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STUDY BY THE STAFF OF THE U.S.

General Accounting Office

Water Issues Facing The Nation: An Overview

The Federal Government has a tremendous stake in water resources in terms of capital investment and the physical and economic well being of the Nation. Traditionally, the United States has built, maintained, and operated massive public works projects to solve its water problems. But, this solution is becoming too expensive. The Nation now faces the dilemma of ensuring adequate supplies of fresh water in the face of deteriorating facilities, inflating costs, and decreasing budgets.

This study discusses the issues and problems relating to water resources and the perspective used by GAO in organizing its related audit efforts.

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FOREWORD

Adequate supplies of clean water have always been vital to the physical and economic health of our Nation. Yet, because it is becoming more scarce, water has been described by many experts as the "next American crisis." In addition, many of the Nation's water projects, including those associated with navigation, are getting older and will soon need major rehabilitation. Operating and maintaining existing projects now costs about $1.5 billion a year, and the combination of inflation and age will surely drive the cost even higher in the future. The Nation faces a dilemma. It must find ways to meet the challenges presented by an increasing demand for a limited supply of fresh water, deteriorating facilities, skyrocketing inflation, and decreasing budgets. How it solves these problems will impact on the Nation's future for decades to come.

This study is a part of a continuing assessment of areas of national concern and interest. It identifies the problems and issues faced by water planners, managers and users, as well as, focuses GAO's audit efforts of the Federal Government's direct and indirect involvement with water-related matters. The discussions may be helpful to other groups in planning their activities and obtaining a better understanding of the crucial issues facing decisionmakers.

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ABBREVIATIONS

GAO	General Accounting Office
OMB	Office of Management and Budget

CHAPTER 1

OVERVIEW--WATER AND WATER-RELATED PROGRAMS

Water and water-related programs are those programs and activities for planning, developing, and managing our Nation's water resources, including the development, operation, and maintenance of the national waterway system. While the U.S. Army Corps of Engineers and the Department of the Interior's Bureau of Reclamation are the two principal agencies involved in water programs, many activities of the Departments of Agriculture, Transportation, Energy, Commerce, and Housing and Urban Development, as well as the Tennessee Valley Authority, also involve water issues. In addition, certain activities of the Environmental Protection Agency, the Water Resources Council, the Cabinet Council on Natural Resources and the Environment, and several river basin organizations significantly affect water matters.

ISSUES NEEDING ATTENTION

Basic water issues never really change. What does change, however, is their relative importance. Presently, five issues have been identified as requiring immediate attention--these are presented in detail in chapters 2 through 6. Each chapter focuses on a related set of problems and trends and reflects the strong desire of the Congress and the administration to reduce Federal spending and increase the efficiency of Federal operations. Also, the discussions in those chapters recognize the concern many experts have expressed that our Nation soon may be facing a serious water supply crisis. The issues needing attention are as follows.

--What can the Federal Government do to help meet the Nation's water needs and make optimal use of its existing water resources?

--Are water projects being developed and rehabilitated in the most economical and efficient manner?

--Are water resources projects efficiently, effectively, economically, and safely operated and maintained?

--How can the Nation's navigation system be developed, operated, maintained, and managed in more effective, economical, and efficient ways?

--Are cost allocations, repayment, and financing policies for Federal water resources projects effectively meeting today's needs?

LONG-TERM TRENDS

During the next decade the following four factors will greatly impact on water resources matters in the United States.

1. The emphasis on reducing Federal spending.

2. The movement toward greater cost recovery from water project users and also toward a greater State, local, and private role in developing, maintaining, and financing water resources and navigation projects.

3. The increasing threat (reality in many instances) of major water shortages.

4. The impact of the energy crisis.

Impact of the Federal budget

Possibly the factor with the greatest impact on water resources matters is the current direction of the administration and the Congress concerning Federal spending. Given the billions of dollars needed to construct new projects; the increasing funds needed for operations, maintenance, and rehabilitation; and the commitment to reduce the Federal budget, it becomes evident that some significant changes must occur in the way this Nation approaches its water resources problems.

Traditionally, our Nation's approach to solving water problems has been to build more and more projects. The Corps, the Bureau of Reclamation, and the Department of Agriculture have over $50 billion in projects already authorized by the Congress. In addition, hundreds of additional projects are presently under study which, if built, could cost billions more. Considerable debate in the Congress has centered on why these projects are needed and whether the Nation can continue to spend its resources on expensive water projects.

Operation and maintenance costs are also skyrocketing, thereby, taking a larger portion of the budget. For example, the Corps in fiscal year 1967 spent approximately $180 million (approximately $503 million in fiscal year 1982 dollars) to operate and maintain water projects. In fiscal year 1982 that cost is expected to exceed $1 billion or almost one-third of the Corps' civil works budget. While such costs are already staggering, they can only increase. Studies have shown that a large number of the Nation's water projects are getting old and will soon need major rehabilitation. This, coupled with the past emphasis on constructing new projects rather than maintaining existing ones, will result in increased expenditures to rehabilitate existing projects.

Greater cost recovery

The same forces--the push to reduce Federal spending and balance the budget--are also providing impetus for legislative changes. Several bills have been introduced in the Congress to recover from the users much of the cost traditionally borne by the Federal Government. While similar proposals have been introduced in the past, the Congress now appears determined to enact legislation making more equitable cost sharing a reality.

In the past, water projects have been financed and subsidized by the Federal Government. As a result, specific water users often paid only a fraction of the cost to produce the water or, in the case of navigation projects, waterway users paid little of the cost of developing, operating, and maintaining the waterways.

Regarding navigation, the Congress has passed or has bills pending to recover money the Federal Government spends on the Nation's waterways and ports. In fiscal year 1979, for the first time, the Congress passed legislation establishing a fuel tax on users of 26 inland and/or intracoastal waterways. The proceeds of this tax are to be used to defray the cost of constructing and rehabilitating these waterways. Several other bills have been introduced in the 97th Congress to recover from users the costs of developing, operating, and maintaining other waterways and ports.

Impending shortages

Water shortages, particularly in the arid West and Southwest, have become a reality. The one factor most experts agree on is that water shortages will get worse, not better. A popular financial newsletter recently predicted that the Nation in the next two decades will have a water crisis with the potential to be far more devastating than the "energy crisis."

There are numerous reasons for the impending crisis. First, and probably the most important, is the continual shifting of our population from the more water abundant Northeast to the West and Southwest. Second, agriculture is assuming a more critical role in the Nation's drive to increase exports. Because irrigation is so important to the success of agriculture in the West, there is a continually increasing demand for water. Third, vast quantities of water will be needed to develop additional energy sources.

The water crisis is not something that experts are just talking about: it is a reality. Some examples of the problems experienced include

--the water shortages of a few years ago in California;

--the inability of farmers in the Texas Panhandle to continue irrigation at past levels;

--the recent drought in the Midwest which had considerable impact on water levels in the Mississippi; and

--the recent drought in the Northeast.

Another factor that could dramatically affect the Nation's water supply, particularly in the West, is the question of Indian water rights. A 1980 GAO 1/ report commented that the current Indian litigation and potential redistribution of water resources make it almost impossible for potential water users and State administrators to determine what, if any, water is available for new projects and uses. Further, it raises the possibility that existing water right holders may be unable to retain their rights. Presently, there are over 50 lawsuits in the courts involving Indian water rights, and it is very uncertain as to how and when the courts will rule on them.

Basically, there are two ways to overcome water shortages--neither of which is simple. The first is to increase available supplies and the second is to reduce consumption. Increasing supplies entails building more projects, such as reservoirs and pipelines to create additional holding and delivery capacity, or finding technologies whereby water that was formerly unusable can be used. However, water projects are costly and take years to complete. Also, they often are undertaken as if they were ends in themselves, instead of parts of an overall program to meet the Nation's needs. The other answer is stretching available supplies either by conserving or augmenting them through such technologies as wastewater reuse, seawater desalination, and cloud seeding. Thus far, conservation and augmentation efforts have not been very successful because they are either too costly or socially unacceptable.

There is no doubt that when a community or an area experiences a water crisis enormous pressure will be put on the Congress to do something. Given that such a crisis will probably occur in several places during the next decade, this Nation could be in a situation where its limited resources will go toward stopgap solutions rather than more efficient and effective long-term solutions.

Impact of the energy crisis

The energy crisis also poses tremendous implications for water resources. Not only will water be needed to generate hydroelectric power, but vast quantities will be needed for other energy-related efforts, such as steam electric powerplants, shale oil recovery, coal gasification and liquification, and coal-slurry pipelines. These will require vast amounts of water.

1/"Water Supply Should Not Be An Obstacle To Meeting Energy Development Goals" (CED-80-30, Jan. 24, 1980).

Many reports predict that the Nation's quest for energy and mineral independence will stimulate the need for water and will almost exhaust all unused water in the mineral-rich, water-short West. Other reports indicate that there will be adequate water for new energy sources until the year 2000. The one area in which no disagreement exists is that water is needed for these new energy sources and that when it is needed heavily depends upon how quickly the Nation decides to move to alternate sources of energy.

SCOPE OF THIS STUDY

We obtained the opinions and concerns of many congressional representatives and a wide range of experts and organizations. The organizations involved in the water area included, among others, the Congressional Research Service, Office of Technology Assessment, Congressional Budget Office, Urban Institute, Northeast-Midwest Institute, Environmental Policy Center, National Governor's Association, Water Resources Council, National Academy of Sciences, Resources for the Future, Water Resources Congress, and the Virginia Water Control Board.

We held extensive discussions with the Office of Management and Budget (OMB) as well as with senior officials of the Corps of Engineers and the Bureau of Reclamation. In addition, we solicited input from other Federal agencies with water resource responsibilities, such as the Departments of Agriculture, Commerce, Energy, Housing and Urban Development, and Transportation and the Environmental Protection Agency.

Also, we conducted a 2-day symposium in August 1981 at which the Nation's major water-related problems were identified and discussed. Besides many GAO staff members who have considerable experience evaluating water programs and activities, representatives from the Congress, OMB, Departments of the Army and the Interior, Water Resources Council, and the Environmental Policy Center also participated.

CHAPTER 2

WHAT CAN THE FEDERAL GOVERNMENT DO TO HELP MEET THE NATION'S WATER NEEDS AND MAKE OPTIMAL USE OF ITS EXISTING WATER RESOURCES

MAJOR ISSUES

Water is critical to the very existence of the United States. Adequate supplies of high-quality water are essential for developing domestic energy supplies; for maintaining an industrial, manufacturing, and agricultural base; and most important, for sustaining a healthy population. However, many experts predict that a water supply crisis potentially more serious than the energy crisis looms in the country's future. The crisis, should it occur, would not be the result of inadequate quantities of water, for as a Nation we have an abundant supply. It would be the result of poor management of this resource.

To meet the Nation's water needs, effective planning must be carried out at all government levels, supplies must be made available where and when they are needed, and programs must be implemented to conserve our existing water sources.

Planning policies, mechanisms, and institutional arrangements

Water resources planning encompasses analyzing existing and potential water problems and preparing solutions to such problems. Planning policies and procedures differ from region to region and among agencies. Each region has different water resources problems and each agency has different missions.

Traditionally, the Federal Government's primary role in water resources planning has been related to public works activities, such as flood control, navigation, irrigation, and watershed activities. Federal involvement generally came about in response to (1) interstate needs (2) State and local governments' inability to finance massive projects, and (3) the desire to foster national objectives. Federal agencies, created to execute the programs, generally operate independently of the States and are responsible for program and project implementation decisions.

States have defined their own policies relative to water quantity and quality management and developed laws and practices for allocating and using water supplies. In addition, they carry out water resources planning and development. Local governments generally have primary responsibility for local water supply and wastewater treatment and disposal.

Unfortunately, political boundaries do not coincide with natural river basin boundaries. The Congress, recognizing the

rights of States to manage their own water and the need for coordination among the States, passed the Water Resources Planning Act of 1965 to encourage comprehensive regional planning. The act also established the Water Resources Council to coordinate water management nationwide. This effort, however, has been largely ineffective because the Council and the regional planning bodies had neither the level of responsibility nor the authority necessary to enforce their planning decisions. In September 1981, President Reagan signed two Executive orders that changed the way water resources planning is done. Executive Order 12319 terminated the River Basin Commissions' activities, and Executive Order 12322 directed that water resources project plans be sent to OMB for the technical reviews formerly performed by the Council. In addition, the Congress is considering several proposals to reestablish a regional planning structure.

Water experts believe that nearly every water resources problem, with the exception of physical unavailability, is an institutional one. They have said that the water resources agencies may need to be reorganized to effectively integrate their diverse but related activities. Problems have arisen in the past. For example, agencies charged with protecting the environment or conserving fish and wildlife often disagreed with those responsible for water resources development. In other cases, the objectives of those primarily responsible for or concerned with one purpose, such as flood control, conflicted with the objectives of those concerned with another, such as hydropower electric generation from the same project. Such conflicts sometimes resulted in project completion delays and decreased project benefits.

Ensuring an adequate water supply for all uses

Many problems must be overcome to assure an adequate water supply. First, needed quantities of water must be located and authority to use them obtained. International treaties, interstate compacts, and court decisions sometimes affect the quantities of water available for use in a particular area. Likewise, the ultimate resolution of Indian reserved water rights claims will affect the amount of water available to users. Similarly, maintaining minimum instream flows for hydroelectric power generation, navigation, and other purposes, such as fish and wildlife habitat, can significantly reduce the quantity of water available for water supply uses.

In some areas, surface water stream flows are not reliable; in other areas, the available surface water has been appropriated and additional demand on existing sources cannot be met. Also, ground water aquifers (porous, water-bearing geological formations) are being overdrafted in many areas nationwide, especially where a shortage of surface water exists. This condition causes land subsidence, increased energy costs to pump water from lower levels, and other problems. Continued overdrafting could deplete a ground water source to the point where it can no longer supply water.

In addition to quantity problems, some sources of water have serious quality problems that restrict their use or increase the cost of treatment before use. Surface water supplies are being polluted by municipal and industrial sources which are not yet in compliance with Federal clean water regulations and by numerous nonpoint sources of pollution. Ground water pollution from waste disposal on land and from saltwater intrusion into freshwater supplies are major problems.

Besides finding additional water sources, existing supplies can be augmented using such technologies as weather modification, desalinization, and wastewater reuse and recycling. However, many of these technologies are still in the research and development stage, are too costly, or are socially unacceptable.

The Federal Government has a tremendous stake in ensuring that no part of the country runs out of water. If such a catastrophe should occur, the costs in terms of human suffering and economic losses would be intolerable and, the Congress undoubtedly would be under extreme pressure to provide financial and technical assistance. Therefore, the Federal Government needs assurances that our Nation's water resources are being managed wisely. It seems certain that, in the future, greater emphasis will be placed on managing our existing water supplies more effectively. Now is the time to take action. If the Nation waits until the shortage reaches crisis proportions, the remedies are likely to be stopgap in nature and too late to be of real benefit.

Conservation

Conservation programs primarily involve agricultural, municipal, and industrial use of ground and surface waters. However, the greatest potential, as well as the greatest need, for better water management and conservation is the irrigated areas of the West. Nationwide, irrigation accounts for over 80 percent of the consumptive use of water, most of which occurs in the arid and semiarid areas of the West.

Using present practices, irrigation is relatively inefficient because the crops actually consume less than half of the water applied to them. The remaining water oversaturates the land, causing drainage problems; is absorbed by weeds; or is returned to the supply system for further uses at a downstream location, degraded in quality by minerals, fertilizers, sediment, and pesticides.

There are several known irrigation techniques which could lead to water savings, for example, lining water conveyance and distribution systems, properly scheduling water deliveries, avoiding overdeliveries, and using water-saving methods such as drip and sprinkler irrigation systems. Other measures include reducing reservoir evaporation, controlling unwanted vegetation, and increasing yields without additional water through better crop varieties, fertilizers, and management.

Although most water used nationwide is for irrigation, about 75 percent of the Nation's population lives in metropolitan areas constituting less than 2 percent of the Nation's land area. By the year 2000 as much as 85 percent of the population may live in these areas. In addition, much of the Nation's industry is located in or around these areas.

While new supplies for many of these areas can be developed, increased emphasis on more efficient use and conservation of existing municipal and industrial water supplies is important. Reasons include the following.

--In some areas access to new supplies may not be readily attainable or the supplies may be located long distances from where they are needed.

--The cost of developing new supplies is often high and can be a financial burden to many communities.

--Developing new supplies by constructing dams and reservoirs has often been questioned or opposed for environmental reasons.

Water conservation can also save energy. When less water is used, less has to be treated and pumped through the distribution system. Also, there is less wastewater to be handled by sewage treatment plants. Additional energy is saved by conserving water that has been heated because according to one study, hot water accounts for 41 percent of all household water usage.

In short, the benefits of conserving water, even in water rich areas, are many and may exceed the costs of conservation techniques. These techniques include water-saving devices, meters, leakage control, water pressure control, and educational campaigns.

The Congress has consistently held that municipal and industrial supply and water use regulations are the responsibility of State and local governments. However, various Federal programs offer numerous opportunities for encouraging and implementing water conservation programs.

ISSUES THAT MUST BE ADDRESSED

The following issues or questions need to be addressed to determine what the Federal Government can do to help meet the Nation's water needs and make optional use of its resources.

1. How effective is the Federal organizational structure for addressing water resources issues?

2. What should the Federal Government's role be in water resources planning?

3. Is there effective integration and coordination of planning efforts between Federal, regional, and State agencies?

4. What are the organizational impediments and institutional constraints to effective planning and what actions are necessary to resolve such problems?

5. What is being done to ensure that water is available to satisfy all competing uses? Are alternatives available; if so, are they acceptable to the region, State, and user?

6. How can conservation practices be encouraged? What factors are inhibiting instituting the practices; how can they be overcome?

GAO ASSIGNMENTS IN PROGRESS

--Overview of Federal efforts to improve water conservation--summary of past GAO work.

CHAPTER 3

ARE WATER PROJECTS BEING DEVELOPED AND REHABILITATED IN THE MOST ECONOMICAL AND EFFICIENT MANNER?

MAJOR ISSUES

The Federal Government has been extensively involved in constructing, managing, and operating water projects. As of 1981, the Federal Government has invested over $54 billion in water resources projects that are either completed or still under construction. This investment includes the ownership of over 2,000 dams. The Bureau of Reclamation and the Corps of Engineers are the two principal agencies that build and manage most of the Nation's water projects. The Tennessee Valley Authority and the Soil Conservation Service are also heavily involved in water project development. These projects can range in size from small pumping plants to huge, multipurpose projects, such as the $6 billion Central Valley Project in California. Most large projects are multipurpose and provide water for a variety of users. In addition to providing water for irrigation and municipal and industrial uses, projects also can provide hydroelectric power generation, fish and wildlife enhancement, outdoor recreation, flood control, and navigation.

Each year the United States spends billions of dollars to construct and rehabilitate water resources projects. In fiscal years 1981 and 1982, appropriations for water project construction and rehabilitation by the Corps and the Bureau totaled about $1.7 and $1.9 billion, respectively. These agencies are requesting about the same funding for fiscal year 1983. In addition, they have a backlog of over $50 billion in congressionally authorized projects. These projects range from those that have been authorized but have no construction or land acquired to ones that are almost completed.

In the past, water projects have met little opposition in the Congress. However, with the present emphasis on tightening the purse strings, water resources project funding is beginning to receive intense scrutiny within the Congress and the executive branch. The Congress today appears more willing to reevaluate the desirability of Federal funding for many water resources projects and has focused increased attention on project selection, authorization, and construction. There is likely to be increased congressional interest in this area as cancellation or deferral of projects offer the opportunity for substantial budget savings.

The following are the major issues related to construction and rehabilitation which must be addressed.

--Do the methodologies used in computing project benefits and costs result in the most economical and efficient projects?

--Given the escalating cost to build water projects, what actions can be taken to control rising project costs?

--Can the lengthy planning, design, and construction periods for most projects be reduced?

--How can the Nation be sure that funds spent for rehabilitation are used most effectively and efficiently?

The issues listed above will probably receive considerable congressional attention during the next few years because of heightened concern over Government spending and the administration's recent action to use OMB rather than the Water Resources Council to review water projects. Specifically, President Reagan directed (Executive Order 12322, Sept. 17, 1981) that any proposal or plan for a Federal or federally assisted water resources project be submitted to OMB before it is introduced in the Congress. OMB is to assess the plan for consistency with (1) the administration's policies and programs, (2) the Principles and Standards for Water and Related Land Resources Planning, or other such guidelines that may be issued, and (3) other applicable laws or regulations relevant to the planning process.

The Congress and the administration need water project information that is pertinent and accurate so they can set national spending priorities and direct water resources programs. To properly evaluate and stay abreast of projects being built, the Congress needs such information at various stages of a project's development--that is, at initial authorization and during the planning, design, and construction phases.

Lengthy planning, design, and construction periods compounded by rising prices due to inflation have driven up project costs. Both the Congress and the administration have expressed concern about the seemingly excessive time--as much as 31 years--required for a project to move from conception to reality. With the increased emphasis on reducing Federal spending, the Congress will have to make some difficult decisions regarding funding ongoing projects as well as any new projects which may be proposed for funding. Identifying steps that could shorten development periods could be a key to holding down overall project costs.

Inflation is adding to the total price of water projects. For example, the Corps, as of fiscal year 1982, lists 439 "active" water projects, bearing a price tag of $52 billion, that have been authorized by the Congress. So far, only about $19 billion of that amount has actually been spent. Applying an inflation rate of 10 percent would result in an annual increase of $3.3 billion for inflation--which is greater than the Corps' annual construction budget of approximately $2 billion.

Many reservoirs and dams are over 50 years old and are in need of renovation and replacement of major equipment. Corps and Bureau officials have said rehabilitation is, and will continue to be, a very important activity. With the current emphasis on saving money, it becomes more important to rehabilitate and replace equipment, thus lengthening the life of existing projects and related equipment. Timely action can also help limit the deterioration of existing structures which would later preclude unnecessary spending to make needed repairs.

ISSUES THAT MUST BE ADDRESSED

To identify and highlight ways to select, construct, and rehabilitate water projects in the most economical and efficient manner, the following issues and questions must be addressed.

1. Are the methodologies used to compute project benefits and costs adequate? Do they require sufficient documentation and periodic updating so that the Congress can make informed decisions? Are projects still economically justified or have conditions or purposes changed since they were initially authorized?

2. Are effective actions being taken to rehabilitate facilities and replace equipment and are feasible alternative solutions fully considered? Do procedures exist to help identify when and where rehabilitative measures are needed?

3. Does the Federal Government design and construct water projects economically and efficiently? Are there steps that can speed up the entire project development and construction process?

GAO ASSIGNMENTS IN PROGRESS

--Review of Federal policies and practices in performing general investigations for new water projects.

--Review of economies that can be achieved in the construction of water resources projects.

--Review of the Corps of Engineers' small projects program.

CHAPTER 4

ARE WATER RESOURCES PROJECTS EFFICIENTLY, EFFECTIVELY, ECONOMICALLY, AND SAFELY OPERATED AND MAINTAINED?

MAJOR ISSUES

The Federal Government has an investment of over $26 billion in completed water resources projects. To protect this investment in an era of tight fiscal constraints, it becomes more essential that existing projects be operated and maintained optimally--greatest benefits at minimum cost. Excluding navigation which is addressed in chapter 5, the Corps and the Bureau are spending over one-half billion dollars annually to operate and maintain water resources projects. This figure is projected to increase more than 300 percent in the next decade.

The major issues within this area of water resources activity are concerned with

--whether water project operations are effectively and efficiently meeting modern-day needs and

--whether water project maintenance programs are ensuring adequate service, prolonged life, and safe operations at the lowest possible costs.

In the past, the Congress and Federal water agencies have concentrated their attention on the very costly water project construction programs. Comparatively, less attention has been paid to operating and maintaining existing facilities. Because of limited funding, these activities have often been managed by the agencies using a philosophy that requires taking shortcuts and postponing needed expenditures. Consequently, there are projects in need of hundred's of millions--perhaps even billions--of dollars to repair the inadequate, leaking, or deteriorating structures.

Operational decisions to balance the diverse services of water projects is becoming increasingly difficult and controversial. Water projects generally provide one or more of the following services--irrigation water storage, hydroelectric power generation, municipal and industrial water supply, flood control, recreation, and fish and wildlife enhancement. How best to allocate the available water supply and how best to conduct water project operations to meet present-day demands of competing water interests are questions of considerable public interest and interagency rivalry.

In many cases operations are conducted in accordance with laws, regulations, and circumstances which were applicable at the time a project was placed in operation rather than what may provide the most beneficial or efficient use today. For example, modern-day needs may call for higher priorities on power

generation and municipal and industrial water use rather than on irrigation, which had the highest priority when the project was constructed decades ago. Recreation and fish and wildlife purposes have also taken on new and demanding importance. Reordering priorities later in a project's life can be controversial, emotional, and difficult to do. Nevertheless, operations need to be reevaluated in the context of today's needs and appropriate policy and legislative changes made.

Another essential element to effective operations is maintenance. Without adequate maintenance, facilities deteriorate and their operations become less effective and efficient. Many existing projects are beginning to age. It has been estimated that by the year 2000, the age of over one-third of the dams will exceed 50 years. Yet, keeping them functioning at peak efficiency and production is becoming critical because of the increasing demand for water and decreasing affordability of new projects. Maintenance is also crucial to the safety of water project operations. Safety is a paramount concern because unsafe operations or possible dam collapse can cause the loss of thousands of lives and millions of dollars in property damages.

Water resources agencies face a dilemma. They now claim they are at the crossroad of continuing or curtailing normal, routine operations and maintenance activities. Replacements, additions, and extraordinary maintenance work have already been delayed. According to the agencies, eliminating these services over the long run will seriously jeopardize water deliveries or power production in areas vitally dependent on them.

Funding levels to a great degree dictate the type of program undertaken. Effective planning and management also have their effects. Inadequate funding and poor management generally result in (1) curtailing operations although peak production may be needed and (2) shifting from a more cost-effective preventive maintenance program to a repair as needed program which may be both dangerous and uneconomical in the long run.

ISSUES THAT MUST BE ADDRESSED

To bring about improvements in operating and maintaining projects, the following questions must be addressed.

1. Are water resources projects being maintained properly to provide the most cost-effective and safe operations of the facilities?

2. Are the original purposes of water resources projects meeting current needs and priorities, and what steps could be taken to optimize project benefits today?

3. Are the diverse functions of multipurpose projects adequately balanced to fulfill the project's intended purposes?

GAO ASSIGNMENTS IN PROGRESS

--Survey of opportunities to improve the management of water project operations.

CHAPTER 5

HOW CAN THE NATION'S NAVIGATION SYSTEM BE DEVELOPED, OPERATED, AND MAINTAINED IN MORE EFFECTIVE, ECONOMICAL, AND EFFICIENT WAYS?

MAJOR ISSUES

An effectively managed and maintained waterways system is vital to supporting the national goals of energy self sufficiency, improved balance of payments--primarily through export of grain and coal--economic growth, and national defense. Since 1824, the Corps of Engineers has been responsible for assuring the integrity of the system at Federal expense.

As part of its activities, the Corps constructs, operates, and maintains navigation improvement projects in U.S. harbors and inland waterways. In total, the Corps operates and maintains about 219 lock and dam facilities and other control structures on some 25,000 miles of inland and intercoastal waterways and maintains over 100 commercial harbors and 416 small boat harbors.

The cost of providing these navigation services is high. In each of fiscal years 1981 and 1982, the Corps was appropriated about $1.2 billion to carry out its navigation functions--about one-third of its total civil works budget.

Three of the major issues involving the navigation system are as follows.

--What can be done to help assure that only the most economical and effective navigation projects are constructed?

--Given the escalating cost to operate, maintain, and rehabilitate aging facilities, what actions can be taken to ensure that funds are spent in the most efficient and effective manner?

--Should user fees or other cost-sharing provisions be instituted for navigation improvement projects?

These issues will receive considerable congressional attention during the next few years because of heightened concern over Government spending, the results of two recent studies, and recent cost recovery proposals. Specifically:

--Development of large specialized ships that take advantage of the economies available through large-scale movement of cargo has significantly affected port operations and development. The trend to larger and deeper vessels has prompted many ports to request the Corps to deepen their harbors and channels.

--The Corps recently completed a congressionally mandated review and assessment of the national waterways system. The study draft 1/ which was released for public comment in mid-1981 contained specific recommendations for improvement which, if implemented, would cost about $32 billion (1981 dollars).

--In March 1981 the administration proposed that users of the Nation's harbors and waterways assume a share of the cost of developing and maintaining ports, waterways, and navigation locks. This, coupled with the publication (February 1982) of the inland waterway user taxes and charges study, will undoubtedly continue to generate considerable debate in the Congress. Until user fees of 4 cents a gallon on fuel were imposed selectively on specified inland and intracoastal waterways in October 1980, use of waterways had been free to barges and ships.

Economical and effective construction of navigation improvement projects

In fiscal year 1983 the Corps requested $452 million to finance construction work on 28 navigation projects. This amount represents less than 10 percent of the latest projected total cost of these projects. Among the more costly projects for which fiscal year 1983 funds have been requested are the Tennessee-Tombigbee Waterway ($186 million), Lock and Dam Number 26 ($68 million), the Red River Waterway ($30 million), and deepening channels at 7 export port locations ($43 million).

Given the enormous cost overruns experienced on some navigation projects, inflation, and efforts to reduce Federal spending, the Congress appears willing to reevaluate the need to construct many projects. For currently authorized projects, questions that will be asked by the Congress include (1) are the projects still economically justified, (2) have conditions changed since the project was initially authorized, and (3) is this the best use of the tax dollar. In reviewing proposed projects, considerable congressional attention probably will be focused on the need for the projects, the accuracy of the benefit-cost analyses, and whether only the most economical and effective projects are being constructed.

1/According to Corps representatives, considerable changes have been made to the draft since it was first released, but they were not specific about what the changes are. The final report is expected in May 1982.

Probably the most urgent navigation issue before the Congress is the need to deepen our ports. According to the Corps, over the next 20 years, 10 to 12 ports will be deepened to the 50- to 55-foot range, and the cost would probably range from $200 million to $500 million per port. The National Waterways Study draft recommended that to improve our Nation's waterways system three deep draft ports should be developed at an estimated cost of $1.7 billion (1981 dollars). These high costs will necessitate selectivity from among the various alternative port locations and may require imposing some form of cost recovery.

Reducing costs of rehabilitating, operating, and maintaining navigation projects

Since World War II, resources have been directed to extending the waterway system rather than intensively developing the existing system. Consequently, needed maintenance, including rehabilitation, has often been postponed. Priorities are now shifting to upgrading our existing waterways. As we enter a period of fiscal restraint, all needed improvements in the navigation system cannot be made or will be made only after considerable scrutiny by the Congress.

The most serious constraint to handling navigation traffic efficiently is that key facilities in the inland waterway system are getting old and may be technologically outdated. For example, the average age of the system's 184 principal locks is 40 years, and some are approaching 80. The National Waterways Study draft predicted that the annual cost to rehabilitate our existing facilities would increase fourfold by the year 2000. The Corps' appropriation for rehabilitation was $63 million in fiscal year 1982, but it has only requested $23 million for fiscal year 1983.

Next to construction, operations and maintenance of existing facilities is the largest cost item in the Corps' navigation budget. This activity includes dredging, constructing bulkheads, repairing channel and canal stabilization works and harbor jetties, and replacing parts for day-to-day functioning. Besides increased operation and maintenance costs due to the age of the facilities, the costs will also continually be driven up by inflation and the added cost of complying with environmental regulations, particularly those associated with disposing of dredged material in an environmentally safe manner.

In fiscal year 1982 the Corps received about $507 million for navigation-related operation and maintenance--about one-sixth of its total civil works budget. In an effort to hold down an ever increasing Corps budget, the administration's fiscal year 1983 budget request proposes discontinuing, or drastically reducing operation and maintenance of lower use, lower priority navigation projects. The Corps estimates that this action alone would save about $150 million in fiscal year 1983.

Costs could increase dramatically in the years ahead, particularly for rehabilitation, operation, and maintenance because (1) existing navigation facilities are becoming old and will require significant rehabilitation in order to handle traffic efficiently and (2) necessary routine operation and maintenance activities, which keep inland waterways navigable, are becoming increasingly more expensive.

User fees and cost sharing

The inland waterways were traditionally constructed and maintained at Federal expense by the Corps. However, beginning in fiscal year 1981, a fuel tax was imposed on commercial cargo vessels operating on 26 specific inland and intracoastal waterways--about 40 percent of the navigable miles of all such waterways. Beginning at 4 cents a gallon, the tax will eventually increase to 10 cents a gallon in fiscal year 1986. Revenues collected will be made available--after authorization and appropriation--for constructing and rehabilitating these waterways. The intent, however, is not to recover the full cost of operating, maintaining, and developing the inland waterways.

As costs continue to escalate, a movement to recover more of the costs from waterway users can be anticipated. Along these lines, the administration, in March 1981, proposed assessing ships and barges for a share of the full cost of improving ports, waterways, and navigation locks. Also, several bills introduced in the 97th Congress have provisions for up-front financing or repayment.

ISSUES THAT MUST BE ADDRESSED

To ensure that the Congress has the vital information it needs on (1) whether adequate measures are being taken to preserve the existing navigation system and (2) whether the system is being administered to effectively meet changing demands, the following questions or issues must be addressed.

1. Are the methodologies used to compute navigation improvement benefits and costs adequate? Do they require sufficient documentation and periodic updating so that the Congress can make informed decisions? Are the projects still economically justified or have conditions or purposes changed since they were initially authorized?

2. Are effective actions being taken to rehabilitate navigation facilities and replace equipment and are feasible alternative solutions fully considered? Do procedures exist to help identify when and where rehabilitative measures are needed?

3. Are navigation improvement projects being maintained in such a way as to provide the most cost-effective operation of the facilities?

4. Are there alternative ways of financing navigation project development and operation and maintenance activities?

GAO ASSIGNMENTS IN PROGRESS

--Survey of operation and maintenance activities of the Nation's inland waterways.

CHAPTER 6

ARE COST ALLOCATIONS, REPAYMENT, AND FINANCING POLICIES FOR FEDERAL WATER RESOURCES PROJECTS EFFECTIVELY MEETING TODAY'S NEEDS?

MAJOR ISSUES

"Water [supplied from Federal reservoirs] is cheaper than dirt" according to some economists. In a recent Senate floor debate, a Senator said

> "A larger share of the burden of subsidizing Federal water projects should be shifted from the backs of taxpayers to the pocketbooks of those who benefit most from their construction."

Supporters of cheap water argue that the national return on investment from subsidies in terms of food production, exports, and contributions to urban and rural development offset the cost. Excessively cheap or heavily subsidized water has long been the winning position of this country's national water policy. Times are changing. With construction costs and interest rates skyrocketing, the Federal Government may no longer be able to afford the lion's share of financing water resource projects.

Reclamation, flood control, and water supply laws have established policy for cost sharing, financing, and repayment terms which may no longer be valid in today's conditions. These laws contained generous features, such as interest-free financing, liberal contract terms, and long-term (up to 60 years) fixed price repayment periods. While these laws were enacted for specific purposes--such as, settlement of the West through providing cheap water--substantial changes in the economy and population patterns have occurred since these laws were passed. These antiquated policies are or will be applied to future projects--unless changed.

Who puts up the money and who repays how much over time are major issues that the Congress faces in deliberating water policy reform. Existing Federal water project repayment laws and policies have been questioned for heavily subsidizing water users. Congressional committees, Presidential task forces, and advisory committes have concluded that reforms are needed to match the growing concern for fiscal austerity. With a new administration and many changes in the Congress, a debate over the future of Federal water repayment policy is taking shape. These issues may take years to resolve, but it seems clear that the day of unquestioned low-cost or free water and generous repayment terms may be over.

In 1981 Senators Domenici (New Mexico) and Moynihan (New York) introduced S. 621, the National Water Resources Policy

Act of 1981, which proposes to completely change the manner in which water resource development projects are authorized, funded, and repaid. The bill calls for annual water project construction appropriations that would be apportioned among the individual States based on their area and population. States would also be required to pay, or contribute in kind, 25 percent of construction costs and 50 percent of operation and maintenance costs. Currently, the Federal Government finances almost 100 percent of these costs.

Similarly, the Water Pricing Reform Act of 1981 (H.R. 2606) was introduced to establish an improved water-pricing system to reduce "unjustified subsidies" and to more rapidly recover costs. The legislation proposes that users pay (1) all construction costs properly allocable to irrigation, municipal and industrial, and power purposes, (2) all operation and maintenance costs, and (3) interest on these charges. In contrast, present laws now allow interest-free or low-interest rates, no reimbursement for flood control costs, repayment of only a small percentage of construction cost by the irrigators, and less than actual operation and maintenance cost due to existing allocation procedures.

These legislative proposals, similar to bills introduced in previous sessions of the Congress and never acted upon, reflect an increasing concern for reform.

Major issues within this area of water resources include

--more equitable cost-sharing arrangements among water users,

--full cost recovery from water users,

--strengthening repayment terms, and

--alternative financing methods.

Cost-sharing arrangments--who should pay?

The law generally requires that project costs be recovered from irrigation, municipal and industrial, and hydroelectric users. Costs for other purposes such as flood control, fish and wildlife, and recreation are absorbed (nonreimbursable) by the Federal Government because they are considered to have national benefits. Costs for repayment are apportioned to the purposes served by a complex web of rules established over the years by congressional acts and administrative decisions. These rules and decisions have allowed for a lot of flexibility and interpretation into how much cost is to be recovered.

Consequently, critics repeatedly cite examples of users paying too little and argue for new cost-allocation policies to increase fairness in distributing financial burdens. For

example, on six irrigation projects we recently reviewed, 1/ the Federal Government's cost to provide the water ranged from $54 to $130 per acre-foot(325,851 gallons). Yet, the users paid only $0.27 to $9.82.

Pricing--should water prices be increased?

Water projects are largely financed by the Federal Government. Funds are advanced for project construction and upon completion, the Government requires the water users to repay the Federal costs in installments over periods of up to 60 years.

The prices paid, however, vary tremendously. Irrigation users can pay far less than total cost ($0.27 versus $54 per acre-foot). Existing rates charged municipal and industrial water customers--$2 to $50 per acre-foot--are extremely low because of subsidized low-interest loans. Realistically, charges of $0.27 to $50 per acre-foot equate to only 8 hundredths of a cent to 2 cents per 100 gallons--far less than the true water service cost.

Pricing for water programs--ability to pay, willingness to pay, full cost, or market value--is sure to be one of the major issues in the future. The answers will not be easy because they involve a complex, delicate, and controversial balance between other issues--pricing farmers out of business, increasing cost of food to consumers, and diverting farmlands. It may, however, no longer be justified, as it once may have been, to make water available at less than its full cost. Water is too valuable to be given away or priced way below cost in today's or tomorrow's environment.

Repayment terms--tough or generous, fixed or adjustable?

Over $5 billion in repayment contracts are now in effect. Costs are not being recovered on these contracts signed in the 1950's and 1960's. For example, in the Bureau of Reclamation's California Central Valley Project, the practice of marketing municipal and industrial water at inadequate rates and with contract provisions which do not permit periodic rate adjustments are contributing to deficits which will reach over $130 million by the year 1995--over $2 billion by the year 2020, if not corrected.

1/"Federal Changes for Irrigation Projects Reviewed Do Not Cover Costs" (PAD-81-07, Mar. 13, 1981).

Even though existing contracts are long term, as many as 40 or 50 contracts per year may be renegotiated at various times to incorporate something the water user may want (increase in water deliveries, etc.). Such renegotiations provide the opportunity for the Federal Government to pursue greater cost recovery, if it so desires.

Financing--is there a better way?

Existing water resources projects were built and financed almost totally by long-term U.S. Treasury borrowing. The fiscal year 1983 request for water project construction funding is about $1.9 billion. The magnitude of future capital expenditures has not been and probably cannot be estimated with any degree of certainty. However, with rising construction costs, inflation, and interest rates, the price will be high.

Current budget constraints raise doubts about the availability of adequate financial resources or the willingness of users to increase their contributions. Alternative means of raising capital (greater State participation, Federal grants, State bonds, revenue sharing, property taxes, user charges, joint ventures, etc.) will need to be explored.

ISSUES THAT MUST BE ADDRESSED

Issues that need to be addressed include Federal cost allocations, repayment policies, and financing methods in light of today's conditions and whether they are fair and equitable to identifiable users and taxpayers. Specific questions are:

1. Should identifiable beneficiaries be required to assume a larger share of the costs of water provided by Federal water resources projects?

2. Are the debt repayment provisions such as interest rates and repayment schedules and procedures reasonable and consistent with legislative requirements, and do they need revision?

3. Is the Federal Government actually recovering the money due it under existing repayment agreements?

4. Should the water resources agencies require more realistic charges for water?

5. Are viable alternatives available which would reduce financial burdens now borne by taxpayers?

GAO ASSIGNMENTS IN PROGRESS

--Review of contracting procedures and water releases from Lake Tahoe.

--Review of the nonrecovery of Federal expenditures for operation and maintenance on major Federal water projects.

--Survey of the effect of proposed interest rate formulas on recovering the true cost to the Government of loaning money for reclamation projects.

WATER RELATED GAO REPORTS ISSUED

BETWEEN MAY 1980 AND APRIL 1982

"Contracts To Provide Space in Federal Reservoirs for Future Water Supplies Should Be More Flexible" (CED-80-78, May 16, 1980)

"Accounting for Collection for Operation and Maintenance Expenses" (Denver Regional Office, May 28, 1980)

"Financial Implications of a Proposed Monthly Water Service Repayment Change Under the Federal Reclamation Act" (CED-0-253, June 5, 1980)

"Managerial Changes Needed To Speed Up Processing Permits for Dredging Projects" Request of Chairman, House Committee on Merchant Marine and Fisheries (CED-80-71, June 9, 1980)

"The Bureau of Reclamation Penalty Rates for Delinquent Payments Do Not Comply with U.S. Treasury Requirements" (San Francisco Regional Office, Aug. 19, 1980)

"Rural Water Problems: An Overview" (CED-80-120, Aug. 20, 1980)

"Improvements Are Needed in USDA's Soil and Water Resources Conservation Act Reports" (CED-80-132, Sept. 3, 1980)

"Savings Available By Eliminating Duplicate Bonding Requirements" (Seattle Regional Office, Sept. 3, 1980)

"California Westlands Water District's Contract for Distribution and Drainage System" (CED-0-264, Oct. 10, 1980)

"Congressional Guidance Needed on Federal Cost Share of Water Resource Projects When Project Benefits Are Not Widespread" (CED-81-12, Nov. 13, 1980)

"Additional Federal Aid for Urban Water Distribution Systems Should Wait Until Needs Are Clearly Established" (CED-81-17, Nov. 24, 1980)

"Federal Water Resources Agencies Should Assess Less Costly Ways To Comply With Regulations" (CED-81-36, Feb. 17, 1981)

"Legal question on the Department of the Interior's compliance with law requiring a valid repayment contract as conditions for water deliveries to Westlands Water District" (Office of General Counsel, B-199162, Feb. 18, 1981)

"Federal-Interstate Compact Commissions: Useful Mechanisms for Planning and Managing River Basin Operations" (CED-81-34, Feb. 20, 1981)

"Federal Charges for Irrigation Projects Reviewed Do Not Cover Costs" (PAD-81-07, Mar. 13, 1981)

"Information on the Resale of Water Provided Under Contract by the Federal Government in California" Request of Congressman George Miller (CED-81-95, Apr. 21, 1981)

"Impact Uncertain Reorganization of the Water and Power Resources Service" Request of Senator Dennis DeConcini and nine other Senators (CED-81-80, Apr. 29, 1981)

"To Continue or Halt the Tenn-Tom Waterway? Information To Help the Congress Resolve the Controversy" Request of the Chairman, Subcommittee on Energy and Water Development, Senate Committee on Appropriations, and five other Members of Congress (CED-81-89, May 15, 1981)

"Information on the Resale of Federal Project Water Supplies Intermediaries" Request of Congressman George Miller (CED-81-102, May 27, 1981)

"Information on the Upper Mississippi River Basin Commission's Master Plan Contracting Procedures" Request of the Chairman, Subcommittee on Energy and Water Development, House Committee on Appropriations (CED-81-106, May 27, 1981)

"River Basin Commissions Have Been Helpful, But Changes Are Needed" (CED-81-69, May 28, 1981)

"Congressional Action Needed To Provide a Better Focus On Water-Related Research Activities" (CED-81-87, June 5, 1981)

"The Corps' Penalty Rates for Late Payments Are Not Based on Treasury's Current Value of Funds" (Kansas City Regional Office, July 15, 1981)

"Changes in Federal Water Project Repayment Policies Can Reduce Federal Costs" (CED-81-77, Aug. 7, 1981)

"Eliminating Contractor Inspections of Federal Water Projects Could Save Millions" (CED-81-146, Sept. 29, 1981)

"Reforming Interest Provisions in Federal Water Laws Could Save Millions" (CED-82-3, Oct. 22, 1981)

"Information on the Army Corps of Engineers' Contracting for Dredging Work on the Great Lakes" Request of Senator Donald W. Reigle, Jr. (CED-82-10, Nov. 10, 1981)

"Information on California Delta Water Quality Standards" (CED-82-30, Jan. 18, 1982)

"Corps of Engineers Should Reevaluate the Elk Creek Project's Benefits and Costs" (CED-82-53, Mar. 15, 1982)

"Information on Corps of Engineers Deauthorization Program for Water Projects" (CED-82-55, Mar. 23, 1982)

"Information on Federal Funding of Portions of the San Luis Unit of the California Central Valley Project" (CED-82-64, Apr. 13, 1982)

CONGRESSIONAL COMMITTEES

WITH WATER-RELATED RESPONSIBILITIES

Senate

Committee on Appropriations
- Subcommittee on Energy and Water Development
- Subcommittee on Interior
- Subcommittee on Transportation

Committee on the Budget

Committee on Energy and Natural Resources
- Subcommittee on Public Lands and Reserved Water
- Subcommittee on Water and Power

Committee on Environment and Public Works
- Subcommittee on Transportation
- Subcommittee on Water Resources

House of Representatives

Committee on Appropriations
- Subcommittee on Energy and Water Development
- Subcommittee on Interior
- Subcommittee on Transportation

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Committee on Energy and Commerce
- Subcommittee on Commerce, Transportation and Tourism
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Committee on Interior and Insular Affairs
- Subcommittee on Energy and the Environment
- Subcommittee on Water and Power Resources

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