level rises, the Section 201 authorization remains valid unless indications are that the original cost estimate was deficient and should have been in excess of $10 million at the time of authorization.[2]

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[1]The two projects were the Four Mile Run, Virginia, and the Mobile Harbor (Theodore Channel), Alabama, project. Section 84 of the Water Resource Development Act of 1974 modified the Four Mile Run authorization, and Section 112 of the Water Resource Development Act of 1976 modified the Mobile Harbor authorization. Thus, both projects, in effect, were reauthorized by acts of Congress because the estimated Federal costs at the time construction was to be undertaken revealed that Section 201 was not an appropriate vehicle for authorization.

[2]See legal opinion of E. Manning Seltzer, General Counsel to the Chief of Engineers, printed in U.S., Congress, House,

Since June 1978, the Secretary of the Army has not recommended that any projects be authorized under the provisions of Section 201. Projects otherwise eligible for Section 201 authorization have been recommended to Congress on the basis of new cost sharing provisions which have not been enacted into law. Such projects have been viewed as ineligible for Section 201 authorization.[1]

Section 201(b), as amended, specifies that "any water resource development project authorized to be constructed by this section shall be subject to the same requirements of local cooperation as it would be if the estimated first cost of such project were $15,000,000 or more."[2]

Consequently, Section 201(b), which permits the use of time-saving committee resolutions to authorize projects with an

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Committee on Public Works, Water Resources Development 1973, Hearings before the Subcommittee on Water Resources, House of Representatives, on H.R. 4904, H.R, 4905, and Related Bills, 93d Cong., 1st sess., 1973, pp. 665-671.

[1]In 1978-1979, a number of projects were recommended to Congress for authorization by the Carter administration on the basis of cost sharing provisions greater than in accordance with existing law. Between August 1979 and May 1983, no flood damage prevention projects were recommended to Congress for authorization. The reason for this hiatus was initially the impasse between the Carter administration and the Congress over the President's desire to establish an independent review board which would evaluate all reports before they were cleared for transmittal by the Secretary of the Army to the Congress. Although President Reagan rescinded the executive order establishing the Independent Review Board in September 1981, it was not until May 1983 that reports recommending authorization of flood damage prevention projects were transmitted to Congress. The Department of the Army's letters of transmittal since May 1983 have indicated that the non-Federal share of project costs should be 35 percent or a contribution of lands, easements, and rights-of-way, whichever is greater.

[2]Flood Control Act of 1965, Pub. L. 89-298, Sec. 201(b), as amended by the Water Resource Development Act of 1976, Pub. L. 94- 587, Sec 131.

estimated Federal cost of $15 million or less, will not be used unless new cost sharing proposals included in recommendations for Corps projects are enacted into law, or Section 201(b) is modified so that the Congress vests in the legislative committees the authority to approve projects where cost sharing proposals recommended differ from existing law.[1]

[1]Discussions with the staff of the Assistant Secretary of the Army for Civil Works indicate a reluctance to propose such legislation based on a concern that deleting Section 201(b) would enable the authorizing committees to authorize projects not in accordance with the Department of the Army's recommendations.

Analysis of Projects

An analysis was made of the Section 201 projects authorized between 1970 and 1978. Included in this group of eighty-four projects were forty-one flood damage prevention projects. Since all but two of these projects were authorized prior to October 1976, each was limited in cost to a Federal investment of $10 million plus price escalation between the time of authorization and the completion of construction. During a period when authorization for Phase I rather than for construction became more common, the Section 201 program provided the only means of authorizing and implementing new flood damage prevention projects with a cost greater than the cost of small projects which the Chief of Engineers could authorize under the continuing authorities program.[1]

A review of the forty-one flood damage prevention projects reveals that more than half have been constructed, are under construction, or are awaiting receipt of construction funds.[2] A summary of progress on the projects since their authorization is shown in Table 11.

A further analysis was made of the fifteen projects where either local cooperation was withdrawn or the benefit-cost ratio dropped below unity. As indicated in Table 12, both reasons account for the failure of the projects to be constructed.

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[1]Since 1976, the maximum Federal investment per project under Section 205 of the Flood Control Act of 1948, as amended, is $4 million.

[2]Those projects awaiting receipt of construction funds fall into two groups: 1) those proposed by the administration as new construction starts in the Fiscal Year 1983 and 1984 budgets, and 2) those projects with local support but not included in the budget requests.

TABLE 11

PROGRESS ON SECTION 201 PROJECTS
WHICH PROVIDE FLOOD DAMAGE
PREVENTION BENEFITS

Year Authorized	Total Number	Under Construction or Complete	Preconstruction Planning		Lack of Local Cooperation	Benefit-Cost Ratio Below Unity
			Complete Awaiting Construction Funding	Under Way		
1970	18	10	2	-	3	3
1971	3	2	-	-	-	1
1972	6	3	1	-	1	1
1974	2	-	-	-	1	1
1976	10	2	5	-	2	1
1977	2	1	-	-	1	-
	41	18	8	-	8	7

TABLE 12

SECTION 201 PROJECTS NO LONGER SUPPORTED
OR NO LONGER ECONOMICALLY JUSTIFIED

Project	Year	Estimated Cost at Time of Authorization		Benefit-Cost Ratio & Discount Rate When Transmitted to Congress	Latest Benefit-Cost Rates & Discount Rate	Reason for Not Being Implemented
		Federal ($ in Million)	Non-Federal ($ in Million)			
Fort Chartres and Other Drainage Districts, IL	1970	2,310	120	1.4 @ 5-1/8	1.05 @ 8-1/8	B/C
Posten Bayou, AR	1970	1,379	201	2.4 @ 4-7/8	1.3 @ 6-5/8	L/C
Reedy River, SC	1970	1,610	863	3.4 @ 4-7/8	2.5 @ 5-5/8	L/C
Running Water Draw, Plainview, TX	1970	3,200	2,600	1.5 @ 4-4/8	1.04 @ 6-3/8	B/C
Wenatche, WA	1970	9,890	920	2.6 @ 5-1/8	0.87 @ 7-5/8	B/C
Zintel Canyon, WA	1970	1,860	260	1.3 @ 5-1/8	1.3 @ 8-1/8	B/C
University Wash, CA	1971	5,630	2,110	1.10 @ 5-1/8	0.21 @ 5-7/8	B/C
Beals Creek at Big Spring, TX	1972	1,578	948	1.16 @ 4-7/8	1.08 @ 6-3/8	B/C
Peyton Creek, TX	1972	6,700	1,400	1.8 @ 5-3/8	4.2 @ 5-5/8	L/C
Pecos River in Vicinity of Pecos, TX	1974	3,384	270	1.5 @ 5-1/2	1.3 @ 6-1/8	L/C
Pottstown, PA	1974	2,410	216	2.8 @ 5-5/8	0.44 @ 7-5/8	B/C

TABLE 12--Continued

Project	Year	Estimated Cost at Time of Authorization		Benefit-Cost Ratio & Discount Rate When Transmitted to Congress	Latest Benefit-Cost Rates & Discount Rate	Reason for Not Being Implemented
		Federal ($ in Million)	Non-Federal ($ in Million)			
Upper Guyandotte River Basin, Oceana, WV	1976	2,279	490	3.1 @ 5-5/8	2.1 @ 7-1/8	L/C
Bear River Basin, CA	1976	2,200	2,000	1.5 @ 5-3/8	0.21 @ 7-1/8	B/C
Hay Creek, Birdsboro, PA	1976	1,386	364	1.4 @ 5-1/2	Not Applicable [a]	
Flathead and Clark Fork River Basin Near Kalespell, MT	1977	3,480	80	2.6 @ 5-5/8	1.8 @ 7-3/8	L/C

[a]The project was authorized without BCR being required; the project was to have protected some HUD buildings that are no longer there.

Legend: B/C Benefit-cost ratio estimated to be below unity at some point after the project was authorized.

L/C Local cooperation withdrawn after the project was authorized.

From an efficiency point of view, Section 201 projects met all requirements of a favorable benefit-cost ratio based on criteria then in effect. Projects authorized in this manner included both urban and rural areas. Each one had a favorable benefit-cost ratio and some demonstrable indication of willingness of local cooperation. Each of the Section 201 projects was estimated to cost less than $10 million in Federal cost at the time it was transmitted to Congress. Generally speaking, this meant that the projects protected small communities, sections of large communities, or rural areas. Since the projects were all authorized between 1970 and 1977, the discount rate used in evaluating the projects was the current rate pursuant to the Water Resources Council policy promulgated in 1969 and confirmed in law by Section 80 of Public Law 93-251. All Section 201 projects were, therefore, analyzed at the current discount rate up to the time initial construction funds were appropriated for the project.

At the present time, three of the Section 201 projects have been recommended by the Secretary of the Army as new construction starts based on voluntary agreements with the local sponsors to pay 35 percent of project construction costs in lieu of the costs of lands, easements, and rights-of-way. The difference in non-Federal cost is approximately 11 percent as shown in Table 13.

The Section 201 process reflects a high degree of administrative efficiency. In each and every case, the flood damage prevention project was recommended by the Assistant Secretary of the Army (Civil Works) for authorization under the provisions of Section 201, and the authorizing committees of Congress concurred. Selection was not based on political considerations but rather on technical criter-

TABLE 13

SECTION 201 PROJECTS RECOMMENDED AS NEW CONSTRUCTION STARTS,
FISCAL YEAR 1983-1984 ($ in Thousands)

Project	Estimated Construction Cost				Non-Federal Share of Flood Control Costs	
	Traditional		Dept of the Army			
	Federal	Non-Federal	Federal	Non-Federal	Traditional	Dept of the Army
San Luis Rey River, CA	36,100 [a]	11,300 [a]	30,600 [a]	16,800 [a]	22	35
Kahoma Stream, Maui, HI	16,100	5,700	14,200	7,600	26	35
Virginia Beach Streams Canal No. 2, VA	4,511	1,339	3,800	2,050	23	35
Total	56,711	18,339	48,600	26,450	24	35

[a]Costs include limited recreation development to be cost shared on a 50-50 basis.

ia. The committees recognized that since the authorization of the Section 201 projects would not require approval of the entire Congress, exceptions to the recommendations of the technical experts and the administration would not be in order.

From the point of view of responsiveness, the Section 201 program was an excellent vehicle for bringing projects to the implementation stage during a period when most projects were recommended for Phase I authorization and when there was less frequency in the passage of water resource development acts. With the exception of the Section 201 projects authorized in 1970, the authorizations in subsequent years enabled the Corps to design the projects and, where supported at the local level, undertake construction in a timely manner. Had the Section 201 process not functioned, more than two years could have elapsed before the projects were authorized. It is also quite possible that the projects would have been authorized for Phase I only.

Table 14 displays the time saved by the Section 201 process under two assumptions. The first is that the project would have been authorized for construction in the 1974 or 1976 Water Resources Development Act. The second assumption is that the project would have been authorized for Phase I only. The list of projects is limited to those which have reached the construction stage or which command continued interest and for which the benefit-cost ratio continues to exceed unity.

The savings in time of upward of ten years is not unrealistic. Several projects that underwent the full review process in the early to mid-1970s but had an estimated Federal cost in excess of $10 million were authorized for Phase I and are still awaiting

TABLE 14

TIME SAVED BY THE SECTION 201 PROCESS OF PROJECTS CONSTRUCTED OR AVAILABLE FOR CONSTRUCTION[a]

Project	Status	Date Authorized	Date of First WRDA after Auth	Time Saved by Sec 201 Process	
				If Fully Auth in WRDA	If Auth For Ph I Only
Frio River, Three Rivers, TX	C	Nov 71	Mar 74	2-1/3 yrs	12 yrs.
Winona, MN	C	Nov 71	Mar 74	2-1/3 yrs	12 yrs
Moline, IL	AC	Jun 72	Mar 74	1-3/4 yrs	11-1/2 yrs
Ottumwa, IA	C	Oct 72	Mar 74	1-1/4 yrs	11 yrs
Perry County Drainage & Levee Districts 1, 2, & 3, IL	C	Oct 72	Mar 74	1-1/4 yrs	11 yrs
Point Place, Toledo, OH	C	Oct 72	Mar 74	1-1/4 yrs	11 yrs
Wildcat and San Pablo Creeks, CA	AC	Jun 76	Oct 76	1/3 yrs	7 yrs
Sawmill River at Elmford and Greenburgh, NY	AC	Jun 76	Oct 76	1/3 yrs	7 yrs
Ardsley, NY	AC	Oct 76	Oct 76	-	7 yrs
Evansdale, IA	C	Oct 76	Oct 76	-	7 yrs
Kahoma Stream, Maui, HI	BC	Oct 76	Oct 76	-	7 yrs
Grand Isle & vicinity, LA	C	Oct 76	Oct 76	-	7 yrs

TABLE 14--Continued

Project	Status	Date Authorized	Date of First WRDA after Auth	Time Saved by Sec 201 Process	
				If Fully Auth in WRDA	If Auth For Ph I Only
Virginia Beach Streams, Canal No. 2, VA	BC	Oct 76	Oct 76		7 yrs
Upper Baker Project, WA	C	May 77	None	6 yrs	6 yrs

[a]Projects shown above were authorized after 1970. Most Section 201 projects authorized in 1970 did not experience any time saved since the projects were authorized in December 1970, the same month as the Flood Control Act of 1970. The two Section 201 projects authorized earlier in 1970 were Four Mile Run, Virginia, and Minot, North Dakota, both authorized in July 1970.

Status Codes

C = Under construction or completed.
BC = Budgeted for construction in Fiscal Year 1983 and 1984.
AC = Available for construction funding, subject to agreement with local sponsor.

authorization for construction. Several of the projects included in this category are shown in Table 15.[1]

Focus on the issue of timeliness as a measure of responsiveness is more apparent when reviewing the list of over 160 projects of all types undergoing the Washington level review prior to authorization. There are over sixty-five projects in this category which each have an estimated Federal cost of less than $15 million under traditional cost sharing formulas. Forty of the projects are flood damage prevention projects. Some have had favorable recommendations from the Chief of Engineers since 1975 and have been with the Congress awaiting authorization since 1978. Others have only recently received a positive recommendation. A list of these projects and their status is shown in Table 16.

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[1]Reservoir projects in this category are not shown because of the difficulties encountered in gaining public acceptance. The examples shown were recommended for construction by the Department of the Army but were authorized for Phase I.

TABLE 15

PHASE I PROJECTS WITH FAVORABLE RECOMMENDATIONS ORIGINALLY RECOMMENDED BY THE DEPARTMENT OF THE ARMY FOR AUTHORIZATION FOR CONSTRUCTION

Project	Authorizing Document	Estimated Cost in Authorizing Document		Date Authorized For Phase I	Current Status
		Federal ($000)	Non-Federal ($000)		
Rochester, MN	HD-93-156	31,240	2,650	March 1974	Report with Congress since 1979 awaiting authorization.
Bushley Bayou, LA	HD 93-157	13,350	0	March 1974	Chief of Engineers report dated April 1980 and supplemented in August 1982. Under review by Department of the Army.
Lock Haven, PA	HD 94-577	23,257	2,160	October 1976	Chief of Engineers report dated December 1981. Under review by Department of the Army.

TABLE 16

PROJECTS WITH AN ESTIMATED FEDERAL COST OF LESS
THAN $15 MILLION AT OCTOBER 1982 PRICES
UNDERGOING WASHINGTON LEVEL REVIEW

Projects with Congress	Estimated Federal Cost ($000)	Date of Report of Chief of Engineers	Date Transmitted to Congress
Rahway River and Van Winkle Brook, Springfield, NJ	12,300	October 1975	November 1978
Agana River, GU	5,820	March 1977	November 1978
Rahway River Basin, Robinson's Branch, Rahway, NJ	13,500	October 1975	December 1978
Root River Basin, MN	8,145	May 1977	November 1978
Des Moines River Basin, IA & MN	11,200	July 1977	May 1979
Buffalo Metro Area, NY (Cazenovia Creek)	1,910	September 1977	May 1979
Little Wood River, Gooding & Shoshone, ID	3,750	November 1977	November 1978
Sawmill Run, Pittsburgh, PA	7,020	January 1978	November 1978
Muskingum River Basin, Killback, OH	3,500	February 1978	April 1979
Muskingum River Basin, Mansfield, OH	6,418	February 1978	April 1979
Yakima River at Yakima & Union Gap, WA	8,640	August 1979	September 1983
Puerco River and Tributaries, Gallup, NM	3,222	September 1981	December 1983
Oates Creek, Savannah River, GA	8,362	December 1981	December 1983

TABLE 16--Continued

Projects with the Assistant Secretary of the Army (Civil Works)	Estimated Federal Cost ($000)	Date of Report of Chief of Engineers
Hocking River at Logan, OH	6,175	June 1978
Hocking River at Melsonville, OH	6,462	June 1978
Halstead, KS	6,130	May 1979
Eight Mile Creek, AR	14,450	May 1979
Lake Witchita, Holiday Creek, TX	14,900	July 1979
Mississippi River, Green Bay Levee & Drainage District No. 2, IA	5,480	October 1981
Redwood River at Marshall, MN	3,130	November 1981
Miami River Basin, Holes Creek, OH	5,950	December 1981
Fountain Creek, Pueblo, CO (Phase I)	6,600	December 1981
Metro Denver and South Platte River (Westerly Creek), CO	9,080	December 1981
Little Colorado River at Holbrook, AZ	7,729	December 1981
Brush Creek & Tribs, MO & KS	12,100	January 1983
Horn Creek Lake, TN & MS (Phase I)	2,450	January 1983
Mississippi River at St. Paul, MN	7,226	June 1983
Helena & Vicinity, AR	11,600	June 1983
Fairfield, OH	9,180	June 1983
Bethel Bank Stabilization, AK	13,780	July 1983
Alenaio Streams, HI	5,506	August 1983
Fry Creeks, Tulsa, OK	8,500	September 1983

TABLE 16--Continued

Projects with the Chief of Engineers	Estimated Federal Cost ($000)	Date of Public Notice
Muscatine Island Levee District, IA	12,500	August 1975
Colorado River & Tribs, Boggy Creek, TX	14,000	December 1979
Scioto River, N. Chillicothe, OH	9,070	September 1980
Upper Little Arkansas River Watershed, KS	8,190	August 1982
South Quincy Drainage & Levee District, IL	10,077	November 1982
Three Mile Creek, AL	8,863	February 1983
Roughans Point, Revere, MA	7,986	January 1983
North Branch Chicago River, IL (Phase I)	13,668	September 1983

Authorized Projects Funded for Construction

New Starts

An analysis made of projects funded for initiation of construction since Fiscal Year 1968 highlights the decline in the number and cost of the new construction starts. Several reasons, such as the non-acceptability of reservoir projects and higher priorities of other needs in urban areas, help explain the decrease. At this time, the number of authorized projects that can be considered as potential new starts is limited; there are certain policy issues which must be resolved between the executive and legislative branches of the Federal government so that new projects can be implemented. Cost sharing and financing of project construction are the most notable issues requiring resolution.

Table 17 shows the number and dollar value of new construction starts from Fiscal Year 1968 through Fiscal Year 1984. The overall number of new starts declined dramatically since the enactment of NEPA, and the number of available reservoir projects with flood control storage is no longer an issue in the process of selecting new starts. New starts actually selected for construction by the administration and Congress were compared with the total universe from which new starts could be drawn. Although the dollar value and number of available projects appeared to be large at this time, a close scrutiny of individual projects revealed that very few can reasonably be considered as new start candidates over the next few years.[1]

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[1]The importance of this point is that the backlog of potential new construction starts from existing authorized projects

TABLE 17

NEW CONSTRUCTION STARTS,[a] FISCAL YEARS 1968-1984

Fiscal Year	Total Number of Projects	Number of Flood Damage Prevention		Other Types of Projects	Estimated Construction Costs ($ in Billion)	Number of Projects Actually Constructed or Under Construction		
		Reservoirs	Other			Flood Control Reservoirs	Other Flood Damage Prevention	Other Project Purposes
1968	33	0	13	20	0.2	0	8	19
1969	8	0	7	1	0.1	0	5	1
1970	34	8	16	10	0.6	7	11	8
1971	48	19	15	14	1.4	15	12	8
1972	24	8	8	8	0.3	7	4	7
1973	31	12	11	8	1.1	8	9	8
1974	21	1	7	13	0.7	1	7	13
1975	29	5	13	11	0.9	4	12	9
1976	20	5	9	6	0.3	2	8	6
1977	24	3	10	11	0.5	1	9	10
1978	0	0	0	0	-	0	0	0
1979	32	0	13	19	0.6	0	11	19
1980	19	1	13	5	0.5	1	7	3
1981	1	0	1	0	0.3	0	1	0
1982	0	0	0	0	-	0	0	0
1983[b]	-	-	-	-	-	-	-	-
1984[b]	-	-	-	-	-	-	-	-

[a]Projects funded for land acquisition only are excluded until funds to initiate construction are appropriated.

[b]Nine new construction projects were proposed for Fiscal Year 1983 and five for Fiscal Year 1984 on the basis of new, innovative cost sharing proposals. To date, Congress has not acted on these proposals. However, several bills are pending in the 98th Congress which would address the issue of cost sharing and new starts appropriations.

In Fiscal Years 1983 and 1984, the administration recommended fourteen new construction starts, of which nine are flood damage prevention projects. On each of these nine (eight local protection projects and one reservoir), the non-Federal sponsor submitted a letter of assurance, agreeing to the Department of the Army's proposal to finance 35 percent of the construction costs.[1] An analysis of the eight local protection projects shown in Tables 18-20 indicates the following:[2]

1. In the absence of the new proposal, the mean value of the traditional cost sharing requirement for flood control would be 23 percent.

2. Under the Department of the Army's formula, the change in cost sharing ranges from 28 percent (7 to 35 percent) for Davenport, Iowa, to no increase for the Ellicott Creek, New York, project and the Fairfield vicinity streams, California, project.

3. If the new cost sharing proposal contained in H.R. 3678 is enacted into law, the overall sharing of flood control costs for the eight projects would not materially change; however, as shown in Table 19, some projects would experience a considerable change in cost sharing requirements. The non-Federal costs of the Davenport project would increase from 7 to 25 percent, while the Ellicott Creek and Fairfield projects would realize a decrease of 10 and 14 percent, respectively, in their non-Federal cost.

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is extremely limited. See U.S. Congress, House, An Examination of the Water Project Construction Backlog, Joint Hearings before the Subcommittee on Investigations and Oversight and the Subcommittee on Water Resources of the Committee on Public Works and Transportation, 98th Cong., 1st sess., pp. 110-179.

[1]The amount of non-Federal cost in excess of the traditional a-b-c's would be provided on a voluntary basis and would be accepted by the Corps pursuant to 33 U.S.C. 560. One project, Randleman Lake, North Carolina, is a multiple-purpose reservoir with water supply and recreation benefits and costs.

[2]The analysis excludes the one reservoir project proposed as a new start. Under traditional cost sharing, the non-Federal sponsor would not be required to pay for any of the project construction costs allocated to flood control of the Randleman Lake, North Carolina, project. The Department of the Army's proposal called for a 35 percent contribution.

TABLE 18

COMPARISON OF TRADITIONAL COST SHARING AND DEPARTMENT OF THE ARMY'S PROPOSAL
FOR FISCAL YEARS 1983 AND 1984 LOCAL PROTECTION PROJECTS
BUDGETED AS NEW CONSTRUCTION STARTS ($ in Millions)

Fiscal Year As New Start	Name of Project	Total Estimated Construction Costs	Traditional Financing				Department of the Army's Proposal				Non-Federal Share of Flood Control Costs	
			Federal		Non-Federal		Federal		Non-Federal			
			Flood Control	Recrea-tion	Flood Control	Recrea-tion	Flood Control	Recrea-tion	Flood Control	Recrea-tion	Traditional	Dept of Army
1983	Merced County Streams, CA	112.0	87.8	0.3	23.6	0.3	72.4	0.3	39.0	0.3	21	35
1983	Kahoma Streams, HI	21.8	16.1	-	5.7	-	14.2	-	7.6	-	26	35
1983	Davenport, IA	49.3	38.5	4.0	2.8	4.0	26.0	4.0	15.3	4.0	7	35
1983	Virginia Beach Streams, Canal No. 2, VA	5.9	4.5	-	1.4	-	3.8	-	2.1	-	23	35
1983	Fairfield vicinity Streams, CA	35.5	19.2	0.4	15.5	0.4	19.2	0.4	15.5	0.4	44	44
1983	San Luis Rey River, CA	47.4	35.5	0.6	10.7	0.6	30.0	0.6	16.2	0.6	22	35
1983	Bassett Creek, MN	33.2	28.2	-	5.0		21.6	-	11.6	-	15	35
1984	Ellicott Creek, NY	25.0	14.1	0.5	9.9	0.5	14.1	0.5	9.9	0.5	40	40
	Totals	330.1	243.9	5.8	74.6	5.8	201.3	5.8	117.2	5.8	23	37

[a]Estimated construction costs are based on October 1982 price levels plus an allowance for inflation through the construction period.

TABLE 19

COMPARISON OF TRADITIONAL COST SHARING AND PROPOSAL IN H.R. 3678
FOR FISCAL YEAR 1983 AND 1984 LOCAL PROTECTION PROJECTS
BUDGETED AS NEW CONSTRUCTION STARTS ($ in Millions)

Name of Project	Total Estimated Construction Costs	Traditional Financing				H.R. 3678 Cost Sharing				Non-Federal Share of Flood Control Costs	
		Federal		Non-Federal		Federal		Non-Federal			
		Flood Control	Recrea-tion	Flood Control	Recrea-tion	Flood Control	Recrea-tion	Flood Control	Recrea-tion	Traditional	H.R. 3678
Merced County Streams, CA	112.0	87.8	0.3	23.6	0.3	83.6	0.3	28.9	0.3	21	25
Kahoma Streams, HI	21.8	16.1	-	5.7	-	16.1	-	5.7	-	26	26
Davenport, IA	49.3	38.5	4.0	2.8	4.0	26.0	4.0	15.2	4.0	7	25
Virginia Beach Streams, Canal No. 2, VA	5.9	4.5	-	1.4	-	4.4	-	1.5	-	23	25
Fairfield vicinity Streams, CA	35.5	19.2	0.4	15.5	0.4	26.0	0.4	8.6	0.4	44	30
San Luis Rey River, CA	47.4	35.5	0.6	10.7	0.6	34.7	0.6	11.6	0.6	22	25
Bassett Cree . MN	33.2	28.2	-	5.0	-	24.9	-	8.3	-	15	25
Ellicott Creek, NY	25.0	14.1	0.5	9.9	0.5	16.8	0.5	7.2	0.5	40	30
Totals	330.1	243.9	5.8	74.6	5.8	232.5	5.8	87.0	5.8	23	27

[a]Estimated construction costs are based on October 1982 price levels plus an allowance for inflation through the construction period.

TABLE 20

COMPARATIVE WEALTH OF COMMUNITIES WITH NEW CONSTRUCTION STARTS
PROPOSED FOR FISCAL YEARS 1983 AND 1984

Name of Project	Non-Federal Share of Flood Damage Costs			Area Receiving Protection	
	Traditional	Dept of Army	H.R. 3678	Median Income	Median Value of Dwelling
Merced County Streams, CA	21	35	25	6,324	54,105
Kahoma Streams, HI	26	35	26	7,567	113,600
Davenport, IA	7	35	25	8,478	52,800
Virginia Beach Streams, Canal No. 2, VA	24	35	25	7,920	61,200
Fairfield vicinity streams, CA	44	44	30	7,532	67,500
San Luis Rey River, CA	24	35	25	6,811	91,000
Bassett Creek, MN	15	35	25	8,670	65,700
Ellicott Creek, NY	40	40	30	6,050	40,200
Totals	23	37	27	Mean Median Value 8 Projects	7,419	68,263
				Mean Median Value New Starts FY 1968-1984	6,317	45,000

4. A comparison of the relative community wealth of the proposed Fiscal Year 1983 and 1984 new starts, as measured by income and housing value, indicates that the benefiting jurisdictions are wealthier on average than jurisdictions which have received funds for a new construction start since Fiscal Year 1968.[1]

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[1]It is also shown in Chapter VI that the average wealth of jurisdictions awaiting the authorization of projects is comparable with those which received new starts since 1968 (See Table 36.). The implication, at this point, is that wealthier communities may be more apt to obtain funds for their projects in the Corps budget if the Department of the Army's formula is enacted into law or otherwise accepted as a basis for proceeding with new starts.

Continuing Construction Program

A Corps project funded for construction generally receives incremental funding consistent with annual requirements. A project constructed over a period of five years would normally receive an appropriation in each of the five years. While it is desirable to fund projects consistent with efficient construction schedules, the timing would not be possible if the program were large and the budget tight. As the number of construction projects in the budget decreased, it became less difficult to assure adequate funds for the continuing construction program.[1] An evaluation of the continuing construction program in Fiscal Years 1982-1984 revealed that, despite shrinking finances, continuing construction projects were funded on an efficient schedule. The basis for adequate funding for continuing construction projects despite a constrained budget is attributable to: 1) contractor bids below government estimates due largely to the recession, 2) changes in policy on financing new separable elements of ongoing construction projects and Federally financed recreation construction as Corps reservoirs, and 3) the lack of new construction starts in recent years.

Once a project receives funds and moves into construction, funding in future years until completion of the authorized work is normally assured. The discount rate in effect during the first year of funding for construction remains in effect for the duration of construction. Furthermore, benefit-cost ratios presented to Congress

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[1]For example, high inflation rates and concern over the rapidly rising price of fuel resulted in a funding shortage in Fiscal Year 1980. However, in Fiscal Years 1981-1984 construction funding was adequate for efficient scheduling despite constrained budgets neccessitated by high budget deficits.

in subsequent fiscal years are based upon the remaining benefit-remaining cost ratio (RBRCR). Until construction has proceeded far enough to produce project benefits, the ratio will generally increase since sunk costs are no longer considered in the benefit-cost analysis.[1] The effect has been that once projects or separable elements are justified at a particular discount rate and are started, they rarely become economically infeasible using the same discount rate.[2] Projects that are not started, however, experience the problem of higher discount rates in competing as new starts and are frequently subject to new planning guidelines.

In short, the state of the program at the present time shows a decline in total dollars with sufficient funds to maintain the schedule on projects which are under way. The lack of new construction starts in recent years, as indicated in Table 17, has resulted in the bulk of the construction funds being applied to projects which have been funded for several years.[3] As projects are completed, and new starts are not included in subsequent appropria-

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[1]This procedure has been in effect in annual budget presentations to the Office of Management and Budget and Congress since 1980.

[2]The Corps presents RBRCR's to the Assistant Secretary of the Army for Civil Works and the Office of Management and Budget on the basis of the legal discount rate and the current rate. The congressional appropriations committees prefer to review RBRCR's based on the legal (Section 80) discount rate only.

[3]For example, a review of the Corps Fiscal Year 1984 construction budget reveals that the majority of the projects had received construction funds for at least five years and had a legal discount rate of 3-1/4 percent or less. A comparison with recent construction budgets also reveals the decline in the total number or projects included in the budget. The Fiscal Year 1984 budget contained 129 construction projects (exclusive of major rehabilitation) compared with over 230 projects in Fiscal Year 1972.

tions acts, the number of projects in the budget declines along with the dollar requirements. Table 21 illustrates the decline in the annual appropriations for the "construction, general" appropriation in terms of constant dollars (July 1965).[1]

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[1]The appropriations are shown in actual dollars and in 1965 dollars and reflect funds for the entire Corps construction program with the exception of funds appropriated for projects in the alluvial valley of the Mississippi River from Cape Girardeau, Missouri, to the Gulf of Mexico. Work in this area is funded by the "flood control, Mississippi River and tributaries," account.

TABLE 21

CONSTRUCTION, GENERAL, CORPS OF ENGINEERS
APPROPRIATIONS FISCAL YEAR 1967
THROUGH FISCAL YEAR 1984
(Dollars in Millions)

Fiscal Year	Actual Appropriation	Value in July 1965 Dollars
1967	965,955	965,955
1968	967,599	921,523
1969	862,714	778,454
1970	711,992	587,058
1971	851,178	650,494
1972	1,025,084	703,844
1973	1,203,943	727,002
1974	873,589	503,399
1975	966,338	502,248
1976	1,237,151	600,460
1977	1,430,195	618,436
1978	1,537,820	620,945
1979	1,343,711	507,796
1980	1,660,966	584,957
1981	1,593,892	516,469
1982	1,429,992	432,586
1983	1,508,405[a]	421,448
1984	894,104	237,116

[a]Includes $180 million deferred in Fiscal Year 1983 for use in Fiscal Year 1984, and $85 million Jobs Act funds appropriated in Fiscal Year 1983.

Lower Mississippi Valley

With the decline in the number of new starts and in the number of projects funded for construction, the Corps could allocate a larger share of its annual budget request to activities under the "flood control, Mississippi River and tributaries," account. The result for this account was a budget request in Fiscal Year 1984 totaling $290 million, of which approximately $200 million was for construction activities which provide flood damage prevention benefits. In Fiscal Year 1972, the total budget request for this account was $81 million, of which $49 million was for construction. The fourfold increase in the twelve-year period reflects considerable inflation as well as the realization following Mississippi River basin floods in 1973, 1974, and 1975 that further improvements were necessary for this massive project.[1] However, it was the decline in construction elsewhere in the nation that created an opportunity to increase significantly the level of funding for this massive project.

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[1]In contrast to many other areas in which flooding of consequence has been relatively recent, the work in the lower Mississippi has been recognized and authorized for implementation in various acts spanning more than fifty years as part of comprehensive plans of improvement. Consequently, raising Mississippi levees following the floods in the 1970s did not require further congressional authorization; the work was deemed necessary to pass a previously authorized design flow.

Authorized Projects Not Funded for Construction

Included in the category of authorized projects not funded for construction is a substantial list of projects and elements of projects that for one reason or another remain active but not constructed. The estimated Federal cost of these projects is in excess of $15 billion.[1] This magnitude seems to imply that the Corps has a substantial backlog of authorized projects awaiting construction; that is not the case. A careful review of the individual projects revealed that the vast majority do not meet current standards for initiating construction. Furthermore, proposals to increase the non-Federal share of project construction costs, if enacted into law,[2] would make even fewer projects viable candidates for selection as new starts.

The existence of a "backlog" of unstarted active projects of this magnitude having little or no prospect of being funded in the near future focuses attention on a major shortcoming in the process for authorizing and funding Corps civil works projects.[3] Projects

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[1]U.S. Congress, House, Committee on Appropriation, Energy and Water Development Appropriations for 1984, Hearings before the Subcommittee on Energy and Water Development, 98th Cong., 1st sess., pp. 156-199.

[2]There is a strong possibility that the cost sharing formula for flood damage prevention projects will be changed after more than forty years. H.R. 3678 and S. 1730, pending in the 98th Congress, would increase the average non-Federal cost sharing requirements for flood damage prevention projects. Based on projects awaiting authorization, the median non-Federal share of project construction costs would increase by 7 percent if H.R. 3678 is enacted versus 17 percent if S. 1730 becomes law.

[3]This point was made by the Assistant Secretary of the Army for Civil Works in testimony responding to a General Accounting Office's report that concluded that the backlog has grown in actual dollars because funding had not been sufficient to offset inflation

are developed after a feasibility study by the Corps. The Corps recommendations are reviewed by numerous other agencies. Ultimately, projects are authorized by Congress, presumably with the support of communities and states that would directly benefit from them. When projects are authorized and remain active, there is an expectation by the non-Federal sponsors that a Federal project will be forthcoming. Alternative non-Federal solutions are generally not carried out. In the case of a Corps flood damage prevention project, an authorized active project not funded for construction results in the continued presence of a flood hazard. The likelihood that non-Federal interests will undertake the project is remote; the community tends to become complacent, believing that the project will soon start.[1] At best, communities may implement certain nonstructural measures[2] but will rarely undertake the Corps project without Federal assistance.[3] In the absence of a Corps

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and other cost increases. See U.S. Congress, House, Committee on Public Works and Transportation, An Examination of the Water Project Construction Backlog, Hearings, pp. 11-89 (General Accounting Office report) and pp. 114-152 (Assistant Secretary of the Army's response).

[1]Ibid., p. 139.

[2]Communities have begun to recognize the long wait and distinct possibility that a project will not be forthcoming. They have installed a number of non-structural measures. For example, see H. James Owen and M. Wendell, Owen and Wendell Associates, Effectiveness of Flood Warning and Preparedness Alternatives, a report submitted to the Institute for Water Resources, Ft. Belvoir, Virginia, Report No. 81-R08, 1981. This report cites examples of flood warning systems installed by several communities and counties that incurred serious flood damages during the 1970s but have no structural protection afforded by a Corps project. In addition, it would appear that flood-prone communities have availed themselves of the National Flood Insurance Program.

[3]There are exceptions when communities undertake a portion of the Federal project either after or before a project is

project, the non-structural initiatives undertaken by non-Federal interests may result in the most practical solution to the continuing flood threat.

When considering the large number of unstarted authorized projects which are in the active, inactive, and deferred categories, the gap between policy, promise, and delivery becomes apparent. At one point in time, the vast majority of these projects were considered needed, and justified, and they were supported by the non-Federal sponsors. This all points to the need for a more rigorous pre-authorization evaluation: the reasonableness of the non-Federal sponsor having the financial ability and desire to meet the requirements of local cooperation needs to be considered along with engineering and economic analysis.[1] It also points to the need for considering options in the event a traditional flood damage prevention project does not materialize.

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authorized. When the work accomplished is part of an authorized project, limited reimbursement or credit (up to $1 million) can be made pursuant to Section 215 of the Flood Control Act of 1968.

[1]This issue is most important in connection with projects undergoing the Washington level review prior to being authorized for construction and is discussed in the next section of Chapter V.

Projects With Favorable Recommendations Undergoing Washington Level Review

The failure of Congress to enact a water resource development act since 1976 has resulted in the accumulation of over 170 projects with favorable recommendations that are in the Washington review process, awaiting congressional authorization.[1] Included in this group of projects are over seventy that would provide flood damage prevention benefits.[2] Many have been in the Washington level review process for over four years, while others have reached Washington within the past year.

Before discussing the projects which were impacted by the failure of Congress to enact a water resource development act since 1976, some background information on why the impasse has occurred is appropriate. The system became bogged down over such issues as cost sharing and project review of Corps reports recommending projects for authorization. In 1978, President Carter announced to the Congress new cost sharing policies to be included in project reports transmitted to Congress for authorization.[3]

Flood damage reduction projects recommended to Congress for authorization under the Carter proposal included a requirement that local interests contribute a standard 20 percent for structural and

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[1]The favorably recommended projects are with Congress, under review by the Office of Management and Budget, the Secretary of the Army, the Chief of Engineers, or the Board of Engineers for Rivers and Harbors.

[2]As indicated earlier, over forty of these flood damage prevention projects have an estimated Federal cost of under $15 million.

[3]U.S., Office of the White House Press Secretary, "Presidential Water Policy Initiatives," June 6, 1978.

non-structural remedies. The contribution could be in the form of cash or consist of the traditional local share, i.e., lands, easements, rights-of-way, and relocations. The local contribution would be made prior to construction or in ten annual installments with interest. In addition, a 5 percent state financing contribution would be required.[1] The new cost sharing proposals were not enacted into law by Congress; no flood damage prevention projects were authorized on the basis of the 20 percent plus 5 percent up-front state financing.

It is interesting to note that under certain circumstances President Carter's new cost sharing proposal actually decreased rather than increased the non-Federal share. Prior to the new proposal, hurricane protection projects were cost shared on a 70 percent Federal and 30 percent non-Federal basis. The other situation wherein the non-Federal share would be less under the new proposal would be where the cost of lands, easements, and rights-of-way plus relocations, traditionally a local responsibility, exceeded 25 percent of the total project costs. Local flood protection projects in urban centers where the price of land is high relative to the cost of construction may fall into this category.[2] Thus, in an effort to equalize the percent of non-Federal contribution nationwide, some projects would actually have experienced a reduction in the non-Federal share. President Carter's water policy initiatives were designed to:

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[1] Ibid., pp. 5-6.

[2] Local flood damage prevention projects in highly urbanized locations frequently fall into this category based on the high cost of lands and extensive relocations that may be required.

> Improve planning and efficient management of Federal water resource programs to prevent waste and to permit necessary water projects which are cost-effective, safe and environmentally sound to move forward expeditiously; Provide a new national emphasis on water conservation; Enhance Federal-state cooperation and improved state water resources planning; and Increase attention to environmental quality.[1]

These policy initiatives came in the aftermath of a review in 1977, by the President, of all Corps projects funded for construction in Fiscal Year 1978.[2] Considerable criticism emerged on nineteen Corps projects which were then placed under an intensive review, including public hearings, to determine whether the projects should be continued or not.[3] Environmental criticism, benefits for a limited number of people rather than many, and the questionable value of benefits claimed by the Corps were among the major criticisms cited. The Corps also was criticized for paying too little attention to non-structural solutions to flooding problems and to the value of wetlands as they are drained to make them suitable for agricultural use.[4]

In his policy statement of June 6, 1978, President Carter announced that an independent review function would be established by executive order and would be located within the Water Resources

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[1]"Presidential Water Policy Initiatives," p. 1.

[2]For detailed information on the review of the Corps projects funded for construction in Fiscal Year 1978, see U.S., Congress, House Appropriations Committee, Public Works for Water and Power Development and Energy Research Appropriations Bill, 1978, Part 9, Hearings before a Subcommittee on Public Works, 1977, pp. 1-375.

[3]Ibid., pp. 355-361.

[4]Ibid., pp. 3-38.

Council. Executive Order 12113 was issued on January 4, 1979, directing the Water Resources Council to ensure impartial technical review of pre-authorization reports and preconstruction planning documents submitted by the Corps and other Federal water resources agencies.[1] However, the Independent Review Board never functioned because of the refusal by Congress to fund its operation. The Congress felt that the review board had not been authorized in law and would not improve the review process. Further, a task of the review board was to assure that planning and cost sharing reforms proposed by President Carter would be properly implemented. Since Congress had not enacted the new cost sharing proposals into law, there was a reluctance on the part of Congress to agree to a review for compliance with a policy in which it did not concur.

A major thrust of the Independent Review Board was to place a higher priority on environmental concerns. For example, presidential project selection criteria which were to be used as the basis for presidential decisions on annual funding of water projects included a clear preference for environmental considerations over economic and social well-being, particularly when non-vendible outputs such as flood control are involved. Projects with substantial environmental benefits could be used as a basis for project justification when traditional economic analysis produced a benefit-cost ratio below unity.[2] A heavy emphasis was placed on non-structural solutions rather than continuing to rely on traditional structural flood control measures such as dams, levees, flood

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[1]U.S., President, Executive Order 12113.

[2]"Presidential Water Policy Initiatives," p. 9.

walls, and channel improvements. Other criteria included compliance with all relevant environmental statutes and the funding of mitigation of fish and wildlife damages concurrently and proportionately with construction funding.[1]

Over fifty reports were transmitted by water resource agencies to the Water Resources Council for review by the Independent Review Board. However, they were never officially reviewed. Most of these were Corps pre-authorization reports or were design memoranda on authorized projects which were under consideration for authorization. In June 1981 they were returned to the Department of the Army for updating to current price levels and, in the case of navigation projects, for revision in accordance with new guidance on proposed user fee legislation. Thus, the reports that had been transmitted to the Water Resources Council in the 1978-1980 time frame were returned to the Corps in 1981. As much as three years were lost in the review process.

On September 17, 1981, Executive Order 12322 was issued, placing the responsibility for reviewing reports, prior to submission to Congress for authorization, with the Office of Management and Budget. The order also revoked Executive Order 12113, which had created the Independent Review Board at the Water Resources Council.[2] Most of these reports have been updated and returned to the Assistant Secretary of the Army for transmittal to the Office of Management and Budget. Numerous other feasibility studies resulted

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[1] Ibid.

[2] U.S., President Executive Order 12322, "Water Resources Projects," Federal Register, Vol. 46, No. 182, Sept. 21, 1981.

AD-A160 627 FLOOD DAMAGE PREVENTION SERVICES OF THE US ARMY CORPS OF ENGINEERS: AN EV..(U) ARMY ENGINEER INST FOR WATER RESOURCES FORT BELVOIR VA B STEINBERG FEB 84 4/5

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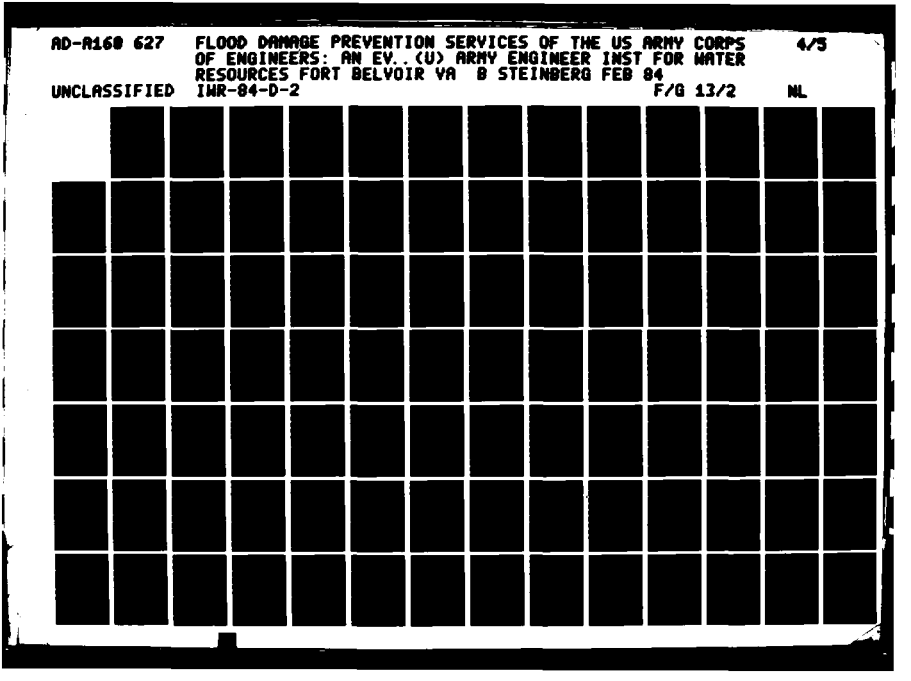

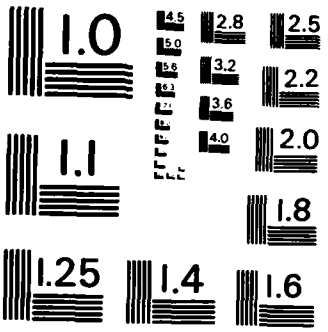

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A

in favorable recommendations for authorization of Corps projects. In total, approximately 170 favorable reports[1] are now with Congress, the Office of Management and Budget, the Assistant Secretary of the Army, or the Chief of Engineers. Recently, the Assistant Secretary of the Army began sending reports to Congress with favorable recommendations after a hiatus of nearly four years. The transmittal of the reports may be attributed to political pressure to furnish Congress the administration's views on each project now that they have been exhaustively studied, and the Congress appears close to enactment of legislation authorizing new projects. Each of the recent recommendations to Congress includes a statement that expresses the views of the Reagan administration on cost sharing for flood damage prevention projects.[2]

An evaluation of the projects undergoing review in Washington reveals that for the most part the traditional non-Federal cost sharing on flood damage prevention projects would be considerably less than 35 percent. There are approximately seventy flood damage prevention projects in this category. A review of the traditional non-Federal cost sharing requirements is shown in Tables 22 and 23.

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[1]These reports have all received a favorable recommendation by the division commander and the Board of Engineers for Rivers and Harbors (or the Mississippi River Commission, as appropriate).

[2]The Assistant Secretary of the Army has generally concurred in the recommendations of the Chief of Engineers, "subject to non-Federal cost sharing equal to 35 percent of construction costs or the costs of lands, easements, rights-of-way and relocations (traditional cost sharing), whichever is greater, and to other items of local cooperation concurred in by the Chief of Engineers in his report." (Quoted from letter signed by the Assistant Secretary of the Army for Civil Works to Senator Stafford, Chairman, Committee on Environment and Public Works, United States Senate, October 5, 1983.)

TABLE 22

TRADITIONAL COST SHARING FLOOD DAMAGE PREVENTION
PROJECTS AWAITING AUTHORIZATION, DECEMBER 1983

Size of Project ($ in Millions)	Number of Projects	Estimated Non-Federal Cost		Median Value	
		Mean (%)	Median (%)	Median Income ($ in Thousands)	Median Value Of Dwellling ($ in Thousands)
Less than 10	19	16	16	6.13	40.8
10-20	20	20	25	6.16	41.0
20-50	15	16	21	5.97	40.1
50-100	10	23	24	7.66	53.2
Greater than 100[a]	6	20	17		
	7	12	17	6.82	44.3
Totals	70	20[b]	18		
	71	15	18	6.40	42.9

[a]Exclusive of Santa Ana, California, project. Based upon the recommendations of the Chief of Engineers, the Santa Ana project would have a non-Federal requirement of 7 percent. With the very large project included in the calculations, the mean non-Federal cost would be 15 percent.

[b]The overall mean non-Federal cost without the Santa Ana project, obtained by dividing the total non-Federal costs by the total project costs, is approximately 20 percent. With the Santa Ana project included the mean would be 15 percent. While some minor recreation costs are included in the costs shown in Table 21, the removal of these costs would reduce the mean non-Federal share to 18 percent without Santa Ana and 14 percent with the Santa Ana project.

TABLE 23

GEOGRAPHICAL DISTRIBUTION OF FLOOD DAMAGE PREVENTION PROJECTS
AWAITING AUTHORIZATION, DECEMBER 1983

Geographical Region	Estimated Cost		Percent Non-Federal	Mean Value	
	Federal ($ in millions)	Non-Federal ($ in millions)		Median Income ($ in Thousands)	Median Value of Dwelling ($ in Thousands)
Northeast	528.2	78.6	13	7.03	49.7
North Central	440.2	152.9	26	6.45	40.3
South	732.9	201.2	22	5.87	36.2
West (with Santa Ana)	1,443.0	128.6	9	6.58	52.5
Santa Ana	(1,178.0)[a]	(82.0)	7	8.60	88.5
Other	5.8	3.1	35	Not Available	Not Available
Total	3,150.1	564.4	15	6.40	42.9

[a]Includes a substantial amount for reservoir work at full Federal cost.

From the analysis of projects of comparable size shown in Table 22, it appears that there is some correlation between cost of project, mean non-Federal cost, and wealth of benefiting geographical areas. The jurisdictions with projects in the $50-$100 million range protect wealthier communities but also require the highest non-Federal cost sharing. Smaller projects require less cost sharing from the non-Federal sector but also protect less wealthy communities in the aggregate.[1]

Table 22 shows that geographical regions of the country with the wealthier communities awaiting authorization of projects would actually be required to pay less of the project costs under traditional cost sharing than less wealthy communities in other regions. For example, projects in the west and the northeast are in wealthier communities in the aggregate than are projects in the south and north-central regions of the nation. Yet, local interests in the south and north-central regions would be required to pay a greater share of project costs.

The apparent lack of equity in the non-Federal costs based on the distribution by geographical region can be attributed to several causes.[2] The most notable cause is the lack of a distinction in

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[1]A more detailed analysis of individual projects clearly indicates that there are many exceptions to the conclusions drawn from the data presented in Table 21. A number of the projects consist of improvements to existing projects with a minimum of lands, easements, and rights-of-way required. In a few cases, reservoir projects not requiring cost sharing are a major component of the project.

[2]The causes were determined from an analysis of data on individual projects. The data for the most part were printed in U.S. Congress, House Committee on Public Works and Transportation,

the extent of cost sharing between projects proposed for areas presently enjoying a degree of protection versus those which do not have any or at best have very marginal protection.

Proposed Water Resources Development Projects of the U.S. Army Corps of Engineers, Hearings before the Subcommittee on Water Resources, 97th Cong., 2d sess., and in U.S. Congress, House Committee on Public Works and Transportation, Proposed Water Resources Development Projects of the U.S. Army Corps of Engineers, Hearings before the Subcommittee on Water Resources, 98th Cong., 1st sess.

Non-Structural Solutions

Projects Implemented

An analysis was made of authorized projects to determine the extent that non-structural solutions have been implemented since NEPA. More than 250 new construction starts have been funded since Fiscal Year 1970, of which approximately 170 were flood damage prevention projects. Major non-structural components were included in only three of these projects. The work actually accomplished involved measures in both developed and sparsely developed flood plains. Measures accomplished in developed flood plains include relocation,[1] flood-proofing of structures, and flood warning systems. In sparsely developed flood plains, non-structural measures consist of the acquisition of flood plain lands so as to prohibit future development or for overbank storage and recreation. Specific measures that have been implemented in developed flood plains are described below:

Prairie du Chien, Wisconsin

This project consists of the permanent evacuation and relocation of approximately 130 residences and two businesses from St. Feriole Island at Prairie du Chien, Wisconsin, and from the ten-year flood plain on the mainland adjacent to the island. The structures have been relocated to flood-free areas of the community.

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[1]Relocation in a non-structural sense involves moving homes and businesses out of the flood plain, either by physically relocating structures or by the construction of new structures out of the flood plain. Relocations used in connection with structural solutions involve the movement of facilities that interfere with project construction. This frequently entails the reconstruction of highways, railroads, and utilities that interfere with construction of structural solutions.

The remaining structures were flood proofed to the design level adopted. The project was authorized in 1974, received initial construction funds in 1979, and the work is presently nearing completion. Non-Federal interests are paying approximately $1 million, or 20 percent of project costs.[1]

Allenville, Arizona

Three major floods in the 1978-1980 time frame made the town of Allenville, Arizona, uninhabitable. The residents were moved to temporary mobile homes provided by the Department of Housing and Urban Development. A project was formulated and constructed under the provisions of Section 205 of the Flood Control Act of 1948[2] and was recently completed. The work consisted of a replacement community for approximately thirty-five families. The Arizona Division of Emergency Services was the non-Federal sponsor and acquired all the necessary real estate. The Corps constructed the streets, utilities, community center, park, and replacement houses at the new site. The cost sharing was 80 percent Federal and 20 percent non-Federal.

These are the only two non-structural projects involving developed flood plains that have been implemented. Several non-structural solutions involving sparsely populated flood plains have also been implemented. These projects are:

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[1]This is consistent with Section 73, Public law 93-251.

[2]Flood Control Act of 1948, Pub. L. 858, 80th Cong., 2d sess. Section 205 of this act, as amended, authorized the construction of small flood control projects that have not been specifically authorized by Congress. A Federal expenditure limit was placed on each project as well as the total program funds allotted per fiscal year.

Indian Bend Wash, Arizona

This project was authorized in 1965 but did not receive initial construction funds until 1975. This project combines structural and non-structural components. The non-structural components consist of the acquisition of land for a greenbelt floodway corridor and recreation area. Except during periods of flooding, the floodway functioned as a park and golf course.

Charles River basin natural storage area, Massachusetts

This project, authorized in 1974, involved the acquisition of approximately 900 acres of wetlands and adjacent undeveloped areas in the upper Charles River basin. The beneficiaries are the heavily developed communities downstream in the basin. Without the project, these communities would be subject to an increased flood threat as upstream urbanization occurred. The land has all been acquired at Federal cost.[1]

Littleton, Colorado

Section 88 of the Water Resource Development Act of 1974 authorized the Corps to participate with non-Federal interests in the acquisition of flood plain lands immediately downstream from Chatfield Dam.[2] In lieu of constructing part of the downstream channel, approximately 750 acres are being acquired for open space and recreation. Land acquisition is currently under way.

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[1]The project was authorized at full Federal cost by Section 2 of Public Law 93-251.

[2]Chatfield Dam is a Corps flood damage prevention project authorized in 1950 and constructed in the late 1960s and 1970s.

Solutions Being Considered

Approximately fifty non-structural solutions have emerged from Corps studies in the past several years.[1] With the exception of the few projects previously described and several Section 205 projects of relatively modest proportions, none have been authorized or implemented. A summary of the status of non-structural solutions developed by the Corps is shown in Table 24.

There are many difficulties in justifying a non-structural project and in obtaining the necessary local support and financing. In response to the question, "What do you see as impediments to Corps implementation of non-structural measures?", posed to Corps district offices, the most common impediments cited were lack of local cooperation or acceptance and economic feasibility.[2] Experience gained by Corps planners in attempting to develop solutions to flooding which do not involve structural measures points to the very difficult problems associated with relocation. Non-structural solutions involving relocation or flood proofing are very personal measures. It is difficult to convince homeowners residing at a higher elevation that their tax dollars should be used to help pay for the relocation of people who used poor judgment in

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[1]A complete list and description of these non-structural solutions is contained in U.S., Army Corps of Engineers, Seminar Proceedings: Implementation of Non-Structural Measures (Ft. Belvoir, VA: Institute for Water Resources, 1983), Policy Study 83-G520, pp. 401-07.

[2]Allen E. Chin, "Corps of Engineers Implementation of Nonstructural Measures" (unpublished paper, Water Resource Planning Associate, Board of Engineers for Rivers and Harbors, Ft. Belvoir, VA, 1981), pp. 22-29.

TABLE 24

STATUS OF NON-STRUCTURAL SOLUTIONS DEVELOPED BY THE CORPS OF ENGINEERS SINCE PASSAGE OF NEPA

Authorized Projects		Section 205 Projects		Feasibility Reports		
Implemented or Under Way	Not Funded for Implementation	Implemented or Under Way	Potential Project	In Field	Favorable Recommendation Report in Washington	Unfavorable Report
5	7	3	8	9	8	6

residing in the flood plain.[1] Experience has shown that some people are willing to accept the risk of periodic flooding given the alternatives of being asked to move. Several reasons are given for this reaction. One has to do with the Federal flood insurance program. Where periodic flooding still leaves the home habitable, the owners can look forward to periodic upgrading from insurance payments. Another reason is the tendency for individuals to compare the benefits they derive from a non-structural project with those of their neighbors. People residing at slightly higher elevation may not be included in the relocation plan. Yet, they may be subject to flooding since the relocated structures may only involve those in the ten- to fifteen-year flood plain (in the case of relocations) or flood proofing to the ten-year storm elevation.[2]

The formulation of a project with a benefit-cost ratio greater than unity has proved to be much more difficult for a non-structural than for a structural project. The cost of relocating homes or flood-proofing homes so that damages would be averted or minimized tends to run too high for storms in excess of ten- to fifteen-year frequency.[3] Flood proofing also leaves

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[1]While the same argument can be made in the case of a structural solution such as a floodwall, the relocation of a home is a much more personal issue. It is difficult to convince a community and the individuals residing in elevations above which homes are not proposed for relocation that they should contribute to the non-Federal share of project costs.

[2]Generally, economic justification of non-structural measures is difficult to develop, and when developed is generally limited to actions involving existing development in the ten- to fifteen-year flood plain. This has resulted in the polarization of communities between those included and those excluded from a non-structural project. See Seminar Proceedings, pp. 259-262.

[3]The problem stems from the high cost associated with each

residual problems. If homes are protected against a ten-year flood because flood proofing beyond this elevation is not economically justified, damages will continue to occur from greater floods.[1] Aside from the inability to justify a high level of protection, non-structural measures are not effective in alleviating such problems as disruption of business and other community activities. Roads and bridges are subject to the same degree of potential damage with or without the non-structural measures, and no lesser degree of post-flood clean-up can be expected.[2]

In contrast to a structural local protection project providing a standard project flood level of protection, non-structural solutions sought by the Corps would be effective in the event of lesser flood events. Furthermore, to be effective for the future, non-structural solutions require intergovernmental agreements or contracts with non-Federal units of government which can control flood plain development. Case studies have shown that intergovernmental management of flood plains in the United States is in a rudimentary phase, with much more effort needed to make local officials, in a particular community as well as neighboring jurisdictions with similar problems, aware of the problem and

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and every home as compared with a levee that gives equal protection to all within the protected area. On the benefit side, no special consideration is given beneficial environmental or social features of non-structural solutions.

[1]Unanswered is the question of Federal liability when homes are floodproofed pursuant to a Corps project but a flood of major proportions renders the floodproofing ineffective.

[2]Chin, "Corps of Engineers Implementation of Non-Structural Measures," p. 26.

efforts being made toward sound flood plain management.[1] In all of the non-structural solutions proposed by the Corps and in the case of those completed projects, the Corps role generally ends with implementation.[2] Periodically, the Corps inspects structural projects maintained by local interests for adequacy of maintenance. In contrast, there are no specific procedures for checking and enforcing compliance with the requirements of local cooperation for completed non-structural measures. Consequently, states, regional entities, or the communities themselves must exercise an enforcement role if the program is to be successful. This will require intergovernmental coordination in a horizontal or lateral dimension,[3] a worthy research effort beyond the scope of the present study.

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[1]Rutherford H. Platt, et al., Intergovernmental Management of Floodplains (Boulder, CO: University of Colorado, 1980), pp. 287-288.

[2]For example, for the Charles River natural valley storage areas project, local interests are required to prevent modification or alteration of existing roadways, utilities, bridges, culverts and any other improvements that might affect the drainage characteristics of the natural storage areas. They must also adopt and enforce regulations to restrict development of flood plain lands.

[3]Case studies have shown that intergovernmental coordination is usually regarded in a vertical sense. For example, the Corps deals with individual local sponsors each concerned with its own project. Similarly, the National Flood Insurance Program is run in a manner which focuses on individual communities' willingness to participate and comply with certain minimum requirements. See Platt, Intergovernmental Management of Floodplains, p. 288.

Summary

The policy changes which influenced the status of the various categories of projects are summarized in Table 25 along with their impact on outputs. As indicated in Chapter I, the outputs are value neutral and need to be evaluated against appropriate criteria to give meaning and justification to policies. The application of several criteria to the same distribution of outputs leads to different conclusions. This evaluation is presented in Chapter VI.

TABLE 25

SALIENT CHANGES IMPACTING PROGRAM OUTPUTS
SUMMARIZED BY CATEGORY OF PROJECT

Category of Projects	Status/Results		Salient Changes	Impact on Outputs
	Pre-NEPA	Post NEPA		
Phase I	Non-existent.	Authorized in 1974 and 1976. Many no longer supported (particularly reservoirs) or economically justified.	Slowdown in Washington level review and in failure of Congress to enact authorizing legislation. Impasse on cost sharing issue. Unacceptability of reservoir projects. New planning guidance (principles and standards). Higher discount rates.	Generally, the Phase I process has not worked as intended. Very few Phase I reports have been transmitted to Congress or have resulted in congressional authorization of a project for construction. However, when adequate public support for a project no longer exists, the Phase I process has worked successfully.
Inactive or deferred	Less likely due to discount rate.	More likely due to higher discount rates, environmental reasons, and unacceptability of reservoir projects.	Unacceptability of reservoir projects and higher priority or changing community needs. Higher discount rates.	Projects that no longer meet economic justification criteria or are no longer supported by local interests continue to be placed in the inactive and deferred categories, and many are ultimately deauthorized.
Reservoirs with water quality storage	Water quality control a significant benefit in justifying projects.	Water quality control no longer accepted as a valid benefit.	Public Law 92-500 and opposition by EPA to dilution of pollution. Reservoirs no longer acceptable as a solution to flooding problems in most cases.	"Grandfathered" projects with water quality control benefits are being completed, whereas new projects are not being undertaken with this type of storage.
Section 201	Not implemented between 1965-1970.	Used extensively between 1970-1977. Not used since June 1978.	Impasse on cost sharing issue. Higher discount rates.	Projects otherwise eligible for authorization under Section 201 are not being recommended for authorization under this authority. A number of authorized Section 201 projects are no longer economically justified.
Authorized Projects Funded for Construction				
New starts	Liberal selection by administration.	Gradual slowdown. Only one in Fiscal Year 1981 and none since that time.	Failure of Congress to enact authorizing legislation. Impasse on cost sharing issue. Unacceptability of reservoir projects. Higher discount rates. Budget constraints.	Only one new construction start since Fiscal Year 1981. List of authorized projects from which new starts can be selected is very limited.

TABLE 25--Continued

Category of Projects	Status/Results		Salient Changes	Impact on Outputs
	Pre-NEPA	Post NEPA		
Continuing construction projects	More than 250 projects funded annually. Size of program in constant dollars peaks in the late 1960s.	Program gradually shrinks as projects are completed and new starts become very limited.	Failure of Congress to enact authorizing legislation. Unacceptability of reservoir projects.	The number of continuing construction projects has been declining. Despite a lower level of funds for construction, the amounts appropriated are adequate to meet efficient construction schedules (because of the lesser number of projects funded).
Other active projects not funded for construction	List is substantial but dynamic in that new starts are numerous and authorizing legislation is enacted approximately every two years.	List gradually shrinking as projects are reclassified to the inactive and deferred categories and new projects are not authorized.	Unacceptability of reservoir projects. Higher priority or change of community needs. Higher discount rates and changed benefit computation methodology.	The number of authorized projects not yet funded for construction which meet current economic criteria and which are supported by local interests is very limited.
Projects with favorable recommendations undergoing Washington level review	Not an issue because authorizing legislation enacted approximately every other year.	The number of projects in this category continues to grow as the time elapsed since the prior water resources development act (1976) increases.	Failure of Congress to enact authorizating legislation. Impasse on cost sharing issue. Slowdown in Washington level review. Changes in planning guidance.	Over seventy flood damage prevention projects are awaiting authorization, some for over six years.

PART TWO

CHAPTER VI

EVALUATION OF FINDINGS AGAINST RESEARCH QUESTIONS

Organization of Responses to Research Questions

Chapter VI is the beginning of Part Two of the study. It includes a discussion of the salient policy changes and resulting outputs which are evaluated against the criteria of equity, efficiency, and responsiveness. Concurrently it provides answers to the research questions, drawing upon Part One of the study. The analysis of project data (Chapter V) and the study of the application of benefit-cost theory by the Corps to its flood damage prevention program (Chapter III) are used as the basis for drawing conclusions as to program outputs. These outputs are evaluated against the criteria discussed in Chapter IV from which outcomes are derived. In Chapter VI, policy changes and the most significant program outputs are juxtaposed and are evaluated in terms of concepts of equity, efficiency, and responsiveness. For convenience, the research questions are repeated below.

The main research question is: To what extent have external and internal pressures from 1970 through 1983 changed the flood damage prevention services of the U.S. Army Corps of Engineers when measured against criteria of equity, efficiency, and responsiveness?

The subsidiary research questions are:

1. What are the specific policy changes of the period, and what dimensions of the planning and implementation process have they affected? Of particular interest are changes having a bearing on:

   a. The process for authorization of new projects.

   b. The calculation of benefit-cost ratios.

   c. The types of solutions being recommended.

   d. The implementation of authorized projects.

2. What impacts have fiscal constraints had on the implementation of flood damage prevention projects by the Corps?

3. To what degree have policy changes affected the technical remedies, with the emphasis on non-structural solutions, implemented by the Corps for preventing flood damage?

4. From the available literature, what operational definitions of equity, efficiency, and responsiveness can be framed to describe and evaluate the Federal provision of flood damage prevention services?

5. In what specific ways have these changes contributed to or detracted from the objectives of equity, efficiency, and responsiveness in the provision of flood damage prevention services?

In addressing each question, it became apparent that some grouping of the questions would facilitate a coherent presentation. For example, policy changes and resulting outputs are evaluated against the criteria of equity, efficiency, and responsiveness. However, a presentation of the most appropriate concepts of equity, efficiency, and responsiveness and their operational characteristics derived from the literature and from the overall assessment of external and internal pressures and policy changes affecting the Corps flood damage prevention services (subsidiary research question 4) should precede the evaluation required by the main research question. Accordingly, the research questions are grouped in the following combination and order of presentation:

1. Main research question and subsidiary question 4: The most pertinent operational definitions of equity, efficiency, and responsiveness are based on the literature review of Chapter IV, the

nature of the Corps flood damage prevention program, e.g., public good, investment decisions, who pays, who benefits, etc., as well as consideration of the pertinent policy changes. Where feasible, the definitions are operationalized in a manner which permits quantification of outcomes associated with the project data analyzed in Chapter V. Therefore, the first question to be addressed will be subsidiary research question 4 followed by the main research question.

2. Subsidiary research questions 1 and 5: Both of these questions deal with the salient changes of the period. Question 1 relates changes to the dimensions of the planning and implementation process, while question 5 relates the changes in a positive or negative sense to equity, efficiency, and responsiveness.

3. Subsidiary research question 2: Funding constraints per se did not appear to be a major reason for the slowdown in the implementation of Corps projects. However, since NEPA, particularly during the past few years, high budget deficits have been of major concern in formulating annual budgets. It is, therefore, of interest to assess the impact of budget constraints on the implementation of new projects as well as to document the reasons for which the continuing program has not been seriously affected by budget constraints.

4. Subsidiary research question 3: During the post-NEPA period there was considerable pressure to formulate and implement nonstructural solutions rather than structural ones. Very few nonstructural projects have been authorized and implemented. The reasons for this apparent lack of success despite the strongest support from the executive and legislative branches and environmental interests are addressed. It is of interest to ascertain the dimensions of non-structural solutions and to determine why so few projects of this type have been implemented. Finally, it is appropriate to assess the outlook for this program.

Subsidiary Research Question 4

From the available literature, what operational definition of equity, efficiency, and responsiveness can be framed to describe and evaluate the Federal provisions of flood damage prevention services?

Various concepts of equity, efficiency, and responsiveness found in the literature were discussed in Chapter IV and were summarized in Table 7. The most appropriate of these concepts in evaluating the Corps flood damage prevention program are presented in Table 26. Certain concepts lend themselves to quantifiable operational definitions while others are best evaluated in non-quantifiable terms where outcomes will be based on more inferential conclusions.

A distinct relationship was observed between the various concepts of equity, efficiency, and responsiveness. Generally, equity and efficiency are pulling in opposite directions, with responsiveness (particularly timely responsiveness) a balancing force. For example, the decision by Congress to authorize and fund at full Federal cost a major flood damage prevention project with a high level of protection for communities in the Tug and Levisa Fork and the upper Cumberland River in West Virginia and Kentucky enhanced concepts of equity, particularly vertical and jurisdictional equity. Efficiency would be decreased under all three definitions, while citizen, political, and timely responsiveness are enhanced. Attempts to formulate projects with a favorable benefit-cost ratio had been undertaken for many years without success. Without the declaration by Congress that benefits exceeded

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[1]See discussion of Phase I project data in Chapter V.

TABLE 26

CONCEPTS OF EQUITY, EFFICIENCY, AND RESPONSIVENESS CONSIDERED MOST APPROPRIATE IN THE PROVISION OF FLOOD DAMAGE PREVENTION SERVICES

EQUITY	RESPONSIVENESS	EFFICIENCY
Interpersonal	Citizen	Macroeconomic
o Distribution of costs progressively by income and wealth; services targeted in favor of poor (vertical equity).	o Degree to which citizens' preferences are considered in solutions.	o National economic benefits must exceed costs for project to be valid.
	Political	
	o Degree of political support for project at local, state, and Federal level.	o Maximize net economic development benefits (as opposed to providing standard project flood protection for safety reasons).
o Distribution of costs and benefits amont similar individuals (horizontal equity).	Timely	
	o Timeliness of solution.	
Jurisdictional		Administrative
o Distribution costs and benefits in a manner that favors depressed regions.		o Concentration of power in the chief executive and his political appointees in contrast to the pluralist democracy model.
		o Neutral treatment of flood problems in formulating and implementing Corps projects.
		Microeconomic
		o Benefits to the rich are as valid as benefits to the poor as long as the service provided is paid for.
		o Willingness of the beneficiaries to pay a higher share of project costs.

costs when considering all objectives of Section 209 of the Flood Control Act of 1970,[1] the project would not be authorized for construction.

Only studies would be continuing. The congressional action resulted in initiation of construction, and subsequent funding has enabled the Corps to continue the work.

Another example illustrates that when policy actions or inactions result in outcomes of enhanced efficiency, equity is generally decreased. Responsiveness may be decreased under certain concepts but enhanced under another. When the administration[1] institutes policies without congressional consent, but Congress does not formally object to the policies, or, conversely, when Congress fails to enact meaningful authorizing legislation for several years, the stature of the chief executive is enhanced on issues of policy, power, and decision-making. This results in enhanced administrative efficiency and generally a higher degree of macroeconomic and microeconomic efficiency.[2] The outcomes would reflect decreased equity. Citizen and political responsiveness would likely be diminished, while the outcome may actually be more timely, depending upon whether Congress objects or acquiesces to the policy.[3]

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[1]It does not necessarily matter whether a Republican or Democratic administration is in office.

[2]This would certainly be the case under policies of the Reagan administration. It could be argued that the Carter administration's preoccupation with environmental quality may have resulted in some decisions which did not maximize net economic development benefits; in such instances, a lesser degree of macroeconomic efficiency would have resulted.

[3]The Department of the Army's new start proposal in Fiscal Years 1983 and 1984 is a case in point. Thus far, Congress has objected to implementation of new construction starts on the basis

A more detailed discussion of policy changes and resulting outputs and an analysis of the outputs against the evaluation criteria is presented later in this chapter in response to subsidiary research question 5. At this point, examples of policy decisions which resulted in outcomes of enhanced equity, responsiveness, and efficiency are presented in Table 27 together with the resulting outcome when measured against different criteria.

Several quantifiable operational indicators were used in determining whether outcomes resulted in enhanced or decreased equity, efficiency, and responsiveness. They are summarized later in this chapter in Table 32. Other outcomes were more inferential and were based upon results or the lack thereof. These too are presented.

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of higher but voluntary cost sharing. The Assistant Secretary has stated that this is the only way to get new starts given the high budget deficits. He also contends that willingness to pay is a better indicator of project worth than the benefit-cost ratio computation. Congress has under consideration higher cost sharing proposals in H.R. 3678 and S. 1739. The enactment of either bill would put the cost sharing formula closer to the administration's proposal than traditional cost sharing. It can therefore be argued that concurrence by Congress with the administration's cost sharing proposal (or at least not objecting to it), by permitting the new starts to proceed, would improve the timeliness of response.

TABLE 27

OUTCOMES OF POLICY CHANGES MEASURED AGAINST VARIOUS CONCEPTS OF THE EVALUATION CRITERIA

Policy Changes		Resulting Impact on		
Description	Criteria Enhanced	Equity	Responsiveness	Efficiency
	Equity Concepts			
Grandfathered discount rate	Interpersonal (vertical equity)	Jurisdictional enhanced	Political and citizen enhanced	Macroeconomic decreased
Uniform cost sharing	Interpersonal (horizontal equity)	Jurisdictional decreased	Political and citizen enhanced if uniform cost sharing is equal or less than traditional cost sharing	Microeconomic increased if higher cost sharing results; otherwise decreased
Authorization based on 4 accounts in Section 209	Jurisdictional	Interpersonal (vertical) enhanced	Citizen, political, and timely enhanced	Macroeconomic and microeconomic decreased
	Responsiveness Concepts			
Emphasis on public participation and a more open planning process	Citizen	Jurisdictional enhanced Interpersonal (vertical) enhanced	Timely decreased	Macroeconomic decreased
Phase I authorizations in 1974 and 1976	Political		Timely decreased	Macroeconomic enhanced
Use of Section 201 authority during 1970-1977	Timely	Jurisdictional enhanced	Citizen and political enhanced	Macroeconomic enhanced

TABLE 27--Continued

Policy Changes		Resulting Impact on		
Description	*Criteria Enhanced*	Equity	Responsiveness	Efficiency
	Efficiency Concepts			
Use of higher discount rate in formulating new projects and in recommending new starts	Macroeconomic	Jurisdictional decreased	Political enhanced where consistent with Section 80, PL 93-251	Administrative enhanced
Establishment of rules for cost sharing, project formulation, and new starts without congressional approval	Administrative	Interpersonal (vertical) and jurisdictional decreased	Political decreased	Macroeconomic enhanced
Higher cost sharing as proposed by the administration	Microeconomic	Interpersonal (vertical) decreased	Varies--timely enhanced if Congress concurs in the proposals or some variation thereof such as those contained in H.R. 3678 and S. 1739; otherwise, timely decreased	Administrative enhanced

Quantifiable Operational Indicators

Three quantifiable operational indicators were used in evaluating the project data (Chapter V). For jurisdictional equity the indicator is whether the geographical area to be protected was poor compared with the state it is in. However, the main focus is on the new starts funded for construction versus the projects awaiting authorization which should constitute future new starts. Were projects formulated and initiated under old rules protecting richer or poorer communities than projects awaiting authorization?

In evaluating outputs against the macroeconomic efficiency criteria, an attempt was made to determine the impact of policy changes on the benefit-cost ratio. By starting with groups of projects that at one point in time had favorable benefit-cost ratios, and subsequently had their benefit-cost ratio drop below unity when evaluated at a higher discount rate or in accordance with other benefit computation changes, an increase in macroeconomic efficiency could be attributed to the policy changes. This in itself was to be expected. Of greater importance is that it points to the benefits that would have been foregone in the case of the ex post analysis of reservoir projects with water quality control storage; secondly, it identifies projects such as those in the Phase I and Section 201 categories which are no longer economically justified.[1] However, a closer scrutiny of these projects revealed that very few on which the benefit-cost ratio dropped below unity were supported by local interests based on traditional cost sharing, let

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[1]Phase I and Section 201 projects were all authorized after 1968 and, therefore, the discount rate used in justifying such projects continued to rise until funded for construction.

alone higher cost sharing. In such a case, both macroeconomic efficiency and political responsiveness are enhanced.

A number of policy changes since NEPA lengthened the time required to accomplish activities that were more readily achievable prior to NEPA or at least prior to the policy change. Time as a measure of responsiveness is particularly important when policies result in delays or impasses which are rather lengthy. The time required for certain activities was reviewed for several project categories and is shown in Table 28.

TABLE 28

A COMPARISON OF TIME REQUIRED TO ACHIEVE PROJECT AUTHORIZATION AND IMPLEMENTATION

Project Category	Policy Change	Time Measured	Time Saved or Lost	
			Before Policy Change	After Policy Change
Authorized Section 201 project and projects awaiting authorization that met the Section 201 dollar limit.	Use of Section 201 authority discontinued after 1978.	Time saved by using the Section 201 authority on those projects implemented or awaiting implementation.	As much as twelve years saved by using Section 201.	Section 201 discontinued in 1978 (last flood damage prevention project in 1977) and no authorizing legislation was enacted since that time. This means that as much as seven years have been lost while waiting for an authorization bill (1976-1983).
Projects undergoing the Washington level review.	Impasse in project authorization due to cost sharing, project review, and related issues.	Time required for Washington level review (from division commanders notice to authorization).	Prior to NEPA, the time required for the Washington level review was approximately one year.	Washington level review ranging from about two years to seven years (depending on when the next authorization act is passed).

Main Research Question

To what extent have external and internal pressures from 1970 through 1983 changed the flood damage prevention services of the U.S. Army Corps of Engineers when measured against criteria of equity, efficiency, and responsiveness?

The major external pressures during 1970-1983 affecting the Corps flood damage prevention program appear to have come from the environmental movement and as a reaction to high budget deficits. The root cause of most policy changes discussed in the study can be traced to these pressures, which have been prevalent during the period of study. Environmental issues and budget deficits are national in character and obviously affected much more than the Corps flood damage prevention program. However, in seeking to identify the fundamental reasons for decisions which altered policies during 1970-1983 and in reviewing the outputs from such policy changes, the environmental movement and budget deficits stand out as the primary pressures. Policy changes instituted by the Corps, as well as those initiated by the Congress and the administration, appear to be in response to the external pressures.[1]

Being responsive to the public within constraints established in law and in policies has long been a Corps trademark. The challenge since 1970 has been to attempt to remain responsive to a more vocal public frequently expressing views that differed from traditional Corps policies. Thus, the major internal pressure has been to

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[1]Inaction by the administration and Congress may also be traced to these external pressures.

react to external pressures in a manner which reflects responsiveness to the public while retaining a technically strong and competent workforce.[1] The major external and internal pressures and resulting policy changes are shown in Table 29.

The environmental pressures were particularly strong as the National Environmental Policy Act (NEPA) was signed on January 1, 1970. Following this major legislation, the Corps was in a catch-up mode seeking to comply with the requirements of NEPA so that authorized projects could proceed. Within a short period of time projects were being challenged on the basis of an inadequate environmental impact statement or non-compliance with NEPA.[2]

The frequent opposition to authorized projects on environmental grounds or for other reasons prompted Congress to authorize projects in 1974 and 1976 for Phase I design only. As pointed out in Chapter V, virtually none of these projects has been authorized for implementation, and many are no longer supported by local interests. Proponents of non-structural solutions were frequently from the environmental community. The emphasis given to non-structural alternatives by the Carter administration was attributable to a

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[1]Reaction to external pressures reflects the Corps desire to succeed, i.e., being responsive to the public by providing services in an acceptable form. There is also a basic inherent desire to retain its technical expertise for several reasons. From an organizational viewpoint, the need is tied to the role of the Corps in the event of a national mobilization requirement. From the perspective of Corps management, there is a desire to succeed, and this equates to being technically competent.

[2]The early environmental impact statements written in 1970 were only a few pages long; subsequent statements frequently were several hundred pages in length.

TABLE 29

MAJOR EXTERNAL AND INTERNAL PRESSURES
AFFECTING THE CORPS OF ENGINEERS
FLOOD DAMAGE PREVENTION PROGRAM
1970-1983

External Pressures	
Source of Pressure	Resulting Policy Change
Environmental movement	o Environmentally oriented legislation. o Environmentally oriented presidential memoranda, policy statements, and executive orders. o Principles and standards revisions stressing non-structural solutions and stricter rules in justifying projects. o Phase I authorizations in 1974 and 1976. o Reduced congressional support reflected in the failure of Congress to enact legislation authorizing new projects.
Budget deficits	o Proposals for higher non-Federal cost sharing. o Slowdown in new starts. o Impasse over enactment of authorizing legislation.

Internal Pressures	
Source of Pressure	Resulting Policy Change
Responses to external pressures (primarily from the environmental movement and resulting policy changes)	o Reorganization with emphasis on environmental issues and the planning function. o Creation of the Chief of Engineers' Environmental Advisory Board and the establishment of environmental objectives for the planning process. o Changes in outputs, e.g., local protection projects with some non-structural elements being recommended in contrast to multiple-purpose dams and reservoirs prior to NEPA. o Greater sensitivity to the environmental quality objective in the formulation and design of new projects. o More open decision-making characterized by more public meetings, consultation with various publics, and consideration of a greater number of alternatives before recommending a particular plan.

desire for greater attention to environmental values.[1]

The treatment of environmental quality objectives was unquestionably a driving force in the project review directed by President Carter in 1977[2] and in the revisions to the principles and standards in 1979-1980[3] Furthermore, budget guidance required agency heads to certify that the budget was in compliance with fifteen environmental laws.[4] The current principles and guidelines list over thirty environmental laws, executive orders, and Federal policies that are considered in water resource studies, most of which are applicable in any particular flood damage prevention study which may produce a Corps project.[5]

By comparison with recent budget deficits, those experienced in the 1970s were modest. Not only were they much smaller, the

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[1]U.S., President, Memorandum, "Improvements in the Planning and Evaluation of Federal Water Resources Programs and Projects," July 12, 1978, pp. 3-5.

[2]See U.S., Congress, House, Hearings 1978, Part 9, pp. 1-375. The three tests which each project underwent were 1) no major adverse environmental impact, 2) remaining-benefit remaining-cost ratio greater than unity at a discount rate of 6-3/8 percent, and 3) no credible safety problems. A careful review of the hearings document clearly indicates the Carter administration's preoccupation with the environmental issue.

[3]President Carter announced his desire to revise the principles and standards in his memorandum of July 12, 1978, stressing the economic development and environmental objectives and the requirement for the preparation and inclusion of a primarily non-structural plan as one alternative whenever a structural project is considered.

[4]U.S., Executive Office of the President, Office of Management and Budget, Preparation and Submission of Budget Estimates, Circular A-11 (Washington, D.C., June 1980), p.11.

[5]See Appendix A for a list of pertinent legislation.

interest rates which prevailed were considerably lower. Yet, it has been the policy of the Office of Management and Budget (OMB) to scrutinize the Corps civil works program, particularly new starts, in an effort to reduce Federal expenditures. New projects and unstarted elements of projects have been viewed as controllable expenditures, much more susceptible to budget cuts than expenditures required by law. As interest rates increased and budget deficits grew in a dramatic way over the past several years, other means of reducing Federal investments were proposed. In the case of the Corps flood damage prevention program, this meant proposals for increasing the non-Federal share of construction costs, reducing the number of new starts, and a much closer scrutiny of proposed projects by the present and prior administrations.[1]

A summary of an evaluation of the most important policy changes or proposed changes, the resulting outputs and outcomes, and the logic of the conclusions drawn are shown later in this chapter in addressing subsidiary research question 5 (See Table 31.).

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[1]This closer scrutiny is also related to environmental considerations.

Subsidiary Research Question 1

What are the specific policy changes of the period, and what dimensions of the planning and implementation process have they affected? Of particular interest are changes having a bearing on:

1. The process for authorization of new projects.
2. The calculation of benefit-cost ratios.
3. The type of solutions being recommended.
4. The implementation of authorized projects.

During the period since the passage of NEPA, there has been a significant decline in the number of flood damage prevention projects authorized for implementation. Yoe discusses the major authorization acts of the 1950s and particularly the 1960s and the sharp decline in the cost of projects authorized in the three authorization acts in the 1970s.[1] In considering policy changes it is essential to consider motives behind such policy changes. Policy changes were supported by individuals and groups opposed to a continued program of constructing water resource projects. Shabman points to the view of environmental interests who brought into question the basic historical premise of continued construction of dams and water delivery systems and to the collapse in the late 1960s of the social consensus on water development.[2] More importantly, he points out that only during the disintegration of the social con-

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[1]Charles Yoe, The Declining Role of the U.S. Army Corps of Engineers in the Development of the National Water Resources (Fort Collins, CO: Colorado Water Resources Research Institute, Colorado State University, 1981), pp. 113-117.

[2]Leonard Shabman, "Non-Market Valuation and Public Policy: Historical Lessons and Newe Directions," a paper prepared for Southern Natural Resource Economics Committee Meeting, Biloxi, MS, May 19, 1983, pp. 11-12.

sensus of the worth of water projects was it possible to develop and put into effect the principles and standards.[1]

The fact that there was a water project "hit list" at all during the Carter administration attests to the decline in the broad-based support for water projects. The Carter reforms, previously described, sought to tighten up the rules in a legally enforceable manner which stressed the marginal contribution of projects to the nation's economy. The assumptions as to the "with" versus "without-project" conditions were carefully specified. In so doing the marginal contribution of projects was narrowly defined. Combined with the higher discount rates used in the formulation of new projects, the curtailment (or at least the slowdown) of recommendations for new projects with favorable benefit-cost ratios became a fact.

Support for the principles and standards came from environmental groups as well as OMB. Both favored the expected results, i.e., fewer projects, rather than the economic analysis per se. The same environmental groups, however, opposed the application of the same standards to specific projects with environmental quality features.[2] Similarly, OMB applied the strict economic criteria to non-structural solutions. The difficulty in justifying non-structural solutions in accordance with the current guidelines, described in Chapter V, serves the OMB theme. The failure to be economically justified can be used as the basis for rejection rather than the

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[1] Ibid., pp. 12-13.

[2] Ibid., p. 14.

fear of permitting a new category of Federal expenditure.[1]

The role of economic efficiency has come full cycle. Prior to NEPA, pro-development groups and politicians used it in seeking support for projects. Now it is frequently used by opponents of Corps projects to indicate the limited worth of the program.[2]

The Reagan administration has added two dimensions to the issue of project feasibility and implementation. These are higher non-Federal cost sharing and much greater emphasis on the national economic development (NED) plan (as opposed to a higher degree of protection). Each of these dimensions should be viewed from the perspective of OMB and the Assistant Secretary of the Army for Civil Works, a Reagan administration appointee. On the issue of project review, which now resides with OMB, the benefit-cost ratio of a proposed project providing flood damage prevention benefits remains the most critical factor in approving a project for processing to Congress. The Assistant Secretary, while recognizing the sacredness of the benefit-cost ratio, realizes that benefit-cost calculations are imprecise at best. He considers willingness to pay as a better indicator of project worth, which at the same time reduces the Federal investment and hence has less adverse impact on the Federal budget deficit.

The issue of emphasizing the selection of the NED plan is primarily one of reducing the Federal investment and simultaneously adhering to the tenet of maximizing the marginal contribution to the

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[1] Ibid.

[2] Ibid., p. 15.

nation's economy stressed in the principles and standards and more recently the principles and guidelines.[1] It would appear that while the issue of cost sharing may be settled in legislation, the level of protection is a more complex subject. Affordability, safety, the sanctity of maximizing NED benefits, and occasionally political pressures are intertwined in a complex situation that may be decided one way or the other depending upon the specifics of the case.[2]

The key dimensions of the planning and implementation process which were affected by policy changes since NEPA are presented in Table 30. For each factor considered, the policy or practice before

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[1]The Corps frequently recommends a project providing a greater degree of protection than the NED plan so as to avoid catastrophic damages in the event of a flood which would exceed the protection afforded by the NED plan. In such an instance, the NED plan generally would have a higher benefit-cost ratio than the more costly project. Occasionally, the local sponsor cannot afford the NED plan, even under traditional cost sharing rules. Where a project of less than NED proportions is preferred by local interests and is acceptable to the Corps from a safety viewpoint, there is a good likelihood that the administration will not object to such a proposal assuming it has a favorable benefit-cost ratio. The principle of combining higher non-Federal cost sharing, level of protection and affordability to the local sponsor consistent with acceptable risk remains intact. However, when the Corps recommends a project which exceeds the NED plan in level of protection, so as to minimize the risk of catastrophic flooding, it may result in controversy with the administration.

[2]The issue of level of protection will not necessarily be resolved with the passage of H.R. 3678 or S. 1739 or some compromise between the two. Aside from philosophical differences stemming from safety considerations versus maximizing NED benefits, a root cause of the difference is attributable to the fact that the Corps is not concerned with how to raise the funds in its budget enabling it to be conservative and favor a policy of minimizing risk. The assistant secretary and OMB, on the other hand, are more sensitive to budget deficits and, therefore, are more inclined to accept a higher degree of risk. Furthermore, the Corps direct involvement with the public which would be protected by a project and its reputation for technical expertise make it more reluctant to recommend the lesser project in an urban setting.

TABLE 30

DIMENSIONS OF THE PLANNING AND IMPLEMENTATION PROCESS IMPACTED BY POLICY CHANGES

Process of Authorization of New Projects		
Factor	Prior to NEPA	Post NEPA
Washington level review	Relatively routine and and accomplished within one year.	Characterized by impasses.
	OMB reviews for the administration.	OMB & ASA(CW) review for administration. Attempt to establish Independent Review Board fails.
Enactment of authorizing legislation	Generally every two years.	Infrequent with emphasis on Phase I's. Last water resource development act in 1976.

The Calculation of Benefit-Cost Ratios		
Factor	Prior to NEPA	Post NEPA
Discount rate	Low (3-1/4 or lower for projects authorized prior to NEPA).	Rising from 4-5/8 in FY 1969 to 8-1/8 in FY 1984.
Water quality control storage benefits	Included in analysis.	Excluded.
Future development	Liberal interpretation of the use and development of the project area without the project.	The "without-project" condition is assumed to reflect sound flood plain management decisions.

TABLE 30--Continued

Factor	The Types of Solutions Being Recommended		
	Prior to NEPA	Post NEPA 1970-1977	Post NEPA 1978-1983
Reservoirs	Authorized in omnibus legislation approximately every two years. Engineering decisions dominate decision-making.	Predominately authorized for Phase I.	Virtually none recommended.
Local Protection Projects			
Federal cost more than $10 million	Authorized in omnibus legislation approximately every two years. Engineering decisions dominate decision-making.	Predominately authorized for Phase I.	Undergoing Washington level review.
Federal cost less than $10 million	Authorized in omnibus legislation approximately every two years. Engineering decisions dominate decision-making.	Authorized for implementation under the provisions of Section 201.	Undergoing Washington level review, but not recommended for Section 201 authorization.
Non-structural solutions	Given minor attention.	Consideration expanded by Section 73, WRDA 1974. Limited number of projects authorized.	Additional projects or elements of projects recommended but not authorized. Principles and guidelines (1983) do not stress to the extent that principles and standards did.

TABLE 30—Continued

The Implementation of Authorized Projects

Factor	Prior to NEPA	Post NEPA 1970–1977	Post NEPA 1978–1983
Degree of protection	Frequently what local sponsors will support, sometimes designed to withstand the flood of record.	Development of standards calling for a higher level of protection. Safety a major consideration.	Safety of a community a major consideration leading to SPF becoming Corps policy. Since 1981, greater focus on the NED plan rather than SPF.
Selection of new starts	Numerous from a large universe of projects.	The number slows down as new authorizations become more limited and opposition grows against certain types of solutions.	Only one new start since FY 1981. Impasse largely over cost sharing.
Funding			
Preauthorization planning and engineering	Less amounts per study per year, but overall study cost lower.	Study costs increase as compliance with NEPA and other environmental legislation and P&S is formally incorporated in the planning process.	The number of studies is reduced to focus resources on those with greatest probability of producing implementable solutions. CP&E program commences in FY 1982.
Post authorization planning and engineering	Generally proceeded smoothly followed by construction funding if project was supported.	The number of projects decreases as new projects are not authorized. Ongoing AE&D projects retrofitted for EIS & P&S.	AE&D program gradually decreasing as preconstruction planning is completed and 1974 & 1976 acts authorized projects for Phase I.

TABLE 30--Continued

The Implementation of Authorized Projects		
Factor	Prior to NEPA	Post NEPA
Continuing construction	Close to 300 projects funded per year. Overall funding high, but delays due to funding occur due to large demands of major projects.	Program declines in terms of constant dollars as number of projects declines; but inflation prevails during substantial portions of the period resulting in lower budgets. Funds generally are adequate to maintain schedule[1] as the number of ongoing projects declines.

[1]An exception was in Fiscal Year 1980 when a high inflation rate and a fear of escalating fuel prices resulted in higher bids and more rapid progress by contractors. This necessitated a major supplemental appropriation.

1970 is compared with that of the post-NEPA period. Where a discernible change in direction was perceived at some point during the 1970-1983 time frame, the post-NEPA period was divided into two periods.

Subsidiary Research Question 5

In what specific ways have these changes contributed to or detracted from the objective of equity, efficiency, and responsiveness?

Referring to Figures 2 and 3 in Chapter I, each of the salient policy factors analyzed for change (Figure 3) will be followed through the policy process (Figure 2). Based on changes in policy that occurred in the 1970-1983 time frame certain outputs resulted. These outputs, measured in such terms as "fewer projects with favorable benefit-cost ratios" (the output of higher discount rates) and "fewer projects receiving local support" (the output of proposals for higher non-Federal cost sharing in financing project construction), are evaluated against the various definitions of equity, efficiency, and responsiveness as defined in Chapter IV.

The project data described in Chapter I and analyzed in Chapter V serve to reinforce conclusions concerning the outputs resulting from the policy changes. For example, an analysis of Phase I projects, new construction starts, unstarted active projects, and projects placed in the deferred and inactive categories all point to the movement away from reservoir projects as a politically acceptable means of solving flood problems. The project data provide input which is used in the analysis of changes in solutions recommended, benefit-cost methodology, funding, and programmatic issues. The resulting outputs are evaluated against the equity, efficiency, and responsiveness criteria. Quantitative measurements are used in the analysis of outcomes where feasible. With respect to the equity criterion, this entailed the analysis of project data against census data to determine characteristics of the communities

which benefited or lost from policy changes. Each of the salient policy factors analyzed for change is briefly discussed, followed by Table 31 which identifies the program outputs and outcomes resulting from a number of salient policy changes and indicates the logic of conclusions drawn. Where appropriate, the evaluation criteria are shown as norms in Table 32. Using numerical measurements, conclusions are drawn which support the outcomes and logic of conclusions discussed in the prior table.

TABLE 31

EVALUATION OF POLICY CHANGES MEASURED AGAINST CONCEPTS OF EQUITY, EFFICIENCY, AND RESPONSIVENESS

Description of Policy Changes	Program Outputs	Criteria	Operational Indicator	Outcome	Logic of Conclusion
Proposed requirements for uniform but generally higher non-Federal cost sharing in financing project construction.	Fewer projects receiving local cooperation.	Jurisdictional equity.	Value of property, average income.	Jurisdictional equity decreased.	A comparison of the median value of income and dwellings in areas where projects are awaiting congressional authorization versus those that received new starts since 1968 indicates that on the average, the jurisdictions awaiting project authorization are poorer than those which received new starts. Raising the non-Federal costs will make it more difficult for these communities to pay the non-Federal share resulting in non-implementation of projects or acceptance of projects affording a lower degree of protection.
		Microeconomic efficiency.	Willingness to pay greater share of project costs.	Microeconomic efficiency enhanced.	Willingness of the benefiting jurisdictions to pay a greater share of project costs is a better indicator of project worth than the surrogate measure of the benefit-cost ratio.
		Political responsiveness.	Cost sharing formula presented to local interests and congressional interests.	Political responsiveness decreased.	Projects have been presented to local interests and in testimony before congressional committees on the basis of traditional cost sharing which is generally less than the new proposals under active consideration. To the extent that the non-Federal share of project costs increases, political responsiveness is decreased. However, should the ultimate decision on cost sharing retain or lower the existing formula, political responsiveness increases.
	Timely responsiveness.	Time required to initiate construction following authorization of projects by Congress.	Timely responsiveness decreased.		Negotiations based on a different formula than previously presented to local interests will be time consuming, possibly resulting in design changes to make projects affordable to local interests.

TABLE 31--Continued

Description of Policy Changes	Program Outputs	Criteria	Operational Indicator	Outcome	Logic of Conclusion
Increased Complexity of the Planning Process o Greater public involvement o Environmental legislation o Principles and standards o Corps guidance on standard project flood level of protection	Projects are formulated on the basis of multi-objectives and criteria which do not maximize net economic development benefits.	Macroeconomic efficiency.	Extent to which projects consist of the national economic development (NED) plan.	Macroeconomic efficiency decreased.	The necessity to incorporate environmental quality measures in recommended solutions, and to consider other than the national economic development objective in formulating projects, results in solutions which do not reflect a maximization of national economic development benefits.
Congressional Political Support					
Lack of broad support for water projects by new members of Congress; strong opposition from members whose districts do not receive much in the way of Corps projects. Congress is reluctant to approve proposals which would alter the Federal/non-Federal cost sharing formulas.	Very few projects have been authorized since 1976. Therefore, fewer projects are available for implementation. Use of Section 201 discontinued in 1978.	Macroeconomic efficiency.	Projects with favorable benefit-cost ratios awaiting authorization.	Macroeconomic efficiency decreased.	During this period of indecisiveness, when very few projects were authorized, sound economic investments with favorable benefit-cost ratios were foregone.
		Timely responsiveness.	Time required for authorization of projects by Congress following date of favorable report by Chief of Engineers.	Timely responsiveness decreased.	Failure of Congress to act on favorable reports of the Chief of Engineers by authorizing projects decreases timely responsiveness by Congress. In the decade of the 1960s, major authorization bills were enacted on the average of every other year. Yet none have been enacted since 1976.

TABLE 31--Continued

Description of Policy Changes	Program Outputs	Criteria	Operational Indicator	Outcome	Logic of Conclusion
Benefit-cost ratio methodology					
Higher discount rate for new projects	Fewer projects with favorable benefit-cost ratio.	Jurisdictional equity.	Value of property. Median Income.	Jurisdictional equity decreased.	Where property values are low and all other things are equal, there is less chance that favorable projects will be formulated compared with grandfathered projects.
		Macroeconomic efficiency.	Benefit-cost ratio.	Macroeconomic efficiency increased.	Higher discount rates result in higher annual costs and lower average annual benefits when dealing with future flood damage prevention benefits. The combined effect is a lower benefit-cost ratio. Only those projects with greater benefits will have a favorable benefit-cost ratio. This reduces the risk of the project actually producing benefits in excess of costs.
		Political responsiveness.	Letters of intent and signed contracts agreeing to to the requirements of local cooperation.	Political responsiveness enhanced.	The large number of projects deauthorized since 1977 and the more than 300 projects proposed for deauthorization in H.R. 3678 are an indication that the discount rate need not be a critical element in obtaining support for a project. The vast majority of these projects were not supported at the lower discount rate under which they could have been constructed. Projects awaiting authorization or selection as new starts are reviewed on the basis of the current discount rate. When they are supported by local sponsors and Congress, the chance of success in being authorized and implemented is enhanced by meeting the benefit-cost test at the higher discount rate.

TABLE 31--Continued

Description of Policy Changes	Program Outputs	Criteria	Operational Indicator	Outcome	Logic of Conclusion
Deletion of water quality control benefits	Authorized but unconstructed reservoir projects have benefits which are no longer included in the benefit-cost analysis.	Macroeconomic efficiency.	Benefit-cost ratio.	Macroeconomic efficiency increased.	Reservoir projects which included benefits for water quality storage no longer have such benefits included in calculating the benefit-cost ratios for a number of multiple purpose reservoir projects not yet under construction. This reduces the "risk" of such projects actually providing benefits in excess of costs.
					Reservoir projects with grandfathered water quality control benefits were reanalyzed based on such benefits not being allowed. The result was that many would not have had a favorable benefit-cost ratio.
		Political responsiveness.	Letters of intent and signed contracts agreeing to the requirements of local cooperation.	Political responsiveness enhanced.	A review of authorized but unconstructed reservoir projects authorized for Phase I design reveals that there is little support for such projects with or without water quality control benefits. The deletion of these benefits reduces the benefit-cost ratio and enables the Corps to more readily reclassify the projects to the inactive or deferred categories or to recommend them for deauthorization.

TABLE 31--Continued

Description of Policy Changes	Program Outputs	Criteria	Operational Indicator	Outcome	Logic of Conclusion
Use of lower discount rate on "grandfathered" projects.	More projects with favorable benefit-cost ratio.	Interpersonal equity (vertical equity).	Value of property.	Interpersonal equity enhanced.	There is a better chance for a favorable project compared with non-grandfathered projects even when property values are low.
		Jurisdictional equity.		Jurisdictional equity enhanced.	
		Microeconomic efficiency.	Benefit-cost ratio.	Microeconomic efficiency decreased.	The lower discount rate enables more projects to have favorable benefit-cost ratios, thereby increasing the risk of the project actually producing benefits in excess of costs.

TABLE 32

NUMERICAL OPERATIONAL INDICATORS USED
IN DETERMINING OUTCOMES

Norm	Indicator	Measures	Numerical Conclusion	Project Data Compared
Macroeconomic efficiency	Does benefit-cost ratio exceed unity?	Average annual benefits are greater than average annual costs (both discounted to present worth).	Count projects in various categories as to whether the benefit-cost ratio is above or below unity.	Benefit-cost ratio of projects with water quality benefits recalulated using current policy. Higher discount rate: Phase I projects Section 201 projects Other non-grandfathered projects. Projects reclassified to the inactive and deferred categories. Did the higher discount rate used in evaluating the economic feasibility of the above projects reduce the benefit-cost ratio to below unity?
Jurisdictional equity	Is area poor?	Median value of owner-occupied dwelling. Median income.	Determine mean and median values of projects being evaluated.	New construction starts from Fiscal Years 1968-1984 and projects undergoing the Washington level review awaiting authorization.

Content of policy

The pre-NEPA policy expressed in such documents as Senate Document 97 and the Corps Engineer Regulation 1165-2-1 stressed a broad-based involvement in which the future envisioned was based on "expectation of an expanding national economy in which increasing amounts of goods and services are likely to be required to meet the needs of a growing population, higher levels of living, international commitments and continuing economic growth."[1] Comprehensive plans which considered all water resource needs were stressed. Benefit-cost ratios were calculated using discount rates of 3-1/4 percent or less, and the calculation of secondary benefits was encouraged.[2] Cost sharing was limited, and vendible outputs[3] could be paid for over the life of a project.

The post-NEPA era has been plagued by a lack of clear-cut policy enacted into law or otherwise agreed upon by the executive and legislative branches. Most notable have been attempts to increase the non-Federal share of the cost of flood damage prevention projects, the stressing of environmental quality and non-structural solutions during the planning process, and the promulgation of rules which make the economic justification of flood damage prevention projects more difficult. Consequently, while the Corps role in

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[1]U.S., Congress, Senate, Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Restoration of Water and Related Land Resources, S. Doc. 97, 87th Cong., 2d sess., 1962, p. 5.

[2]Ibid., p. 6.

[3]Primarily water supply and hydroelectric power.

providing flood damage prevention services to the public did not change per se, policies and proposed policies served to inhibit the Corps ability to provide the services in a timely manner. These included legislation, executive orders and other presidential documents, executive branch planning documents, and legislation proposed by the executive branch but not enacted into law.[1]

Process of policy

The process of policy has been severely hampered by "false starts," inaction, and changes in direction resulting in delays in the review of favorable projects recommended by the Chief of Engineers, a lengthened planning process, and a lack of authorization of new projects for implementation. This contrasted with major authorizing legislation on the average of every two years during the same period of time, prior to NEPA.[2]

In the Congress, there was a noticeable lack of broad-based support by new members as well as opposition from those whose states or districts were not receiving much in the way of Corps projects. This contrasted with strong political support prior to NEPA. Senators and congressmen built careers and political power bases

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[1]Examples are as follows: 1) Legislation such as Section 1, PL 93-251, and Section 101, PL 94-587, which authorized Phase I projects; 2) executive orders such as 12113, which established the Independent Review Board; 3) Reformulation of projects to be consistent with the 1979 principles and standards; and 4) cessation in the use of Section 201 because of proposals to increase the non-Federal cost sharing which have yet to be enacted into law.

[2]Major authorization bills were enacted in 1958, 1960, 1962, 1965, 1966, and 1968. This contrasts with bills enacted after NEPA in 1970, 1974, and 1976, with the last two acts containing sixty projects authorized for Phase I planning.

around water projects. They viewed projects as a means of satisfying constituents and providing local and national benefits.

Congressional decision rules accepted the traditional economic justification in Corps survey reports as a reasonable basis for justifying the authorization of Corps projects. This is reflected by a review of projects authorized for construction in omnibus legislation prior to 1970. The shift to Phase I authorizations in 1974 and 1976 was indicative of congressional concern that traditional economic analysis producing projects with benefit-cost ratios greater than unity was not sufficient to make the projects acceptable to local sponsors. Far more authorized Corps projects were deauthorized during 1977-1983 than were authorized or constructed.[1] In the Flood Control Act of 1970, Congress cited four objectives to be included in Federally financed water resource projects and in the evaluation of benefits and costs attributable thereto. While the actual quantification of costs and benefits for each of the four accounts was never implemented by the Corps, the legislation demonstrated the congressional intent that water resource projects should be justified on the basis of national eco-

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[1]Pursuant to Section 12 of the Water Resource Development Act of 1974, as amended, and other individual acts, over 400 projects were deauthorized during 1977-1983. During this same period of time, less than 100 Corps projects of all types were funded or budgeted as new construction starts or authorized for construction. Many more projects are proposed in H.R. 3678, considered by the 98th Congress. Title X of that bill, if enacted, would deauthorize an additional 300 Corps projects of all types with an estimated construction cost of over $11 billion. Approximately 95 percent of the projects were authorized prior to NEPA.

nomic efficiency as well as the other stated objectives.[1] While congressional interests may still support individual studies or projects in their state or congressional district, support for the overall Corps program has waned. This decline in support for the program is reflected in attempts to alter the method of selecting projects and distributing funds for water resource projects and in the period of time necessary to build a coalition of support for legislation authorizing new projects.

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[1]The inability of the Corps to justify projects on the basis of the four accounts has resulted in periodic congressional intervention, such as Section 202 of Public Law 96-367 wherein a high degree of flood protection was authorized for a number of flood-proof communities in Kentucky and West Virginia. In this case, a declaration was made by Congress that benefits attributable to the four objectives exceeded costs. Consideration is being given to further stressing the four accounts in H.R. 3678. Section 1101 of the bill reiterates the four accounts legislated in Section 209 and juxtaposes the prevention of loss of life next to the well-being of the people of the United States. It also calls for consideration of unquantifiable benefits and costs, an apparent encouragement to consider more that NED benefits and costs.

Intergovernmental Factors

Degree of cost sharing

The primary issues involving state and local government and other non-Federal interests, which had a significant bearing on program outputs and outcomes, were cost sharing and the affected public's views of solutions to flood problems. Cost sharing of local protection projects has remained essentially unchanged for over forty years. However, attempts to equalize and, on the average, raise the percent of project construction costs paid by non-Federal sponsors have been given serious consideration for six years without a clear-cut decision. Table 33 displays the traditional non-Federal cost sharing versus proposals made by the Carter and Reagan Administrations and legislation pending before the 98th Congress.

A review of the projects awaiting authorization indicated that the traditional cost sharing would vary from 0 to 50 percent, with a mean value of 15 percent.[1] The median value is 18 percent. A more detailed analysis of those projects with a traditional cost sharing requirement of less than 10 percent reveals that they generally fall into four categories.

1. Those that are an improvement to an existing project where most of the rights-of-way had previously been acquired for the prior project. Examples are channels, levees, or floodwalls now providing less than 100-year protection which will be raised or extended.[2]

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[1]The mean value is 20 percent when excluding the very large Santa Ana, California, project.

[2]Examples are Wyoming valley, Pennsylvania; Yakima River at Yakima and Union Gap, Washington: and South Quincy Drainage and Levee District, Illinois. In each case the existing project provides at least a fifty-year level of protection. The proposed proj-

TABLE 33

NON-FEDERAL COST SHARING
FLOOD DAMAGE PREVENTION PROJECTS

Type of Project	Non-Federal Cost Sharing				
	Traditional	Carter Administration	Reagan Administration	H.R. 3678	S. 1739a
Reservoir	None		35 percent	Not covered per se	35 percent
Local protection	Lands, easements, and rights-of-way and relocations	20 percent local 5 percent state	35 percent on lands, easements, whichever is greater.	25 percent when traditional cost sharing is less than 25 percent; No change when traditional cost sharing is between 25-30 percent. 30 percent when traditional cost sharing exceeds 30 percent.	35 percent of lands, easements, and rights-of-way, which ever is greater. At least 5 percent must be in cash. When lands, easements, and rights-of-way are less than 20 percent, the non-Federal sponsor may elect to pay the difference in cash, in which case the non-Federal share is limited to 25 percent.
Non-structural	20 percent		35 percent	25 percent	5 percent

[a]A major uncertainty in S. 1739 is the provision in Sections 601 and 603 pertaining to "ability to pay." A liberal use of this provision would make the bill more equitable than other formulas.

[b]If payment is made during construction, including not less than a 5 percent cash contribution, local interests are required to pay only 25 percent of project costs.

2. Projects located in certain river basins under the jurisdiction of the Mississippi River Commission. These projects, located in such basins as the St. Francis in Arkansas and the Red River in Louisiana, have historically had the work funded at full Federal cost.[1]

3. Projects in small urban areas or rural areas where the price of land is low compared to the construction cost, and relocations are a minor cost of the project.[2]

4. Reservoir projects where the benefits are widespread and the project costs are all Federal.[3]

Testimony provided at congressional hearings on the proposed projects indicated that the vast majority of the communities were participating in the National Flood Insurance Program.[4] However, the number of policies in each community, the coverage, the number of claims, and the amount paid out reveal something about the perceived risk and the degree to which the Federal government subsidizes certain areas of the country at the expense of other areas. Data provided by the Federal Emergency Management Agency indicates that areas with significant, but less than 100-year, protection, while participating in the program, have a relatively small percent

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ects would increase the level of protection to as high as 500-year protection (in the case of South Quincy).

[1]See discussion in Chapter II for the reasons Congress decided to fund the work in the lower Mississippi River and certain of its tributaries at full Federal cost.

[2]The Root River project in Houston, Minnesota, is an example.

[3]The Buffalo metro area (Tonawanda Creek) project, New York, calls for two detention reservoirs (normally dry) arranged in series. Although the project would provide 500-year protection for Batavia, New York, there are also downstream areas that would benefit to a lesser degree.

[4]Proposed Water Resources Development Projects of the U.S. Army Corps of Engineers, Hearings, pp. 133-138.

of eligible individuals participating in the program.[1] It would appear that serious consideration needs to be given to reviewing the amount of flood insurance claims paid by the Federal government in assessing priorities once the projects undergoing the Washington level review are authorized.

The currently proposed cost sharing changes would be equitable in some cases and inequitable in others. Using median family income and median housing value as measurements of wealth, it was found that in some instances the traditional cost sharing was lowest for the wealthier communities and much higher for poorer communities. In assessing the adjustments proposed in H.R. 3678, there appears to be greater equity. First, the limit on non-Federal costs would be set at 25-30 percent, a reduction for twelve projects providing protection to communities which, on average, are less wealthy than those which would require cash contributions in addition to the traditional a-b-c's. Areas already receiving flood protection would be required to pay an increased share of project costs than under traditional cost sharing.

The cost sharing proposed by the administration would be most consistent with the willingness to pay concept of microeconomic efficiency described in Chapter IV. This is particularly apparent where there exists a degree of protection and the proposed project would materially add to the level of protection. In these instances, the community and state are weighing the benefits of increased protection that would be required only in the event of rare

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[1]Based on an analysis of data furnished by Frank Thomas of the Federal Emergency Management Agency in December 1983.

but devastating floods against the substantial added cash contribution. Future development in the communities can best be evaluated at the local level, and willingness to pay a greater share of project costs reflects a "confirmation" of the favorable benefit-cost ratio.

From the point of view of responsiveness in a timely manner, provisions for payment of all or part of the non-Federal share over a period of years extending beyond the completion of construction would make it easier for communities to sign a contract with the Corps covering the construction of the project. Consideration of ability to pay as specified in S. 1739, while difficult to administer, could make the formula specified in that bill more responsive and equitable particularly for projects with high non-Federal costs. Table 34 ranks the various cost sharing formulas according to a selected concept of equity, efficiency, and responsiveness, considering whether traditional cost sharing is high or low.

Public perception

Analysis of the project data revealed a movement away from reservoir projects as an acceptable solution to flooding problems. The externalities imposed on non-beneficiaries combined with a strong environmental movement in opposition to reservoirs served to virtually eliminate new reservoir projects. In Chapter V, it was pointed out that after Fiscal Year 1977 only one new reservoir project had been started. Similarly, very few solutions to flooding being recommended for authorization are reservoirs.

An area of increased interest during the post-NEPA era has been the use of non-structural solutions. While practically every

TABLE 34

EVALUATION OF VARIOUS COST SHARING SCHEMES AGAINST THE EQUITY, EFFICIENCY, AND RESPONSIVENESS CRITERIA

Traditional Cost Sharing Low (Less Than 20 Percent)					
Criteria	Traditional	Carter	Reagan	H.R. 3678	S. 1739
Jurisdictional Equity	1	2	5	3	4
Microeconomic Efficiency	5	3	1	4	2
Timely Responsiveness	1	3	5	2	4

Traditional Cost Sharing High (Greater Than 35 Percent)					
Criteria	Traditional	Carter	Reagan	H.R. 3678	S. 1739
Jurisdictional Equity	5	1	4	2	3 [a]
Microeconomic Efficiency	1	5	2	4	2 [a]
Timely Responsiveness	5	1	4	2	3 [a]

[a]Depending on guidelines developed for "ability to pay" as specified in Sections 601 and 603 of S. 1739, the ranking could change. A liberal interpretation could make S. 1739 the most equitable.

Note: Each cost sharing scheme is ranked from 1-5 against the equity, efficiency, and responsiveness criteria. The ranking is in relation to the five cost sharing proposals listed, with 1 being the highest and 5 the lowest ranking against each of the three criteria.

study during this period, particularly since 1973, included non-structural options, the public subject to the flooding appeared less enthusiastic than Corps planners when presented with such solutions. Much had to do with the way the non-Federal share of projects are funded. If a community as a whole finances the majority of the non-Federal costs, there is frequently a reluctance on the part of individuals residing out of the flood plain to support a project that benefits individual homeowners whose choice of home location is in the flood plain. Occasionally the issue is simply the desire of individuals to stay where they are and to take the risk of being flooded periodically.[1] Yet, the major difficulty with non-structural solutions appears to be the obstacles encountered by Corps planners in developing projects with favorable benefit-cost ratios. The cost of relocating homes, particularly beyond the ten- to fifteen-year flood plain, is frequently too great. The major benefits associated with non-structural solutions appear to be the mental set with which Corps planners address the flood problems and the requirements included in most projects for the non-Federal sponsor to enact and enforce sound flood plain ordinances.

Little has been accomplished to alter the public's perception that more than twenty years are required between the time a flooding problem is studied and a project is implemented. With the failure of Congress to enact legislation authorizing new projects since 1976, the debacle of the Phase I process, and the cessation in the

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[1]Federal flood insurance, not available prior to 1968, helps defray some of the losses.

use of Section 201 authority, the length of time required for the planning, design, and authorization of a typical project has undoubtedly increased.[1] Other delays result from the impasses over policy issues such as project review and cost sharing. The perception of community officials as expressed in congressional hearings is that the process is by far too slow and that when a project is finally implemented it is based on community needs a generation ago. This, in turn, impedes orderly community development.[2] One partial solution suggested is to credit communities for work undertaken on their own which is compatible with a recommended Corps project.[3]

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[1]A recent report by the General Accounting Office analyzing projects reaching the construction stage during 1978-1983 indicated that flood control projects took about thirty years from the initial survey authorization to construction. See U.S., General Accounting Office, "Update on Time it Takes the Corps of Engineers to Plan and Design Water Resources Projects," Draft Report GAO/RCED-84-16, pp. 4-5.

[2]See testimony of L. Scott Tucker, president of the National Association of Urban Flood Management Agencies, in Proposed Water Resources Development Projects of the U.S. Army Corps of Engineers, Hearings, pp. 1712-1715.

[3]Ibid.

Planning Process and Organization

Complexity of the planning process

When comparing the pre-authorization planning prior to NEPA with procedures and requirements that have evolved since 1970, there is little doubt that the planning process has grown more complex. Aside from a continued emphasis on public participation in the planning process which was emphasized for several years prior to NEPA, the following is a selected list of items that have complicated the planning process:

1. Enactment of numerous environmental statutes: Aside from the preparation of an environmental impact statement, numerous other laws enacted after 1970 or enforced more strenuously after 1970 resulted in more hurdles before a project could reach the authorization stage. Where the project was authorized, post-authorization planning not considered a major effort prior to NEPA also required compliance with the legislation.[1]

2. Compliance with the principles and standards: Although not a significant consideration in the development of a project, an array of social well-being and regional development impacts became a major planning effort. The 1973 principles and standards were subsequently revised in 1980. Numerous Corps implementing regulations were issued. In many instances, studies were begun under one set of instructions and completed under another.[2]

3. Compliance with President Carter's water policy letters of June-July 1978: Certain aspects of the planning process, while not overlooked previously, were given a higher degree of emphasis and were formally incorporated in the Principles and Standards in the 1979-1980 time frame. The increased emphasis on non-structural solutions resulted in few successes when measured in terms of approved or implemented projects. Nevertheless, considerable effort and time were expended.

4. Requirement for a more interdisciplinary effort to complete the required planning effort: Whereas engineers of several

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[1]A difficult task was frequently reaching agreement with other agencies such as the U.S. Fish and Wildlife Service on issues of fish and wildlife mitigation justified as a result of the proposed Corps project.

[2]For instance, Phase I projects were frequently reformulated under different guidelines than the project which was contemplated in the Phase I authorization.

disciplines aided by economists were the key staff elements involved in the planning process fifteen to twenty years ago, the list of specialists required in the post-NEPA era continued to expand as legislation and policies became more environmentally oriented. These specialists became a part of the Corps planning team and were effective in dealing with the public and other Federal, state, local, and private agencies in their area of expertise.

Nature of solution recommended

The solutions recommended in the post-NEPA era differed from those recommended prior to 1970 in several respects. Most notable were the decline in the number of reservoir projects, the attempt, but with limited success, to develop non-structural solutions, and the consideration of fish and wildlife mitigation as part of a structural solution where appropriate. In urban areas, projects involving levees, floodwalls, and rapid-flow channels were frequently designed for a higher degree of protection than the NED project. This added degree of protection at some additional cost was consistent with the emphasis on increased safety stressed during the Carter administration. With the stronger emphasis on the NED plan by the Reagan administration, the higher degree of protection is being scrutinized much more carefully.

The solutions recommended for authorization are presented to local sponsors, the Assistant Secretary of the Army for Civil Works, other government agencies, and to the Congress in testimony on the basis of traditional cost sharing. This may well create a serious problem in the event that H.R. 3678, S. 1739, or some compromise on cost sharing is enacted into law. For example, in the case of the Wyoming valley, Pennsylvania, project, the non-Federal share of the project would increase from $4.5 million to over $50 million if H.R. 3678 were enacted into law. The Santa Ana project, which is the largest Corps project awaiting authorization at this time, would re-

flect non-Federal cost sharing of over $300 million compared with an estimate of $82 million under the traditional formula. While both projects involve areas of potential flood disaster in the absence of the additional protection, the devastation would occur in extremely rare events.[1] While strong support is evident for both projects and others when the amount of the non-Federal share of costs is under 10 percent, it is not clear whether the projects, in their present form, would be supported if higher cost sharing formulas were enacted into law.

Structure of planning organization

Two major changes occurred in the planning organization of Corps district offices which have a bearing on the outputs produced, particularly in the reports which contain favorable recommendations for the authorization of projects. First was the creation of a planning division separate from the engineering division in more than half of the Corps districts. This action placed planning on a more even keel with engineering, which had long been the premier function of Corps district offices.[2]

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[1]Tropical storm Agnes in June 1972 was a 500-year event that resulted in the overtopping and breaching of levees in he Wyoming valley. The Prado Dam on the Santa Ana River in California has been in operation for nearly forty years and has been adequate for floods that have occurred during that period of time. However, with the buildup above and below the dam, there is great concern that the level of protection is inadequate and considerable damage would occur in the event of a rare storm. See testimony in Proposed Water Resources Development Projects of the U.S. Army Corps of Engineers, Hearings, pp. 575-585, 2314-2316, 1110-1120, and 1449-1524.

[2]In a typical Corps district, the chief of the Engineering Division has traditionally been considered the highest ranking civilian, both as to grade and stature.

The second major change was the significant increase in the number and areas of expertise of environmental specialists in district offices. The number increased from approximately 150 prior to NEPA to almost 600 in 1981.[1] Biologists make up nearly half of the environmental staff, with archeologists, landscape architects, recreation resource planners, and geographers are also prominent in terms of numbers.[2] The buildup of environmental specialists was necessary for the preparation studies and archeological studies as well as planning facilities so as to reflect greater environmental sensitivity.

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[1]Data provided by Environmental Resources, Planning Division, Office, Chief of Engineers, December 1983.

[2]Ibid.

Benefit-Cost Ratio Methodology

Changes affecting benefit-cost ratio computations were a significant factor in the determination of the successful implementation of many projects. As a general rule, policy changes affecting the calculations of annual benefits and costs made it more difficult to develop projects with favorable benefit-cost ratios.

Discount rate

The rule change as to the appropriate discount rate to be used in formulating new projects and in updating benefit-cost ratios annually tended to decrease benefit-cost ratios. This was particularly the case when projects failed to get authorized and reach the construction stage. While most projects authorized prior to NEPA were grandfathered, the discount rate increases applied to all projects authorized during the 1970s. For example, Section 201 projects, Phase I projects, and the projects authorized for implementation in 1970, 1974, and 1976 were all evaluated on the basis of an increasing discount rate until they were funded for construction. The discount rate increased from 3-1/4 to 4-5/8 percent in 1969 and has advanced 1/4 percent per year in most years since that time.[1]

During the period 1976-1983, projects formulated but not authorized were constantly faced with higher discount rates. Particularly hard hit by the higher rates were projects protecting rural areas and small urban areas. By 1983 the discount rate had reached 7-7/8 percent at a time when the rate of inflation declined

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[1]The discount rate has increased 1/4 percent per year in each year except 1973 and 1974, when it increased by 1/8 percent. See Table 5 in Chapter III.

to approximately 3 percent. An argument is presented in Chapter III for using an inflation-free discount rate or for incorporating inflation in benefits and costs. In either case, the effect would be to increase the benefit-cost ratio, in which case more projects could be recommended for authorization and those with benefit-cost ratios only slightly greater than unity would stand a better chance of retaining a favorable benefit-cost ratio.[1]

Benefit calculations

Benefit-cost ratios were most seriously affected by higher discount rates and more stringent rules on benefit calculations. The future development in a community subject to flooding was assumed to be based on sound flood plain management consistent with Public Law 93-234. Water quality control benefits were no longer included in the formulation of potential new reservoir projects nor in those authorized prior to October 1972 with such benefits. A more rigorous benefit computation methodology was established in the principles and standards (which were in existence between 1973-1983) and has been perpetuated in the principles and guidelines.

Environmental considerations became a requisite element of each project during the formulation stage, as opposed to retrofitting of projects authorized prior to NEPA but constructed after 1970. The emphasis on the NED plan stressed during the Carter administration and greatly reinforced during the Reagan administration does not diminish the requirement to formulate projects in compliance with environmental legislation. The result has been that the NED plan contains elements which add to the cost of a project

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[1]See Table 5 in Chapter III and Appendix B.

but may not produce quantifiable benefits used in benefit-cost computations.[1] Where there are adverse environmental effects resulting from the construction of a project, the acquisition of land to mitigate these effects is often a requirement resulting in a project cost without a comparable quantifiable benefit.[2]

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[1]Aesthetic treatment such as tree planting, revegetation of the construction area, and the establishment of "greenbelts" are common elements of many recommended plans. While minor recreation benefits are frequently related to these efforts, the point is made that aesthetic treatment is an integral consideration in every project, and once authorized the project would tend to be more acceptable to local interests.

[2]For example, the proposed flood damage prevention project on the middle Rio Grande, Bernalillo to Belen, New Mexico, calls for the acquisition of woodlands to compensate for wildlife habitat that would be lost due to construction of the project. Since this is a mitigation measure, no benefits are claimed; it is questionable, however, whether this feature of the project would have been included prior to NEPA. The mitigation feature of the project is necessary for overall acceptance of the project and compliance with environmental laws under current interpretation.

Funding and Programmatic Issues

The Corps civil works overall program increased significantly in terms of actual appropriations but declined significantly when measured in constant dollars. The operation and maintenance budget continued to rise as more projects were completed, projects became older, and compliance with new legislation was incorporated into the budget process. In Fiscal Year 1970, the "operation and maintenance, general," appropriation accounted for 23 percent of the total civil works program, while the "construction, general," appropriation was 62 percent of the total funds appropriated. The operation and maintenance portion of the Corps program increased throughout the period since Fiscal Year 1970, reaching 45 percent of the program by Fiscal Year 1984. During this same period the construction program declined and accounts for only 34 percent of the Fiscal Year 1984 program. The number of projects funded for construction declined by about 50 percent during this same period. The declining construction budget was due in part to the impasse over new starts, lack of legislation authorizing new projects, and delays or cessation of work tied to environmental factors and policy changes. Projects which were under way in 1983 were in a much better position to be funded at an efficient construction rate than projects under way in the early 1970s when there were many more projects being constructed and new starts were abundant.

Breakdown of types of funds in the budget

Table 35 is a summary of actual appropriations received by the Corps since Fiscal Year 1967. The focus of analysis is on four accounts. These are 1) general investigations, 2) construction, general, 3) operation and maintenance, general, and 4) flood control,

TABLE 35

U.S. ARMY CORPS OF ENGINEERS CIVIL APPROPRIATIONS
FISCAL YEARS 1967 - 1984 AND FISCAL YEAR 1985 BUDGET
($ in Thousands)

Fiscal Year	General Investigations	Construction General	Operation and Maintenance	Flood Control Miss River & Tribs	Other	Total
1967	32,450	965,955	178,900	87,135	28,524	1,292,964
1968	34,445	967,599	193,000	87,135	22,808	1,304,987
1969	30,015	862,714	227,300	69,600	55,959	1,245,588
1970	41,191	711,992	261,825	80,820	60,749	1,156,577
1971	39,024	851,178	301,831	83,987	34,006	1,310,026
1972	50,714	1,025,084	388,519	86,000	38,876	1,589,193
1973	57,805	1,203,943	407,100	111,620	171,906	1,952,374
1974	56,142	873,589	426,625	264,600	149,213	1,770,169
1975	65,284	966,338	494,577	120,051	110,627	1,756,877
1976	66,836	1,237,151	582,073	205,147	92,697	2,183,904
1976TQ	17,110	412,741	153,116	60,300	15,750	659,017
1977	71,920	1,430,195	667,600	231,497	85,816	2,487,028
1978	107,046	1,537,820	768,870	253,081	112,695	2,789,512
1979	137,978	1,343,711	833,100	223,035	252,439	2,790,263
1980	142,145	1,659,752	941,580	210,515	307,210	3,261,202
1981	134,013	1,593,892	967,905	237,519	166,633	3,099,962
1982	137,225	1,429,992	1,025,355	256,310	152,975	3,001,857
1983	139,042	1,508,405	1,201,367	403,052	167,319	3,419,185
1984	133,810	894,104	1,184,492	300,480	136,200	2,649,086
1985(Budget)	118,000	874,000	1,297,000	304,000	131,000	2,724,000

Mississippi River and tributaries. Together these accounts comprise over 90 percent of the civil works funding.

The "general investigations" account provides a source of funds for preauthorization studies and since Fiscal Year 1982 includes advance engineering and design, the post authorization planning necessary prior to construction. This account has realized a substantial growth since 1970, but in terms of constant dollars and programmed activities, the funds allocated to studies which produce projects, there has been a significant decline in recent years. This decline had been preceded by an increase when it became obvious that individual studies were becoming more expensive and that studies with little likelihood of producing an implementable solution were continuing to be funded.[1]

In Fiscal Year 1982, two major changes occurred in the structure of the general investigations account. First was the establishment of a funding category entitled continuation of planning and engineering (CP&E), which enabled the Corps to continue its planning and engineering efforts while reports recommending new project authorizations were undergoing the Washington level review. The second change involved the shifting of the advance engineering and design (AE&D) program from the "construction, general," account to "general investigations."[2] This decision was intended to place

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[1]For example, the total number of studies funded in Fiscal Year 1978 was 271 compared with a Fiscal Year 1979 budget which included funds for 178 studies. The average funding per study was $143,000 per study in 1978 compared with an average of $170,000 per study in 1979.

[2]The advance engineering and design (AE&D) program consists of the post-authorization planning and engineering necessary to award

all preconstruction planning in the same account. Since that time there has been an intentional effort to constrain the "general investigations" account until decisions on increased non-Federal cost sharing are reached.[1]

The "construction, general," account reached a peak in actual dollars in Fiscal Year 1980, although in current dollars the program peaked prior to NEPA.[2] The Fiscal Year 1984 program shows a marked decline, and there is little likelihood that a significant increase would occur over the next two to three years.[3] The key to an upswing in the program rests with the ability of Congress to enact acceptable legislation which would authorize new projects. Such legislation is included in H.R. 3678 and S. 1730, which will be addressed by the second session of the 98th Congress. The key to

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the initial construction contract. It differs from "continuation of planning and engineering (CP&E)" in that CP&E is a program which consists of projects awaiting authorization while AE&D projects are already authorized. Accordingly, CP&E work excludes plans and specifications for the initial construction contract; otherwise the work performed under the two programs is similar.

[1]The policy expounded by the current Assistant Secretary of the Army for Civil Works is that studies producing projects under traditional cost sharing formulas should be slowed down if it is not reasonable to expect the local sponsors to agree to the Department of the Army's formula.

[2]Refer to Table 21.

[3]The primary basis for this statement is that most projects now funded and which will be funded over the next several years are local protection projects which tend to cost less than multiple-purpose reservoir projects. The reservoir projects were dominant in the 1960s-1970s. A second reason is the distinct possibility that local sponsors of future projects will contribute a greater share of project costs.

enactment appears linked to increased cost sharing for such purposes as flood control and user fees for navigation projects. In the interim, projects under way continue at an efficient rate of funding while communities with projects awaiting authorization or initiation of construction must wait, magnifying the risk of being flooded again.

The "operation and maintenance, general," account continues to grow. While most local flood damage prevention projects are operated and maintained by the non-Federal sponsors, several hundred reservoir projects with flood control storage are operated and maintained by the Corps. In addition, a relatively small number of local protection projects are maintained by the Corps. Those projects maintained by the Corps continue to receive high priority in the budget process. The concepts of dam safety and achieving the benefits for which projects were constructed appear to have universal support from all elements of the executive branch as well as the Congress.[1]

The "flood control, Mississippi River and tributaries (MR&T)," appropriation includes funds for planning, engineering, construction, and maintenance activities associated with activities in the alluvial valley of the Mississippi River from Cape Girardeau

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[1]The Corps, the Department of the Army, and the Office of Management and Budget have continuously approved budget levels which are adequate to maintain the structured integrity of Corps dams and the local protection projects which, by special legislation, are maintained by the Corps. There is, however, considerable controversy over proposals by the Corps to increase spillway capacities at certain dams to make them safer in the event of the probable maximum flood (PMF), an event which could theoretically occur but which hasn't at the project location. Congress has traditionally supported Corps recommendations in the "operation and maintenance, general," budget request.

to the Gulf of Mexico. The funds appropriated for this massive project have increased from less than $100 million prior to Fiscal Year 1973 to over $300 million in Fiscal Years 1983 and 1984.[1] In terms of constant dollars, the MR&T program has received slightly higher appropriations in recent years compared with the early 1970s. The fact that this project has a substantial balance of uncompleted authorized work which does not compete as a new start enhances its posture when competing for limited funds available to the Corps.[2]

A second advantage enjoyed by the MR&T project is the very limited requirements of local cooperation. Most of the major features of the project are constructed and maintained at full Federal expense.[3] This enables the Corps to proceed more rapidly with construction once the engineering and design is complete. There is

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[1]Major funding increases were prompted by the Mississippi River basin floods during 1973-1975. While the MR&T project functioned in an exemplary manner, preventing approximately $27 billion in damages during this period, certain improvements were considered necessary in the event of future floods of comparable or greater magnitude. These modifications, which did not require further congressional authorizations, included levee raising and the construction of an auxilliary control structure at Old River, Louisiana, to insure that the Corps would be able to distribute the flood flows between the Mississippi and Atchafalaya Rivers according to its planned allocation and that the Mississippi River will not change its course to that of the Old and Atchafalaya Rivers. For discussion of the 1973-1975 Mississippi River floods, See U.S., Congress, House Committee on Public Works and Transportation, Lower Mississippi River Valley Flooding Problems, Hearings before the Subcommittee on Investigations and Review, 94th Cong., 1st sess.

[2]See discussion in Chapter V.

[3]The features funded at full Federal expense include the Mississippi River channel improvement, Atchafalaya River, St. Francis River, and Yazoo River basins, and the rationale for exempting the MR&T project from traditional cost sharing requirements is discussed in Chapter II. Pending legislation (H.R. 3678 and S. 1730) would alter this arrangement. The Mississippi River levees are

no need to wait for the local sponsor to furnish lands, easements, and rights-of-way.

The continuing work now under construction may be classified as either necessary to assure proper functioning of the project during future floods or as providing increased protection to areas which are unprotected or only partially protected. The flatness of much of the land in the valley and the backwater problems, together with the recognition of the flooding susceptibility by the public and by elected representatives, result in the continued emphasis given to flood control in the lower Mississippi River valley.

Number and size of new construction starts

Table 17 in Chapter V indicates the substantial decline in new starts in recent years as well as the movement away from reservoirs as an acceptable solution to flooding. The movement away from reservoir projects in favor of local protection projects also means that the average cost of a new start will be less.[1] The decline in new starts means that flood damage prevention needs are going unmet. In contrast to other government services which may be provided in varying degrees, flood protection tends to be more of a have or have-not situation. Communities which were fortunate to have received the benefits of a new start and subsequent funding leading to completion of construction can realize the benefits of the project during each flood event. Communities awaiting authori-

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subject to the more traditional cost sharing policies.

[1]Reservoir projects tend to cost more than local protection projects, although there are notable exceptions. The average Federal cost of a reservoir budgeted in Fiscal Year 1972 was $36 million, compared with $25 million for a local protection project.

zation of projects, or which were advised by the Corps that a project could not economically justified, are generally left without adequate protection.[1]

Nearly 200 flood damage prevention projects selected as new starts between 1968 and 1983 were compared with approximately seventy recommended projects undergoing the Washington level review. The comparison was intended to see whether there is a distinction in the wealth of the communities which received a new start versus those awaiting authorization. The results shown below in Table 36 indicate a relatively minor difference in the average wealth of the jurisdictions which received a new start versus those awaiting authorization. Nevertheless, the geographical areas for which new starts were proposed by the administration for Fiscal Years 1983 and 1984, based on a willingness to pay a higher share of project costs, were shown to be wealthier (See Table 20 for details.).

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[1]The point is made that in contrast to government services which are commonly available in varying quantities and qualities, e.g., education, social services, and police protection, projects for flood damage prevention tend to be built or not built, resulting in haves and have-nots. While some communities are being considered for an incremental addition to an existing project, many others are being recommended for initial protection.

TABLE 36

COMPARISON OF WEALTH OF COMMUNITIES WHICH
RECEIVED NEW STARTS VERSUS THOSE
AWAITING PROJECT AUTHORIZATION

Category of Projects	Mean Value	
	Median Income	Median Value of Dwelling
New Construction Starts FY 1968-1984	6,300	45,000
Projects Awaiting Authorization December 1983	6,400	42,900

Subsidiary Research Question 2

What impacts have fiscal constraints had on the implementation of flood damage prevention projects by the Corps?

This question is addressed from several levels. First, there is the issue of new starts. The number and dollar cost of new starts have declined sharply since passage of NEPA. However, fiscal constraints have not been a significant cause of this decline. Rather, lack of legislation authorizing new projects, impasses over project acceptability and cost sharing, and higher priority urban issues have all been much more basic reasons for the decline in new starts. Since Fiscal Year 1981 the outputs from these impasses and inaction are reflected in the total collapse of the new construction start process. The administration has proposed new construction starts in Fiscal Year 1983 and 1984. Congress normally would support such proposals in appropriation acts.[1] However, these new start proposals called for voluntary cost sharing in excess of amounts required by law; the result has been no action by Congress pending a resolution of the cost sharing issue.[2] At this point in time a new start appropriation bill is pending before the 98th Congress which would approve a substantial number of new construction

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[1]In fact, more than two-thirds of the new construction starts funded during Fiscal Year 1970-1981 were added by Congress in appropriation acts.

[2]Committee report language reflected a concern that projects proposed on the basis of increased non-Federal cost sharing would favor wealthier communities. The appropriations committees have considered this approach inequitable. See, for example, U.S. Congress, House, Committee on Appropriations, Energy and Water Development Appropriation Bill, 1984, Report No. 98-271, 98th Cong., 1st sess., pp. 3-4.

starts. The issue of cost sharing in this bill is left unresolved.[1]

A second dimension of fiscal constraints pertains to the continuing construction program. Once a project receives an appropriation for construction and is physically under way, funds for continuation of construction are generally assured.[2] Occassionally, during budget preparation in the post-NEPA period, the magnitude of estimated requirements to maintain schedule on continuing construction projects exceeded the amount in the budget. For the most part, Congress resolved this problem by adding funds in the annual appropriations act or in a supplemental appropriations bill.[3] Since Fiscal Year 1981, the issue of funding continuing construction projects has not been a problem. Policy changes and

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[1]The bill is U.S., Congress, House, A Bill Making Appropriations for Water Resource Development for the Fiscal Year Ending September 30, 1984, and for Other Purposes, H.R. 3958, 98th Cong., 1st sess. Also pending in the 98th Congress are H.R. 3678 and S. 1730, authorization bills which address the issue of cost sharing for flood damage prevention projects. Both authorization bills would increase the average non-Federal cost sharing requirements for flood damage prevention projects, the House bill to the 25-30 percent range and the Senate bill to 35 percent, consistent with the Reagan administration policy. The new starts contained in H.R. 3958 would be subject to final cost sharing formulas contained in the enacted authorization bill.

[2]There have been several notable exceptions based on changes in view of elected representatives at the state and Federal level, e.g., LaFarge Lake, Wisconsin; and based on administration review of project benefits or environmental considerations, e.g., Yatesville Lake, Kentucky. In both cases, the issue is not one of fiscal constraints per se.

[3]The most notable case in recent years was in Fiscal Year 1980 when high inflation rates and a fear that the price of fuel would rise even more sharply than it did caused contractors to submit higher bids and to attempt to complete contruction work faster than originally contemplated. As a result, funding shortages occurred and a supplemental appropriation was provided.

conditions in the economy have served to create an actual surplus of construction funds available for continuing construction projects despite a significant decline in the amounts appropriated for construction. The significant policy changes impacting on the availability of funds are:

1. Commencing with the Fiscal Year 1981 budget, future inflation was incorporated in cost estimates of construction projects and in budget requests for these projects.

2. Commencing with the Fiscal Year 1982 budget, certain policy changes proposed by the executive branch resulted in not proceeding with work included in annual appropriation acts. These included certain recreation facilities which were not cost shared and a number of separable elements of continuing construction projects which do not meet current criteria.

The major external factor which resulted in surplus funds for ongoing construction projects was the recession of the early 1980s and the ensuing drop in the rate of inflation.[1] Table 37 compares the rates of inflation used in Corps budget submissions versus the consumer price index (CPI) and the Engineering News Record (ENR) index for a like period.

In Fiscal Year 1983, the Corps annual appropriation bill was never enacted into law. Instead, the Corps operated under the provisions of a continuing resolution for the entire fiscal year.[2] This event further enhanced the Corps ability to fully finance sched-

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[1]The recession occurred immediately after Congress appropriated $193 million for construction projects in a Fiscal Year 1980 supplemental appropriations bill. This appropriation resolved the immediate funding shortage; good bids based on estimates included with budget justification material helped assure the availability of adequate construction funds despite general budget constraints during Fiscal Years 1981-1984.

[2]Continuing Appropriations Act for Fiscal Year 1983, Pub. L. 93-377.

TABLE 37

CORPS OF ENGINEERS CONTINUING CONSTRUCTION PROGRAM: COMPARISON OF PROJECTED INFLATION RATES VERSUS CONSUMER PRICE INDEX AND ENGINEERING NEWS RECORD

Fiscal Year Budget	Rates of Inflation Projected						Actual CPI Percent Rise			Engineering News Record (ENR)		
	1981	1982	1983	1984	1985	1986	1981	1982	1983	1981	1982	1983
1981[a]	8.3	7.8	7.3	6.6	5.6	5.6	11.1	7.2	2.8 est.	10.0	6.6	5.8
1982[b]	12.3	11.3	9.5	8.8	10.0	10.4						
1983	12.3	11.3	9.9	9.3	10.6	9.8						
1984	-	5.2	7.0	9.0	10.5	10.5						

[a]Inflation rates for the Fiscal Year 1981 budget were prescribed by the Office of Management and Budget based on the broad gross national product index.

[b]Commencing in Fiscal Year 1982, the estimated rates of inflation were based on those developed by the Corps using econometric forecasts for key construction components published by Data Resources, Incorporated.

uled progress on continuing construction projects.[1] In Fiscal Year 1983, Congress enacted the Productive Employment Appropriations Act,[2] which provided an additional $85 million for the " construction, general," account. These funds further enhanced the Corps ability to finance continuing construction projects.[3]

The issue of funding constraints may be summarized as having an indirect relationship to program outcomes. The proposals for higher cost sharing and stricter rules in justifying projects may be discussed in terms of economic efficiency. However, the driving force behind these proposals and rules appears to be directly related to the desire of the administration to reduce the very high budget deficit. Projects already under way reflect a prior commitment to local interests and generally are not the target of budget constraints. As projects are completed, this program will continue to be a smaller part of the Corps budget.[4] New starts and projects awaiting congressional authorization are a more logical target

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[1]The amount made available by the continuing resolution for the Corps "construction, general," account was based on the prior year's obligation, and the requirements for Fiscal Year 1983 were less than Fiscal Year 1982.

[2]Productive Employment Appropriations Act, Pub. L. 98-8, 97 Stat. 13. (commonly referred to as the Jobs Act).

[3]In addition to expediting new contracts on continuing construction projects, the funds enabled the Corps to undertake ahead of schedule several major rehabilitation projects and numerous small projects under the continuing authorities of the Chief of Engineers. Many of these projects, although limited in scope and cost, provided immediate benefits to small communities without having to wait for a review for technical adequacy beyond the Office, Chief of Engineers.

[4]For example, the Fiscal Year 1984 appropriation for continuing construction was about half of the amount appropriated in the Fiscal Year 1981-1982 time frame. In the absence of new starts, the decline will continue in future budgets.

since they reflect a greater potential for demands on the budget in future years.[1]

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[1]Refer to Table 18 in Chapter V. Under the Department of the Army's proposal, the average non-Federal share of project costs would be 37 percent for the eight proposed new starts, compared with 23 percent under traditional cost sharing. For projects awaiting authorization, the traditional cost sharing of approximately 15 percent (See Table 22.) reflects an even greater difference in Federal investment compared with the Department of the Army's proposal. When considered in conjunction with other water resource projects such as those providing navigation benefits, the new proposals are designed to reduce by a substantial amount future Federal investments.

Subsidiary Research Question 3

To what degree have policy changes affected the technical remedies, with the emphasis on non-structural solutions, implemented by the Corps for preventing flood damage?

In Chapter V, several changes in the technical solutions to flooding problems were discussed. Most notable in the post-NEPA era was the movement away from reservoir projects as an acceptable solution. Only one new reservoir project was authorized for construction in the 1970-1983 time frame. The reservoir projects authorized in 1974 and 1976 for Phase I planning are generally not being supported by the affected public and the states. Only one reservoir project has been selected as a new start and and placed under construction since 1977.[1]

With the increasing annual flood damages, despite heavy investment in structural projects and with the very strong emphasis on environmentally acceptable solutions, both the executive and legislative branches stressed non-structural measures. For the Corps, this meant a modification in its way of analyzing flood problems and in formulating solutions.

Tropical storm Agnes in 1972 helped highlight the need for non-structural measures such as flood evacuation, flood plain regulation, flood proofing, and flood forecasting and warning. The need was present even where a high degree of structural protection

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[1]The project is Arcadia Lake, Oklahoma. Although this project provides some flood damage prevention benefits to over 40,000 acres of generally rural areas, the major purpose of the project is water supply for Edmond, Oklahoma.

existed.[1] By 1974, Congress had enacted legislation requiring the Corps to consider non-structural measures[2] and had enacted a more meaningful program of Federal flood insurance.[3] Further emphasis on non-structural measures occurred during the Carter administration. The President's water policy message of June 8, 1978, and the December 1979 revisions to the principles and standards, required at least one non-structural alternative plan whenever a structural project was being considered.

At the present time the pendulum has swung back somewhat. The principles and guidelines which became effective in 1983 no longer make consideration of a non-structural plan mandatory. The principles and guidelines call for giving consideration to both structural and non-structural alternatives and to alternatives which consider a mix of the two approaches.[4] The new planning guidelines include as non-structural measures modifications in public policy, management practice, regulatory policy, and pricing

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[1]For example, the Wyoming Valley of Pennsylvania was one of the areas most devasted by Agnes. Prior to the storm, it was generally accepted that the area had a high degree of protection. The existing project was designed to handle the flood of record dating back to the 1930s. The project proved to be inadequate for Agnes.

[2]Water Resource Development Act of 1974, Pub. L. 93-251, Sec. 73.

[3]Public Law 93-234, The Flood Disaster Protection Act of 1973, expanded the National Flood Insurance Program by substantially increasing the limits of coverage and by requiring flood-prone communities to participate in the program in order to receive Federal financial assistance.

[4]Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, p. 33.

policy.[1] This, in effect, would appear to broaden the potential range of non-structural solutions. However, the principles and guidelines also stress completeness, effectiveness, efficiency, and acceptability as criteria to be considered in formulating alternative plans.[2] It will be interesting to see whether acceptability in which the workability and viability of the plan are stressed with respect to acceptance by state and local entities and the public carries greater weight than efficiency when the two are in conflict.[3]

Based on the failure of Congress to enact an authorization bill since 1976 and with the dearth of new starts in recent years, the implementation of Corps projects has been limited largely to continuing (and completing) projects started a number of years ago. In the regular construction program very few non-structural measures have been funded and implemented. The current administration does not appear to support non-structural solutions to the extent that the Carter administration did unless the non-structural plan is the NED plan. Reaction to two recent Corps plans is indicative of this position. Both involve the relocation of homes in low income areas to a location out of the flood plain. In one instance, relocation was considered as an appropriate measure, along with structural work, for elements of the Tug and Levisa Fork project in West

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[1] Ibid., p. 7.

[2] Ibid.

[3] Acceptability as defined in the principles and guidelines implies a high degree of citizen and political responsiveness as used in this study. Efficiency criteria are used in the sense of being the most cost effective plan.

Virginia and Kentucky. Thus far, only structural measures at three communities have been approved for construction. The second project involves the Village Creek section of Birmingham, Alabama. The Corps Mobile District developed a project with a major non-structural component involving the evacuation of several hundred structures. This project was recommended for approval by the division engineer, Board of Engineers for Rivers and Harbors, and the Chief of Engineers. In October 1983, however, the project was opposed by the Office of Management and Budget. In a recent letter to the Assistant Secretary of the Army for Civil Works, the Office of Management and Budget articulated its objections to the non-structural solution for the Village Creek project.[1] The letter, quoted below, illustrates the difficulties associated with formulating a non-structural project:

> On June 6, 1983, you sent us a copy of the report of the Chief of Engineers on Village Creek, Jefferson County, Alabama. We have completed our review of this project in accordance with Executive Order 12322. On the basis of this review, we conclude that this is not an appropriate Federal activity and recommend against authorization. The proposed non-structural component in the project report (purchase and destruction of flood-prone buildings) represents over 90% of the total cost and is not economically justified. You have recommended that this component be adjusted to include only those purchases that are economic. However, we believe that the low 10-year level of flood protection provided by Corps of Engineers acquisition and evacuation of structures in this project, the majority of which are substandard and rental units, would not be significantly more effective than other types of Federal and non-Federal programs, such as flood in-

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[1]Executive Office of the President, Office of Management and Budget, Letter dated October 24, 1983, from Frederick N. Khedouri, Associate Director for Natural Resources, Energy and Science, to William R. Gianelli, Assistant Secretary of the Army for Civil Works.

surance. In addition, we understand that enhancing the economic feasibility of the project by reducing the number of structures that would be evacuated may leave isolated structures and reduce local support for the project.

For the reasons stated above, we recommend against Corps implementation of this project.

Prior to receipt of this letter, the Corps had testified before the congressional authorizing committees, and the recommendations of the Chief of Engineers were accepted by the committees as a valid basis for the project.[1]

It would appear that the emphasis on non-structural solutions so prevalent during the Carter administration is receiving less than enthusiastic support in the current administration unless they meet the same economic criteria as structural projects. For reasons previously discussed, this is an extremely difficult task. In a broader sense, it would appear that the prerequisite for implementation of a Corps project requiring non-Federal interests to agree "to participate in and comply with applicable Federal flood plain management and flood insurance programs"[2] would provide a sound point of departure for non-structural measures. By further requiring local sponsors to enact ordinances or otherwise control unwise flood plain development as a requirement of local cooperation,

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[1]See testimony in U.S. Congress, House Committee on Public Works and Transportation, Proposed Water Resources Development Projects of the U.S. Army Corps of Engineers, Hearings before the Subcommittee on Water Resources, 97th Cong., 2d sess., pp. 658-664. Also see H.R. 3678, Section 301(a) and S. 1739, Section 701(a)(1). Both bills are pending in the 98th Congress and contain a provision which, if enacted into law, would authorize the Village Creek project in accordance with the recommendations of the Chief of Engineers.

[2]H.R. 3678, Section 303.

the implementation of non-structural measures would be an integral part of all Corps flood damage prevention projects.[1]

A final non-structural measure that has been given only limited attention is the relatively inexpensive flood warning system. Recent studies of several communities have shown that these systems are accurate and can assist in saving lives and reducing flood damages.[2] It is clear that in the absence of a Corps project a flood warning system can more than pay for itself in a single flood event.[3] With a Corps project, the warning system can be of use in major flood events which exceed the level of protection afforded to the community.

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[1]While such is frequently the case, it is the enforcement of such measures that needs to be stressed.

[2]For a thorough discussion of the capability of flood warning systems and examples of their performances, see H. James Owen, "Basic Aspects of Flood Warning Systems," in Seminar Proceedings, pp. 37-66. Also, refer to the discussion with Corps planners following Mr. Owen's presentation, Ibid., pp. 67-71.

[3]The Corps has not considered flood warning systems as a separate project for Federal implementation in the absence of a structural or non-structural project.

Chapter VII

CONCLUSIONS AND RECOMMENDATIONS

Since the enactment of NEPA, it has been shown that the authorization of new projects first slowed down and then came to a complete halt. Virtually all projects authorized in 1974 and 1976 for Phase I design have yet to be authorized for construction. Most projects authorized in the 1970s for implementation and those presently undergoing the Washington level review are local protection projects. This contrasts with the 1950s and 1960s when multiple-purpose reservoirs were popular and were traditionally supported by Federal, state, and local elected officials. No single cause for the slowdown in the authorization process was found.[1] However, several policy changes in both process and content appeared to be the most prominent reasons for the slowdown. Behind these policy changes were the external forces of the environmental movement and the large budget deficits. Serious supporters of both the environmental movement and of lower Federal deficits frequently were in opposition to new Corps projects. On the one hand reservoirs and channel improvement projects were considered environmentally damaging, while a slowdown for any reason would reduce the pressure for a higher budget request or congressional appropriations. As the environmental movement gained momentum and new congressmen and

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[1] In fact, it was sometimes difficult to distinguish between cause and effect.

senators were elected, there frequently was a change in attitude away from the traditional support of Corps projects. From the point of view of the Office of Management and Budget (OMB), the selection of new starts became an easier task. By 1980, the number of authorized projects which could be considered as serious new start candidates had diminished to such a small number that virtually any project that met eligibility and selection criteria[1] was recommended by the Corps as a new start.

After Fiscal Year 1980, the Carter administration ceased to include new construction starts in the budget. As the Federal budget deficit grew, even Congress ceased to add new starts to the President's budget. The number of new start candidates available when the Reagan administration took office was even smaller than during the Carter years; however, the budget deficits were much greater. The Reagan administration's solution for moving ahead with new construction starts while minimizing the impact on the Federal deficit was to propose higher non-Federal cost sharing and up-front financing. Although the formula was applied on a voluntary basis, the hope was that the proposed formula would subsequently be enacted into law and would apply to projects authorized in the future.

Most projects selected as new starts in the post-NEPA period had a legal discount rate of 3-1/4 percent.[2] Nevertheless, many new starts actually were never implemented. More often this

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[1]These criteria were developed so that the recommended new starts are ready for construction, are supported by local sponsors, and have no unresolved environmental problems; and there is reasonable assurance that the terms of non-Federal cost sharing will be met.

[2]See explanation in Chapter III.

reflected a withdrawal of local or state support rather than a decline in the benefit-cost ratio.[1] The implication is that the non-Federal investment or, in the case of reservoir projects funded at full Federal cost, the externality costs are too high compared with the benefits perceived by the local sponsor or those individuals who stand to gain or lose as a result of the project. Communities that are subject to flooding but of an infrequent nature appear to have other options not readily available prior to NEPA. The National Flood Insurance Program and more sophisticated flood warning systems can in many instances mitigate or reduce the financial losses associated with floods.

The average time required to prepare a project for implementation following authorization by Congress increased significantly as more environmental legislation was enacted and procedures for implementing the legislation were undertaken. The longer duration between authorization and project construction combined with the failure of Congress to enact legislation authorizing new projects made the program unresponsive to unmet flood damage prevention needs. However, to the extent that projects were no longer supported by local sponsors or to the extent that alternative solutions were desired, the system was more responsive than in the pre-NEPA era. Furthermore, the dearth of new starts in the 1980s resulted in a greater portion of the Corps construction budget being available for continuing construction projects. The result was the minimum of funding delays on projects under construction resulting in a more

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[1]See the discussion in Chapter V of projects reclassified to the inactive and deferred categories.

timely delivery of project benefits despite high budget deficits.

Major policy issues pertaining to cost sharing maximization, national economic development (NED) benefits versus a balance between the NED plan and minimizing risk, and project review resulted in major delays in processing reports with favorable recommendations. Congress, too, was faced with conflicting pressures. A concern with the environment, large budget deficits, and the lack of strong nationwide demand for water resource projects (compared with earlier years) which were within the Corps traditional jurisdiction resulted in the lack of a water resource development act after 1976 and Phase I authorizations in 1974 and 1976. The result has been that many communities with serious flood problems have been unable to obtain a flood damage prevention project while those with problems that were recognized and for which solutions have been authorized and funded are in an excellent position to have a project completed in a timely manner.[1]

The use of higher discount rates for new projects was supported by all administrations and Congress.[2] Yet the higher discount rate makes justification of new projects for rural and

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[1]The point is made that while a substantial investment has been made in flood damage prevention projects, the impasses in the authorization and newe start processes rather than an intentional levelling off of investment have been the primary reasons for reduced construction funding. There still remains much to be accomplished in reducing flood damages.

[2]The enactment of Section 80 of Public Law 93-251 in 1974 in effect reflected congressional concurrence with the formula change instituted in 1968; however, the main objective of Section 80 was to forestall attempts to increase the quarter-percent maximum change in discount rate per year.

poorer areas more difficult. There are presently approximately 100 projects with favorable recommendations undergoing the Washington level review; however, there were undoubtedly many others that failed to receive a favorable recommendation because of the higher discount rate and other benefit computation changes prescribed in post-NEPA policy documents.[1] In Chapter III the argument is made that the current legal discount rate of 8-1/8 percent is considerably higher than the real interest rate. It includes an element of inflation while the benefit calculations exclude any allowance for inflation. Proper benefit-cost analysis requires that both annual benefits and annual costs include or exclude inflation. Calculations are shown which document that an allowance for inflation in the benefit computation when using an 8-1/8 percent discount rate would raise the benefit-cost ratio. Consequently, use of the higher discount rate without a corresponding allowance for inflation in the benefit calculations is not only incorrect from a theoretical point of view but may deprive rural areas and urban communities with flood problems from receiving a favorable recommendation compared with pre-NEPA and early post-NEPA evaluations. While the higher discount rate reduces the risk that projects will actually produce the estimated benefits, it eliminates from serious consideration by the Corps other geographical areas.

The cessation in the authorization process has resulted in a program that is neither responsive nor equitable. In fact, benefits of considerable magnitude are foregone, and it may be said that

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[1]Although not part of this study, it would be of [illegible] to document which communities failed to receive a favo[illegible] mended project because of higher discount rates.

AD-A160 627 FLOOD DAMAGE PREVENTION SERVICES OF THE US ARMY CORPS OF ENGINEERS: AN EV..(U) ARMY ENGINEER INST FOR WATER RESOURCES FORT BELVOIR VA B STEINBERG FEB 84 5/5

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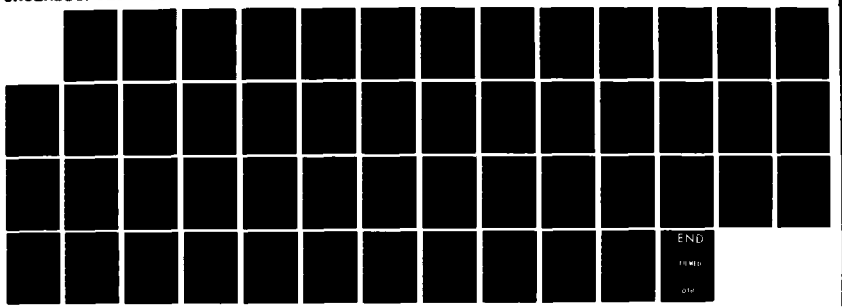

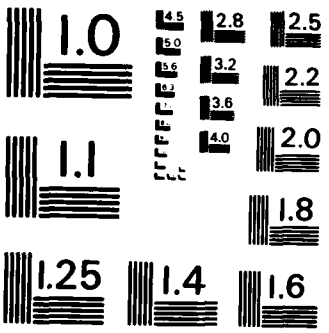

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A

the program has not been efficient, either.[1] From the point of view of concern over the Federal budget deficit, the impasse creates a simple means of reducing the Corps budget without the political ramifications associated with eliminating projects from the budget. In an effort to enact legislation authorizing new projects, both House and Senate committees are proposing changes to the traditional cost sharing formulas which have been used for over forty years. The higher cost sharing formulas are intended to reduce Federal outlays and place a greater burden of the costs on the benefitting local jurisdictions. While it is uncertain as to which formula will ultimately prevail, to the extent that any of the three proposals will increase the non-Federal share, the interpersonal (vertical) equity and jurisdictional equity would be reduced.[2] However, in certain cases the proposals in H.R. 3678 and S. 1739 would be less that traditional cost sharing, resulting in a more equitable cost sharing formula.

The willingness to pay a higher non-Federal share implies a higher degree of microeconomic efficiency. The assumption is made that the non-Federal sponsor is better equipped than the Corps to determine the value of a project to the community. The number of instances in which willingness to pay has been put to the test has been limited to those projects which have been recommended as new

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[1]Based upon the macroeconomic efficiency definition.

[2]In all instances the proposal of the administration would equal or exceed the traditional non-Federal sharing percentage. The proposals in H.R. 3678 and S. 1739 generally equal or exceed the traditional non-Federal requirements. However, in approximately 17 percent of the cases the traditional formula exceeds the House proposals by as much as 20 percent.

starts in Fiscal Years 1983 and 1984. A comparison of the average median income and average median value of owner-occupied dwellings in areas which would be protected by these new starts indicates a higher degree of wealth than other new starts since Fiscal Year 1968. While this is a limited universe of examples of willingness to pay a higher share and was done on a voluntary basis, it is reasonable to conclude that, all other things being equal, willingness to pay a share greater than lands, easements, and rights-of-way favors more wealthy communities and reflects a decrease in vertical equity and jurisdictional equity. The issue of cost sharing, however, is more complicated because the traditional cost sharing frequently bears no relation to the wealth of the community. Examples were found of both wealthy and poor communities with traditional cost sharing of less than 10 percent and higher than 40 percent. Often the traditional cost sharing requirements on the low end of the spectrum reflect a second generation project. The community may have a levee providing fifty-year protection, and the proposed project would provide a much higher degree of protection. On the other hand, an unprotected community may require expensive rights-of-way and relocations, and the traditional cost sharing may be as high as 50 percent. When considering different communities of equal wealth, the extreme differences observed in traditional cost sharing results in an inequitable situation from a horizontal equity viewpoint.[1] A more uniform cost sharing formula would result in a more equitable situation.

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[1]For example, the project on Threemile Creek in Mobile, Alabama requires an estimated 50 percent non-Federal cost sharing under traditional cost sharing requirements. The area in the vicin-

An area in which improvement seems warranted is in achieving a higher percentage of implementation once projects are authorized. The very large number of projects which have been deauthorized since 1977 and which are proposed for deauthorization in H.R. 3678 indicates a deficiency in the planning and authorization process. These projects were supported by the public and political representatives at one point in time, but many were found to be no longer acceptable to the communities given the traditional non-Federal cost and their other financial pressures. With the distinct probability that the average non-Federal share of project costs will increase in the future, there needs to be a better means of assuring that if projects are truly needed, the non-Federal sponsor is better informed of the requirements of local cooperation. The development of a financial memorandum similar to the economics appendix normally prepared by the Corps as part of a survey report would be a more certain indicator of whether or not the non-Federal sponsor was willing and able to finance its share of the recommended project.

The guidelines under which projects are formulated places the Corps in a difficult position to recommend a project for implementation when it has a benefit-cost ratio of less than unity. Actions which favor enhanced vertical and jurisdictional equity are difficult

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ity of Threemile Creek is essentially unprotected. Other projects protecting communities of comparable or greater wealth require less than 5 percent traditional cost sharing. For example, Quincy, Massachusetts, and Yakima-Union Gap, Washington, have a degree of protection and would receive a higher degree of protection with a proposed project, but with virtually no cost to the local sponsor.

to achieve when policies reflect a high degree of administrative efficiency. Exceptions to the sanctity of the benefit-cost ratio test have not been pursued by the Corps nor have they been encouraged by administrations in the post-NEPA period.

Consideration of equity is permitted by Section 209 of the Flood Control Act of 1970, but is not used by the Corps as a basis for recommending a project for authorization and implementation. Congress, on the other hand, has authorized a limited number of projects on this basis in the past and appears inclined to do so selectively again in the future.

Recommendations

The following recommendations are designed to resolve some of the deficiencies in equity, efficiency, and responsiveness previously presented. Generally, a particular recommendation would not result in an improvement in the flood damage prevention services of the Corps when measured against all concepts of the evaluation criteria. Nevertheless, a disproportionate shift in outcome favoring one concept over another may distort the combined consequences leading to policies and actions that are unacceptable politically and to the public. Impasses are indicative of unacceptability of present policies. as well as proposed policies. Continuation of impasses stagnates the program, reduces public reliability on government to resolve problems, and, in the case in point, decreases public confidence in the Corps to resolve flood problems. Thus, the impasses result in outcomes which are deficient in terms of equity, efficiency, and responsivenes. Recommendations to achieve a breakthrough in the impasses facing the program would serve to improve the situation. These recommendations address such crucial areas as cost sharing, project justification, project authorization, and the planning process.

Adjustment in discount rate

In Chapter III the discount rate currently used to evaluate and justify potential projects is shown to contain a built-in level of inflation. In contrast, benefits and costs are based on current price levels. This inconsistency should be rectified by periodic adjustments in the discount rate or by incorporating future inflation into the benefit-cost computations. The result will be more technically correct computations as well as enhanced equity and responsiveness. More projects would be economically justified, but the project sponsors would still have to meet the requirements of local cooperation. Local interests would have a better opportunity for realization of a favorable project. In instances where justification is lacking under traditional discount rate rules, particularly because of property values involved, the recommended change would offer the opportunity for enhanced equity and responsiveness.

Equity considerations in project justification

The Corps has not developed procedures for giving special consideration to poorer communities which have flood problems. Congress has taken the lead in such instances. If H.R. 3678 is enacted, the Corps would be required to quantify non-national economic development benefits. The Corps should take the leadership in developing procedures for quantifying social well-being benefits and special regional considerations. Increased equity and responsiveness would result without a marked decrease in

efficiency.[1] This recommendation is not intended to increase substantially the size of the Corps program; it would, however, enable the Corps to propose exceptions within certain parameters.

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[1]Examples of such projects may be found in H.R. 3678. These include Pottstown, PA, and Falmouth and Salyersville, KY. In addition, there are communitities susceptible to floods which have not received a Corps project despite years of study. At some later point in time, more frequent damaging floods provide a basis for justifying projects according to then current criteria. Guidelines for quantifying social well-being and regional consideration would provide an earlier basis to justify such projects. Certainly, areas in the Passaic River basin fall into this category.

Cost Sharing

Cost sharing has been a major unresolved issue since 1978, affecting both authorized projects and those projects awaiting authorization. In the event this matter is not resolved by the 98th Congress, the authorized projects should be permitted to proceed on the basis of cost sharing arrangements negotiated with the Corps pursuant to formulas proposed by the Assistant Secretary of the Army. Responsiveness and efficiency would be enhanced, and equity is not a problem with the projects recommended as new starts in Fiscal Years 1983 and 1984. Nevertheless, adjustments to the cost sharing formula ultimately enacted into law should be applied, retroactively if necessary, to these projects.[1] In the case of the flood damage prevention projects awaiting authorization, it is incumbent upon the executive and legislative branches to provide a framework within which the Corps can provide flood damage prevention services in a responsive manner. Toward this end, it is recommended that new cost sharing formulas and subsequent implementing guidelines take into consideration the following:

1. The susceptibility of the community to flooding given the without-project conditions.

2. The ability of the community to finance the local share of construction costs. This may entail a trade-off between degree of protection and degree of risk and may result in lesser or greater protection than offered by the NED plan.

Of the cost sharing formulas presented, it would appear that S. 1739 provides the greatest degree of flexibility in balancing

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[1]The new starts proposed in Fiscal Years 1983 and 1984 would take between two and ten years to construct, leaving sufficient time for the adjustment during the period of construction.

equity, efficiency, and responsiveness. Nevertheless, it is precisely the flexibility that would make it the most difficult to administer.[1] That would be the challenge for the Corps.

[1]The ability-to-pay provision enhances flexibility in cost sharing but requires ingenuity in administering in a manner which is consistent with the legislative intent (consistent with the jurisdictional equity concept).

Authorization of Projects

The major disappointment to non-Federal sponsors and to Corps management has been the complete breakdown in the process for the authorization of new projects. A breakthrough in this impasse is absolutely essential if the Corps is to continue to build flood damage prevention projects. The processing of reports in Washington follows, in many respects, the procedures used prior to NEPA when authorization acts were passed on the average of every two years. It is the final steps, after the report of the Chief of Engineers is signed, that have not proceeded as in the pre-NEPA years.

The recommendation is made that procedures and policies used in the formulation of projects not be altered after the report reaches Washington. Instead, reports should be processed in a timely manner with proposed changes based upon new policies covered in commenting or forwarding letters.[1] Secondly, it is recommended that the Section 201 process be reinstituted. It proved to be the most responsive means of authorizing relatively small projects in a timely manner, and projects so authorized underwent the same review process as larger projects. Aside from resuming the Section 201 process, an increase in the $15 million Federal limit to $25 million would assure its usefulness for a longer period of time.[2]

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[1]Unfavorable reports and those not recommending a Corps project are routinely processed to Congress within a year of their arrival in Washington.

[2]The present limit of $15 million was established in 1976. Although many projects have lesser estimated Federal costs, the impact of inflation and the uncertainty of future authorizing legislation make an increase desirable.

Planning Process

Affordability

The vast number of Corps projects which were deauthorized since 1977 and which are proposed for deauthorization in H.R. 3678 indicates that improvement in the planning process is imperative. Projects being considered for authorization at the present have a favorable benefit-cost ratio at the current discount rate. They have been presented to the local sponsors on the basis of traditional cost sharing, which in many cases varies considerably from the formulas proposed in H.R. 3678 and S. 1739. To avoid the experience of the past, it would be beneficial to evaluate the ability and desire of local interests to comply with the cost sharing requirements ultimately enacted.[1] In order to determine whether a project continues to be supported, planning should be undertaken to assess the recommended project as to its affordability. Where the cost sharing formula results in the project's being too expensive for the local sponsor, an alternative project should be formulated or proposed at the earliest possible time.

Non-structural solutions

The very limited success with non-structural solutions needs to be assessed. This type of solution can be both responsive and equitable. Its shortcoming lies in the inability of the Corps to justify many projects that would benefit large segments of communities subject to flooding. Furthermore, justified projects

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[1]The assumption is made that the same legislation or legislation enacted at approximately the same time would authorize new projects and address the cost sharing issue.

which benefit very limited areas within a community frequently fail to receive the necessary local support. It is recommended that greater emphasis be given to flood warning systems where traditional projects are not justified or not supported.

Additional Studies Recommended

The broad evaluation of the Corps flood damage prevention program provided answers to the research questions but raised other questions which are worthy of further study. Several of these unanswered questions are germane to a more complete understanding of the outcomes of the Corps program and of the public attitude toward the program.

Relationship Between the Corps Flood Damage Prevention Program and the National Flood Insurance Program

Although the initial National Flood Insurance Program was authorized in 1968, it was not until 1973 that the program was broadly accepted. Most flood-prone communities participate in the program. Insurance premiums are based upon the degree of risk, i.e., the property is within the 100-year flood plain or it isn't. For homes of comparable value and type, the premium is identical when the buildings are in the ten-year flood plain and the eighty-year flood plain. Thus two communities, both subject to similar riverine flooding, may be faced with altogether different risks in the frequency of flooding. Nevertheless, the residents who buy an insurance policy would pay comparable premiums. It is therefore possible that certain flood-prone communities would forego an expensive Corps project in favor of flood insurance and possibly a warning system. Payment of flood insurance claims has been on a very uneven basis thus far, implying that some communities and the Federal government may be subsidizing jurisdictions more susceptible to flooding. A study is recommended which evaluates in greater detail why local sponsors who supported an economically feasible project subsequently withdraw their support. The flood problem remains when support for a Corps project is withdrawn. The question that comes to mind is whether flood insurance, flood warnings, and other non-Corps programs have a bearing on a community's decision to forego a Corps project.

Who Pays Versus Who Benefits

The analysis of census data pertaining to new starts and projects awaiting authorization was done on the basis of community or county information. A documentation of the relationship between census tract data for the protected areas and the method of raising the non-Federal share of project costs would provide a better documentation of whether or not people living in poorer neighborhoods receive a greater proportion of project benefits than they pay for. A study of this type would require information on property ownership in the flood plain as well. The issue is complex when the protected area involves owner-occupied dwellings, rental units, businesses, and industrial development. It is not enough merely to determine that people living in certain census tracts are poorer than the mean for the community.

Why Didn't Many Studies Produce Favorable Recommendations, and What Happens in Such Instances?

Virtually all of the analysis of project data involved projects that were authorized or are pending authorization. Many studies undertaken by the Corps are never completed because there is little likelihood that a favorable recommendation would result. Other studies are completed and are sent to Congress with an unfavorable recommendation, i.e., a project could not be economically justified or was otherwise unacceptable. The flood problem remains in these communities. It is therefore of interest to document why unfavorable reports resulted and what actions can be taken by the Federal government and the community to alleviate the problem.

On a related theme, it appears that more could be done to help communities that are likely not to receive a Corps project. Documentation of the continued risk of flooding and the potential for reducing the losses by such measures as flood warning systems, evacuation plans, and technical advice pertaining to future development may well have a favorable economic payback.

Administrative Efficiency

The question of whether policies and actions taken by the administration and Congress reflect a high degree of administrative efficiency or reflect a populist model is worthy of more detailed study. On the one hand, each successive administration, through the Office of the Assistant Secretary of the Army for Civil Works and the Office of Management and Budget, is generally concerned with economic efficiency (both macro and micro) issues and budget deficits. The Corps is more concerned with projects, the desire of Congress,[1] and local interests. When Congress fails to enact legislation, has bills vetoed, and otherwise has its policies circumvented or disregarded, the administration would appear to have an upper hand in the continuing power struggle. A study of policies and decisions and their implementation could reveal much about the program outcomes. When the administrative efficiency model is dominant, it is reasonable to expect equity and responsiveness to be diminished. Therefore, a study which focuses in greater detail on the impact of policy changes on administrative efficiency could provide a useful tool for predicting whether the Corps program is moving in a direction which is more equitable and responsive or not.

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[1]Concern is generally with the interest of individual members and committees rather than the overall Congress.

A Final Note

Flood damage prevention projects have evolved from levees and channel improvements totally at non-Federal expense to a massive program of reservoir construction which was financed largely by the Federal government. Many local protection projects have been constructed by the Corps on a nationwide basis since 1936 with the non-Federal share ranging from less than five percent to as much as 50 percent. There is not necessarily a correlation between the non-Federal share and the wealth of the community, nor is there necessarily a consistent basis for the degree of protection provided to one community versus another. The program has now evolved to the point where many communities are seeking additional protection while other areas are being considered for an initial Corps project. Thus, under traditional cost sharing, many communities with some level of protection would be eligible for a higher degree of protection at very little cost to the non-Federal sponsor since much of the rights-of-way were for the previously constructed project. Those areas being considered for an initial project may require a higher non-Federal share. This appears to create the potential for inequity based for flood damage prevention and ability of the community to afford the project recommended by the Corps. Both the House and Senate have bills pending in the 98th Congress which would increase the non-Federal share of project costs in most instances. The Congress appears to be seeking a formula which treats all communities equally by relying on a percentage as the non-Federal share. Such a methodology is wrought with the potential for making it difficult for poor communitities to finance their share of project

costs where lands, easements, and rights-of-way and relocations are a minor claimant of project costs. Those thoughts on this issue are worthy of further study and, hopefully, would lead to decisions which would benefit the public that is subject to flooding. The first is the proper role of the state in water resource development projects. Clearly, if greater non-Federal cost sharing is going to be specified in the future, the state needs to be more deeply involved. With this greater financial involvement should also come a greater voice in land use issues. Secondly, the quantification of benefits based on the four accounts annunciated in Section 209 of Public Law 91-611 and the quantification of these benefits is important to assure broader eligibility for a Corps project based on some notion of benefits exceeding costs. Finally, the challenge to the Corps should be to develop criteria and procedures which take into consideration sound engineering practices, community safety and well-being, and ability of the non-Federal sponsor to finance its share of a project so that the program may continue in a manner that reflects equity as well as efficiency and is responsive in terms of timeliness and services which ultimately reach the public. Once developed, it is incumbent upon the Corps to convince the Office of Management of Budget and the Congress of the validity of such a proposal rather than rely exclusively on the traditional benefit-cost calculations and periodic Congressional intervention. Corps projects need to be treated as long-term investments with benefits extending into future generations rather than business propositions concerned with payback in the near term.

APPENDIX A

SUMARY OF PERTINENT LEGISLATION CITED IN THE STUDY

Name of Act	Sections Cited	Public Law	Description of Section
Swamp Lands Acts of 1849 and 1950.	-	-	Grants Federal lands subject to flooding in Arkansas, Louisiana, Mississippi, and Missouri to those states with proceeds from land sales used for flood control and drainage projects.
Mississippi River Commission, 1979	-	-	Creates seven-member commission with jurisdiction over navigation work and flood control.
Flood Control Act of 1917	2, 3	64-367	Provides for control of floods on Mississippi River and Sacramento River and coordinates study of watersheds.
Flood Control Act of 1928	1, 2	70-391	Authorizes a comprehensive plan for control of the Mississippi River and tributaries. Reaffirms principle of local contribution toward cost of flood control work.
Flood Control Act of 1936	1, 3	74-738	Declares flood control to be a Federal activity, local authorities should participate in cost-sharing, projects should be evaluated by a benefit-cost analysis.

Name of Act	Sections Cited	Public Law	Description of Section
Flood Control Act of 1938	2, 3	75-761	Limits local requirements, provides for flood area evacuation
Flood Control Act of 1941	2, 5, 7	77-228	Modifies local cooperation requirements, authorizes emergency funds for flood fighting, provides that land leasing monies be paid to states for schools and roads
Flood Control Act of 1944	1-8	78-534	Provides concept of comprehensive programs for the development, use, and conservation of resources of river basins.
Flood Control Act of 1948	205	80-858	Authorizes construction of small flood control projects not specifically authorized by Congress.
Flood Control Act of 1950	-	81-564	Authorizes the development of a comprehensive integrated plan for several river basins and the inventory of resources in others.
Emergency Flood Control Funds Act of 1955	-	84-99	Authorizes an emergency fund for flood emergency preparation, flood fighting, rescue operations, and repair or restoration of flood control works.
Flood Control Act of 1960	206	86-645	Authorizes flood plain information studies.
River and Harbor Act of 1960	107, 108	86-645	Establishes a continuing authority authorizing construction of small navigation projects.
Federal Water Pollution Control Act Amendments of 1961	-	87-88	Provides for a more effective program of water pollution control.

Name of Act	Sections Cited	Public Law	Description of Section
River and Harbor Act of 1962	103, 104, 207, 208	87-874	Indicates the extent of Federal participation in cost of beach erosion and shore protection, authorizes construction of such projects, permits recreation developments at non-reservoir projects.
Federal Water Project Recreation Act of 1965	-	89-72	Requires consideration of opportunities for outdoor recreation and fish and wildlife enhancement in planning water resource projects.
Flood Control Act of 1965	201, 217	89-298	Authorizes flood control projects under $10 million and financial assistance in flood zones.
River and Harbor Act of 1965	302, 304	89-298	Authorizes control of aquatic growth, and amends Section 111 of the River and Harbor Act of 1958.
National Flood Insurance Act of 1968	-	90-448	Authorizes subsidized flood insurance for properties in flood hazard area.
River and Harbor Act of 1968	111, 117, 210, 215	90-483	Authorizes mitigation of shore damage, excess depth maintenance, user charges for recreation access, and reimbursement for non-Federal expenditures on authorized projects.
National Environmental Policy Act of 1969	101, 102, 202	91-190	Establishes policy on environmental quality, imposes requirements on Federal agencies, establishes the Council on Environmental Quality.
Clean Air Act Amendments of 1970	309	91-604	Requires EPA to review environmental impact statements prepared by other agencies.
Flood Control Act of 1970	209	91-611	Establishes objectives of Federally financed water resource projects.

Name of Act	Sections Cited	Public Law	Description of Section
River and Harbor Act of 1970	122	91-611	Provides for submission and promulgation of guidelines for considering possible adverse economic, social, and environmental effects of proposed projects.
Federal Water Pollution Control Act Amendments of 1972	102, 404	92-500	Requires issuance of permits to discharge dredged or fill material into navigable waters.
The Conservation, Protection, and Propagation of Endangered Species Act 1973	-	93-205	Requires all Federal agencies to carry out programs to conserve endangered and threatened species, and to preserve habitat of such species.
Flood Disaster Protection Act of 1973	-	93-234	Increases coverage under national flood insurance program, requires state and local participation, extends program to cover losses from erosion and wave action along shoreline.
Water Resources Development Act of 1974	73	93-251	Requires that consideration be given to non-structural alternatives in planning of design of flood protection projects.
Water Resources Development Act of 1976	-	94-587	Authorizes Phase I design memorandum on a project.
Clean Water Act of 1977	67	95-217	Prohibits discharge of dredged or fill material unless an environmental impact statement addresses the effects, and defines requirements to be met in the construction of Federal projects.

Name of Act	Sections Cited	Public Law	Description of Section
Endangered Species Act Amendments of 1978	-	95-632	Establishes an Endangered Species Interagency Committee and directs agencies to conduct a biological assessment to identify endangered or threatened species which may be present.
Inland Waterways Revenue Act of 1978	-	95-502	Establishes an Inland Waterways Trust Fund for revenue received from tax on fuel.
Continuing Appropriations Act for Fiscal Year 1983	-	97-377	Provides for continued funding of authorized work in FY 1983.
Productive Employment Appropriations Act of 1983	-	98-8	Provides additional funds for ongoing work on authorized projects to provide productive employment.

APPENDIX B

CALCULATION OF A BENEFIT-COST RATIO ILLUSTRATING THE USE OF CURRENT PRICE LEVELS AS WELL AS FUTURE INFLATION

Example

A levee project costing $10 million for lands, easements, rights-of-way, and construction at October 1983 price levels is to be constructed over a period of four years (October 1983-September 1987). In each of the four years, approximately $2.5 million is scheduled to be spent. Annual operation and maintenance costs are estimated at $50,000 (October 1983 price levels). Major replacements of mechanical equipment and the like are assumed to be small and are omitted from the calculations.

Flood damage prevention benefits to existing development are estimated at $2 million annually (October 1983 price levels). These benefits will be realized upon completion of construction in 1987. For simplicity, no change is assumed in estimated annual benefits during the economic life of the project. A project life of 100 years is assumed.

Basic Information

First cost of project	$10,000,000
Price level	October 1983
Construction period	4 years
Base year (for realization of benefits)	1987
Construction schedule/funding	October 1983-September 1987 at $2,500,000 per year

Project life	100 years
Annual operation and maintenance costs	$50,000
Expected annual benefits (EAB)	$2,000,000

Base Condition 1: Standard methodology using the current discount rate (8-1/8 percent) and zero inflation.

Description of Steps

Step 1: Computation of interest during construction (IDC) (Using the mid-point approach)[1]

Step 2: Add the interest during construction to the capital investment cost; i.e., the first cost of the project. the sum equals the total investment cost (TIC).

Step 3: Calculate the average annual charges (AAC); this equals the amount calculated in Step 2 (TIC) times the discount rate and times the sinking fund factor. Stated mathematically:

$$AAC = TIC(i) + TIC \left[\frac{i}{(1+i)^n - 1}\right]$$

Where T = the total investment cost
i = the discount rate (8 1/8 percent)
n = economic life of the project (100 years)

NOTE: $\frac{i}{(1+i)^n - 1}$ is very small (0.00003) in relation to "i" (0.08125), (less than one-tenth of one percent)

Step 4: Add to the value calculated in Step 3, the estimated annual operation and maintenance costs (at October 1983 price levels).

Step 5: Calculate the benefit-cost ratio (BCR).

$$BCR = \frac{\text{Estimated average annual benefits}}{\text{Estimated average annual costs (AAC)}}$$

Calculations

Step 1

$$\text{Interest during construction} = 1{,}250{,}000\,[(1+i)^4-1] + 2{,}500{,}000\,[\,[(1+i)^3-1] + [(1+i)^2-1] + [(1+i)-1]\,]$$

[1]For simplicity the assumption is made that the amount spent each year is done so at the middle of that year.

= 1,250,000(.36680) + 2,500,000 (.26409 + .16910 + .08125)
= 458,500 + 1,286,000 = $1,744,600

Step 2 Total investment cost by September 1987 using October 1983 price levels equals
10,000,000 + 1,744,600 = $11,744,600

Step 3 $AAC = TIC(i) + TIC \left[\frac{i}{(1+i)^n - 1}\right] = 11,744,600 \times .08128 = 954,601$ Say $ 954,600

Step 4: Total estimated average annual costs = 954,600 + 50,000 = $1,004,600

Step 5: $BCR = \frac{\text{Estimated average annual benefits}}{\text{Estimated annual costs}} = \frac{2,000,000}{1,004,600} = 1.99$

An illustration of the calculation of a benefit-cost ratio incorporating future inflation, for the same project as described above, follows.

CONDITION 6:

Discount rate 8-1/8 percent

Inflation rate 5 percent

$IDC = 1,250,000[(1.08125)^4-1] + 2,500,000 [[(1.08125)^3-1] + [(1.08125)^2-1] + [(1.08125-1]]$
IDC = 1,744,600

Total investment cost = 10,000,000 + 1,744,600 = $11,744,600

Effect of Inflation

a. Investment cost: It is assumed that investment cost, derived from bid prices, reflects price level escalation included by the contractor based on the anticipated duration of construction. Consequently, no further inflation is computed for this cost. Therefore, investment cost = $11,744,600.

b. Benefits and operation and maintenance costs: The exponential formula shown below is used to determine the effect of a 5 percent inflation rate and 8-1/8 percent discount rate on benefits and costs incurred after construction is completed and estimated benefits are realized.

Cumulative present worth factor (CPWF) = $[1-(1+k)^{-n}]_k$

$K = [(1+i)/_{(1+j)}] - 1$

n = 100 years

i = 8-1/8 percent

j = 5 percent

$$K = \frac{1.08125}{1.05} - 1 = .0298$$

$$CPWF = \frac{[1-(1.0298)^{-100}]}{.0298}$$

$$CPWF = \left[1 - \frac{1}{\frac{18.85}{.0298}}\right] = \frac{1-.0531}{.0298} = 31.78$$

Operation and Maintenance (O&M)

CWPF = 31.78

O&M = $50,000

Total CPW of O&M = 50,000 x 31.78 = $1,589,000

Annual Charges

Total CPW = 11,744,600 + 1,589,000 = $13,333,600

AAC = 13,333,600 x .08128 = $1,083,755

Annual Benefits

EAB = 2,000,000

CPWF = 31.78

Total CPW = 2,000,000 x 31.78 = 63,560,000

AAB = 63,560,000 x .08128 = 5,166,200

Benefit-Cost Ratio

$$BCR = \frac{5,166,200}{1,083,755} = 4.8$$

APPENDIX C

URBAN FLOOD DAMAGE REDUCTION NATIONAL ECONOMIC DEVELOPMENT (NED) BENEFIT EVALUATION PROCEDURE

The following ten steps are currently used in computing urban flood damage prevention benefits.[1]

Step 1: Delineate Affected Area

The area affected by a proposed plan consists of the flood plain plus all other nearby areas likely to serve as alternative sites for any major type of activity that might use the flood plain if it were protected. For example, if the potential use of the flood plain includes industrial use within a standard metropolitan statistical area (SMSA), the entire SMSA is the affected area. However, for residential areas, a much smaller area may be designated as the affected area.

Step 2: Determine Flood Plain Characteristics

The existing characteristics of the flood plain must be determined before its actual use can be estimated. An inventory is taken of flood plain characteristics that make it attractive or unattractive for land use demands. Emphasis is on those characteristics that distinguish the flood plain from other por-

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[1]U.S., Water Resources Council, "Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning (Level C)", Federal Register, IX, Vol. 44, No. 242, December 14, 1979, p. 72931-72938. The principles and guidelines which were issued in 1983 retained the same basic procedure. See Principles and Guidelines, pp. 32-41.

tions of the affected area.[1] These characteristics are necessary to evaluate activities and potential land use in the affected area, as described in steps 3 and 4.

Step 3: Project Activities in Affected Areas

Economic and demographic projections are estimated based on an assessment of trends in larger areas and discussions with knowledgeable local officials, planners, and others who may have information on future activities in the area. Projections of population, personal income, recreation demand, manufacturing, and employment are the principal types to be appraised.

Step 4: Estimate Potential Land Use

Potential land use within the affected area is obtained by converting demographic projections to acres. The conversion factors can normally be derived from published secondary sources.

Step 5: Project Land Use

Land use demand is allocated to flood plain and non-flood plain use for the without-project condition and for each alternative flood plain management plan.[2] The allocation is based on a comparison of the flood plain characteristics, the char-

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[1]These include characteristics of the flood plain such as depths, velocity, duration, debris content, and area flooded by floods of selected frequencies. They also include potential for recreation, open space, wetlands, or wildlife preserves. Physical characteristics of the soil, available services, and existing activity types are considered characteristics of the flood plain, too.

[2]In projecting land use, the flood plain is not considered appropriate for further development unless it has characteristics which give it significant economic advantage to the potential uses over all other available sites within the affected area. This is a significant change from the methodology used in the pre-NEPA era for projecting future land use when a "search" for suitable non-flood plain locations was not stressed.

acteristics sought by potential occcupants, and the availability of sought-after characteristics in the non-flood plain portion of the affected area.

Step 6: Determine Existing Flood Damages

Existing flood damages, which are the average annual damages to activities affected by flooding at the time of the study, are computed in the damage frequency process. Since urbanization may have occurred since historical floods, it is appropriate to supplement historical data with area depth-damage curves and an inventory of capital investment within the flood plain. It is also appropriate to compute estimates of damages for floods that have not yet occurred. The development of estimates of average annual losses are made by using standard damage frequency integration techniques and computer programs that relate to hydrologic flood variables such as discharge and stage to damages and to the probability of occurrence of such variables. These techniques provide estimated average annual flood damages without a project whereas the benefit calculation involves developing similar estimates with a project. The difference provides the average annual benefits based on existing conditions.[1] The procedure used in computing these benefits is discussed in greater detail in the description of step 10.

[1]The average annual benefits based on existing conditions are not affected by discount rate changes since the benefits are assumed to accrue in the base year and throughout the project.

Step 7: Project Future Flood Damages[1]

Future flood damages may be affected by hydrologic changes,[2] economic changes, or the projection of changes in physical flood damages based on the establishment of actual, observed relationships between damages, flood characteristics, and those indicators used for measurement and projection. In measuring flood damages for a future year, it is essential to estimate the number and size of physical units, the future value of these units (at current price levels), and the damage susceptibility of these units.

Estimates of future use of the flood plain, the value of such development, and its susceptibility to damage are all subject to the overriding consideration that assumes the adoption and enforcement of land use regulations pursuant to Public Law 93-234 and Executive Orders 11988 and 11990 for both the with and without-project conditions. In essence, this places a limiting factor on benefits claimed for future development within the 100-year flood plain.[3]

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[1]Future refers to any time after the year in which the study is completed. However, in order to relate costs to benefits, future flood damage prevention benefits must be discounted to the base year.

[2]Changes in basin land use may significantly alter surface run-off characteristics, resulting in a different level of protection early in the life of a project versus later years.

[3]For example, new structures which reasonably would be constructed within the 100-year flood plain are assumed to be flood proofed or elevated. Therefore, the damages averted as a result of the project are limited to those that might occur from infrequent events in excess of the 100-year event plus the cost of flood proofing or elevating.

Step 8: Determine Other Costs of Using the Flood Plain

Aside from potential flood damages, there are other costs which property owners would bear in the absence of a project but which would be averted with a project. These may be converted to national economic development benefits. They include flood proofing costs, national flood insurance costs, and the less efficient use of existing structures based on without-project conditions.[1]

Step 9: Collect Land Market Value and Related Data

This step involves determining the land use and computing the value of the land to be protected with and without the project. This is an important step and one that requires careful analysis and judgment. For example, in an urbanizing area, without-project land values in excess of agricultural land values are to be expected, reflecting the probability of future use as well as existing and anticipated infrastructural investments. More intensive use of land with the project may be claimed as a benefit. However, in an area which has experienced lower market values because of the flood hazard as well as other reasons, the benefits claimed as a result of a project should include only that portion of increased market value attributable to reductions in flood damages.

Step 10: Compute NED Benefits

Based on steps 1 through 9, benefits are calculated for structural and non-structural measures.[2] Table 38 displays the

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[1]For example, the first floor of a garden apartment may not be rented because of a flood hazard.

[2]All benefits are discounted and annualized at the appropriate discount rate to the beginning of the period of analysis.

types of benefits claimable for three of the major flood hazard reduction measures and the steps heretofore described that provide the necessary data.

TABLE 38

GUIDE TO TYPES OF BENEFITS

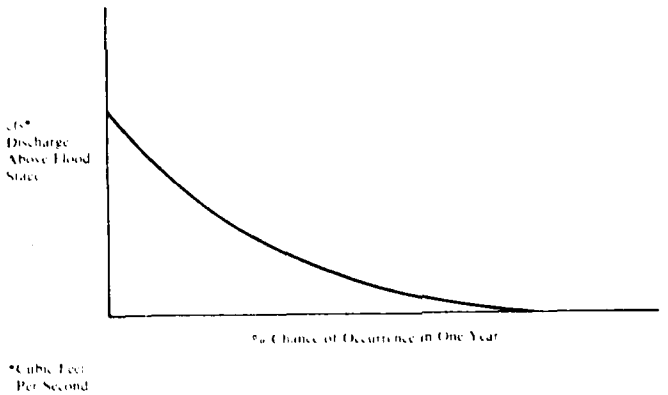
Type of benefit (and step)	Structural	Floodproofing	Evacuation
Inundation:			
Incidental flood damages (step 6)	Claimable	Claimable	Claimable
Primary flood damages (step 6)	Claimable	Claimable	Not claimable
Floodproofing costs reduced (step 7)	Claimable	Not claimable	Not claimable
Reduction in insurance overhead (step 7)	Claimable	Claimable	Claimable
Restoration of land value (step 9)	Claimable	Claimable	Not claimable
Intensification (steps 7 and 9)	Claimable	Claimable	Not claimable
Location:			
Difference in use (step 9)	Claimable	Claimable	Not claimable
New use (step 9)	Not claimable	Not claimable	Claimable
Encumbered title (step 9)	Not claimable	Not claimable	Claimable
Open space (step 9)	Not claimable	Not claimable	Claimable

Method of Calculating Benefits

The quantification of benefits from reducing water discharge through flow regulation is developed by the construction of a set of four interrelated curves.[1] First, a discharge probability curve (Figure 14) is developed. This curve is a plot of the discharge in cubic feet per second above flood stage against the percent chance of occurrence in one year. The curve is developed from statistical analysis of stream flow records, including flood-frequency estimates and various correlations of flood characteristics and hydrologic features of the drainage basin.[2]

FIGURE 14

DISCHARGE PROBABILITY CURVE



[1]Standard damage-frequency integration techniques and computer programs have been developed that relate hydrologic flood variables such as discharge and stage to damages and to the probability of occurrence of such variables.

[2]Flood magnitudes in a particular drainage basin are governed by combinations of many variable factors. The most important are: the quantity, intensity, sequence, and aereal distribution of precipitation; the infiltration capacity of the soil; and natural and artificial storage effects during floods. Compensating variations in these factors usually serve to reduce flood runoff rates and volumes to values far below those that would result from critical combinations of such factors.

Figure 15 is an index station rating curve. This relates flood stage in feet to the rate of discharge. The primary measure of flood severity is depth of flooding.

FIGURE 15

INDEX STATION RATING CURVE

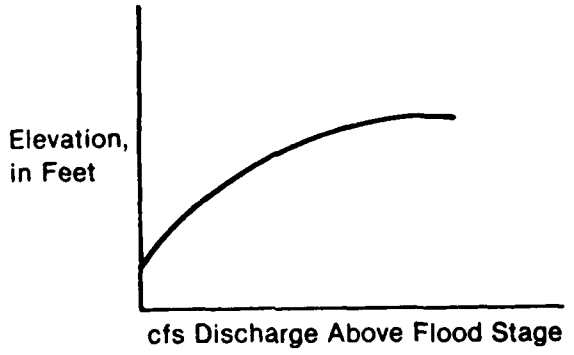
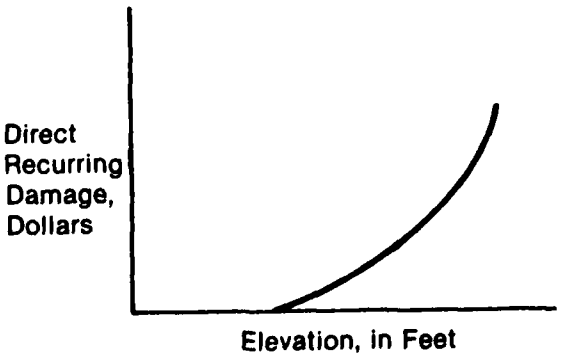


Figure 16 shows a stage-damage curve, which relates damage to the stage in feet. In order to develop this curve an actual survey

FIGURE 16

STAGE DAMAGE CURVE

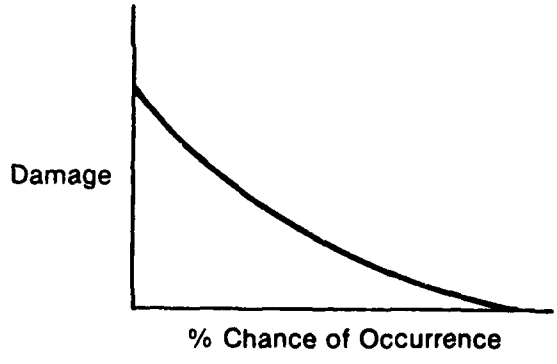


of land, buildings, and other facilities is made to estimate the cost of replacing, repairing, or rehabilitating the affected property in the case of urban damages and as the net effect on farm incomee in the case of crop damage.

The fourth curve (Figure 17) relates damage to percentage chance of occurrence, which is derived by combining the others. The area under this curve is the expected value of damage.[1]

FIGURE 17

DIRECT RECURRING DAMAGE CURVE



[1] A similar curve is developed for the with-project condition. The difference between the two areas is the average annual inundation flood damage reduction benefit.

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