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ORGANIZATIONAL ARRANGEMENTS FOR WATER DEVELOPMENT†

by

IRVING K. FOX* AND LYLE E. CRAINE**

Introduction

As the nation has grown and its economy has expanded, the demands for goods and services derived from water resources have grown in a similar manner. In response to these demands, a variety of water or water-related institutions—both public and private—have been established. Water institutions like other political and economic institutions have varied as circumstances seemed to dictate.

Since shortly after the turn of the century there has been a growing awareness that a more systematic design of water institutions may be desirable because of the nature of the water cycle and the interrelatedness of the natural resources of a river basin. Actually the fragmented pattern of organizational entities which emerged resulted in few serious conflicts as long as the supply of water was large in relation to demand—a situation which still exists in some areas of the nation. However, since World War II, with water demands of various kinds multiplying and with the increasing involvement of government in meeting these demands, the problems arising from haphazard growth of water development institutions have become increasingly evident. Mounting public concern has resulted in a succession of official studies which have devoted major attention to the problem of water organization.¹

In general, proposals for organizational improvements have been based upon an a priori premise that the problem was basically one of overlapping functions and bureaucratic ambition. Solutions have been sought through various combinations of four types of action: (a) consolidation of the several federal water

† The views expressed herein are those of the authors and not necessarily those of Resources for the Future.

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1. Notably the following: (a) U.S. Comm’n on Organization of the Executive Branch of the Gov’t, A Report to the Congress (1949); (b) President’s Water Resources Policy Comm’n, A Water Policy for the American People (1950); (c) The Report of the Missouri Basin Survey Comm’n, Missouri: Land and Water (1953); (d) U.S. Cong., Comm’n on Organization of the Executive Branch of the Gov’t, Report on Water Resources and Power, H.R. Doc. No. 208, 84th Cong., 1st Sess. (1955); (e) U.S. Cong., House Presidential Advisory Comm. on Water Resources Policy, Water Resources Policy, HR. Doc. No. 315, 84th Cong., 2d Sess. (1956). Prior to those post-war studies, two earlier studies of federal organization had made recommendations relating to reorganization of water agencies: Select Comm. to Investigate the Executive Agencies of the Gov’t, Organization of the Executive Branch of the National Gov’t, S. Rep. No. 1275 prepared by Howard G. Moulton, President of the Bookings Institution, June 19, 1937; and U.S. Cong., Senate, President’s Comm’n on Administrative Management in the Gov’t of the United States, S. Doc. No. 8, 75th Cong., 1st Sess. (1937).
resources agencies;  
(b) the creation of relatively independent valley authorities, either as a federal agency, or some combination of federal and state authority;  
(c) the establishment of various coordinating mechanisms, both in Washington and in the field; and (d) more precise division of responsibility among federal, state and local governments. Although wide areas of agreement exist as to the need for reorganization, and even as to the defects of existing organization, little agreement has been found for proposed solutions. Consequently, progress has been halting and trivial.

It is the premise of this study that most proposals for reorganization of water resource activity have been directed to treating the symptoms rather than the roots of the problem. *A priori* assertions of duplication, conflict and bureaucratic aggrandizement are not an adequate basis for understanding the problem. Nor are assertions of the sanctity of “states rights,” “grass roots initiative” and “local responsibility” sufficient criteria for analysis and solution. Organization for water resource development, as is true for any institution, is viable only if it operates in the context of the physical, social and political setting. Much has been written on the organization of water resources activities. Yet, there does not exist an analytical structure that permits consideration of the problem in terms of these fundamental environmental factors.

The purpose of this paper is to suggest such a structure and examine some of its implications. It is our hope that the structure presented will provide a firmer foundation for constructive thought and action regarding the organization of water resource activities.

In speaking of “water organization” our concern is with the total system of political and administrative relationships among institutions involved in the management and use of water resources. To simplify discussion, this range of activities will be termed “water development.” Excluded from consideration in

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3. During the period 1933 to 1945 several serious legislative proposals were made for Valley Authorities more or less patterned after TVA. For a summary of these, see Clark, Proposed “Valley Authority” Legislation, 40 *Am. Pol. Sci. Rev.* 62-63 (1946). Recent proposals for river basin organization have sought through some form of federal-state compact to amalgamate federal and state powers and interests. For example, see the proposed Missouri River Basin Compact published by the Council of State Governments (Jan. 1953) and the Delaware River Basin Compact.

4. Various boards, committees and coordinators have been proposed for the Executive Office of the President as a means of providing some greater unity of direction to the water development functions scattered among federal agencies. Likewise, various proposals have sought to strengthen the existing pattern of interagency river basin committees. The Report of the Presidential Advisory Committee on Water Resources Policy relies chiefly upon a related series of coordinating mechanisms for its organizational prescriptions.

this paper is the function of research and the advancement of technology. Also, relatively little attention is devoted to what is generally referred to as "water allocation law," although this body of law has an important bearing upon water development. In order to narrow the problem to manageable proportions, the analysis is limited primarily to what might be called "active producing institutions" and the factors that determine how they function.

There are four other premises on which the study is based. First, it is concerned with fresh water from natural sources. It does not examine the organizational implications of revolutionary technological changes such as desalinization of sea water or weather modification. Second, the study is based upon a premise that the goal in public water development should be to maximize net social satisfaction. At the same time it is recognized that operational criteria of maximum satisfaction is elusive, and that the utility of the concept as a goal may be disputed. Third, the study does not presume to be definitive. Instead it aspires to be a framework worthy of future elaboration. Fourth, it accepts the view that there probably is no single, best solution to the water organization problem. Our goal is not to seek such a solution but to establish as clearly as possible the conditions to which water agencies should be responsive, to understand the consequences of these conditions, and to suggest some boundaries within which viable institutional arrangements may be found.

The task undertaken in Part I of this paper is to identify, classify, and appraise the factors inherent in our physical, social, and political environment which bear upon the design of institutional arrangements for water development. This provides the analytical structure which is composed of four categories of factors:

1. The value system and its requirements for decision making,
2. The characteristics of the function of producing water services,
3. The significance of relationships among the processes of water development, such as: planning; installation of facilities or other measures of water management; operation of facilities or other management measures; and, distribution and marketing of services,
4. The general institutional environment.

In Part II we explore some of the implications of applying this analytical structure to existing problems of water resources organization.

Part I
AN ANALYTICAL STRUCTURE:
The Value System and Its Requirements for Decision Making

The underlying objective of institutions is to give expression to the values of society and to facilitate their realization. This objective then becomes a basic

6. For an assessment of these implications, see Ackerman & Lof, Technology in American Water Development, 628-57 (1959).
guide in considering organizational needs for public water development. Our first step, therefore, is to examine some elements of the value structure of American culture which affect the instruments of public water development decision-making.

Western culture, among other characteristics, is noteworthy for its concern for the welfare of its individual members. Thus, it can be said that an objective of society is to "maximize welfare." Welfare is, however, a concept that eludes precise definition. It consists of the satisfactions derived from goods and services — such as food, clothing, housing, transportation, music, and scenery. It also includes less tangible satisfactions, such as knowledge, freedom, power, prestige, stability, security and health. Implicit in the concept of welfare is not only the quantity but the quality of satisfactions derived over time from both tangible sources. Also involved is a concern with "equity" or the "fair" distribution of satisfactions among the members of society. Welfare is not maximized if satisfactions are concentrated among a few while others are in want.

In addition, in Western culture there is a primary reliance upon the individual to determine the composition of satisfactions which will maximize his own welfare. This underlies an economic theory based upon the concept that the consumer is sovereign. It supports a political system erected upon the belief that individual views should weigh heavily in deciding upon the course of public action. It upholds a philosophy that respects minority views and desires. In short, the sum of individual preferences regarding the quantity, quality, and distribution of satisfactions is the measure of maximum social welfare, with each individual, in making his judgment restrained by a philosophy of respect for the needs and desires of others. Therefore, in considering the design of organizational arrangements for water resources development, the basic question is whether the design fosters the realization of maximum welfare as such welfare is defined by the sum of individual preferences. This question pervades the remainder of the paper.

Implicit in the concept of maximum welfare is the concept of efficiency. In other words, society seeks to maximize the net satisfactions to its members, i.e. total satisfactions less satisfactions foregone. In doing so, the economic principle of relating marginal social costs to marginal social benefits is applicable. This

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7. This is, no doubt, an oversimplification of concepts that have been treated at length in the literature on welfare economics. (See, for example, Little, A Critique of Welfare Economics (2d ed. 1957). Several points merit emphasis: First, we do not wish to infer that utilities are subject to mathematical manipulation. Second, since it is assumed that the individual is the only competent judge of his own welfare, the effectiveness of institutions is indicated by the extent to which they facilitate a reflection of individual preferences. Third, since individual preferences may on occasion conflict, there is a theoretical balancing of utilities for some against disutilities for others to achieve what society considers to be a social optimum. This is accomplished through economic institutions, political processes and social conventions. (See Arrow, Social Choice and Individual Values (1951)). Fourth, although we use the language of the economist throughout the paper, terms such as "costs" and "benefits" apply to the full range of values involved in welfare as defined above.
means that unless the increase in satisfactions from committing each additional unit of productive resources exceeds the loss in satisfactions which would be realized if that resource unit were devoted to other purposes, resource use is inefficient and maximum welfare may not be achieved.

The pattern of satisfactions that flow from water resources depends upon the decisions that people make through their institutions about the way water should be developed and used. Water development institutions should, therefore, provide decision making machinery which will foster welfare maximization, taking into account the complex nature of welfare as previously described. Ideally this machinery will (1) express relative values as they apply to satisfactions received and satisfactions foregone in any proposed development action, (2) identify as nearly as possible the point where the marginal returns from the use of a given amount of resources fails to match the marginal returns from feasible alternative uses or from satisfactions foregone, and (3) operate to constrain allocation of resources beyond that point. Where do we turn to find these prerequisites of organizational arrangements?

For those goods and services which most nearly satisfy the conditions for the operation of the classical economic model, the competitive market may offer the best and simplest institution for achieving efficiency and for maximizing social satisfactions. In the economic model, the market expresses the relative values of the buyers and sellers, the point of equal marginal benefits and costs is determined by each individual and the market response constrains the process of resource allocation. Thus, economic market, in theory, provides a simple, automatic and democratic method for individuals to express their values and for the productive machinery to identify marginal utilities and respond with an efficient allocation of resources. Certain kinds of water development services have been supplied efficiently through the private market. However, progressively, both the kinds of services demanded and the conditions under which they are produced impair the effectiveness of the market in allocating resources to achieve maximum social satisfactions, and government to an increasing extent becomes involved, substituting the political process for market forces.

With governmental operations, the conceptual problem of comparing marginal social benefits and costs to maximize welfare remains the same but the procedures change. In the private economy the market articulates the relative values of consumer and producer and reconciles them in the production and distribution process. Unfortunately, we have no model of institutional procedures for public decision-making erected on the prerequisites of expressing relative values, identifying marginal utilities and constraining resources allocations accordingly.

To the extent that the recipients of water services are confronted with the costs thereof, either as consumers or as taxpayers, the public water development decision may approach a marginal utility judgment. However, in many situations the relationships are much more complex. Often the significant public benefits
are not only intangible in the eyes of the taxpayer, but they are dispersed and difficult to attach to any specific taxing jurisdiction. Collective, subjective judgments regarding willingness to pay may be handicapped by the haze of uncertainty about the values involved, and by the distortions arising from failure of the voter who exerts pressure for development to be directly confronted with an appropriate share of the cost as a taxpayer. Under these conditions how are relative values to be determined and marginal costs and benefits compared?

Our problem then may be summarized briefly as follows: The objective in designing organizational arrangements for water development is to facilitate welfare maximization. Implicit in the concept of welfare is the applicability of the principle of comparing marginal costs with marginal returns. It is generally accepted that for many activities the competitive private enterprise system applies this principle with considerable effectiveness. In some circumstances the private enterprise system has not worked so well. Thus we pursue two questions:

1. Under what circumstances does governmental intervention offer promise of a closer approach to welfare maximization than primary reliance upon private institutions?
2. When government participates in water development, what institutional relationships are most likely to give expression to relative social values, encourage the search for the point of equal marginal benefits and costs and constrain resource allocation accordingly?

An initial step in the search for an answer to these questions is to examine certain inherent physical and economic characteristics of water development that bear upon these issues.

CHARACTERISTICS OF THE FUNCTION OF PRODUCING WATER SERVICES

Certain physical and economic characteristics of water resources directly condition the process of maximizing social welfare from water development and consequently influence the organizational arrangements necessary for water development decisions. Four of these are of primary importance.8

Physical Interdependencies

The first is the effects of the physical interdependencies which stem from the fluid character of water. These are of two kinds. One is the multiple-purpose potentiality of water development sites. The provision of one kind of service from a given site may impair or enhance the opportunity for other services from the same development site. For example, the construction of a reservoir for the production of hydro-electric power may automatically provide recreation services or navigation. In other instances the effects may be negative rather than positive,

8. For fuller discussion of these see Krutilla & Eckstein, Multiple Purpose River Developments, 52-70 (1958).
as is the case when reservoir draw-downs for power production impair the boating, fishing, and scenic values of a reservoir.

The other result of physical interdependencies is for development at one location to have important physical, and consequently economic, effects some distance away. Thus effluent discharged into a stream may result in water treatment costs to a downstream user; a storage dam may increase power output potentialities at downstream locations; pumping from wells in river valley alluvium may eventually reduce the flow of a river; or land treatment may influence water yield and water quality.

These physical interdependencies may result in advantages and disadvantages to others besides the developer of a single site. In such cases they are referred to as external economies and diseconomies. Unless externalities are in some manner institutionally "internalized," all considerations necessary to the selection of optimum development schemes may not be injected into the decision process. The search for means of internalizing these economic consequences has led intuitively to the concepts of "multiple-purpose," "basin-wide" and "comprehensive development" as central ideas interwoven in water resources policy.9

It is well to recognize that these physical interrelationships often have practical boundaries. In an underdeveloped region a dam may be built which has substantial downstream consequences, but the economic significance may be negligible. Conversely, in a highly developed basin a minor use may have such inconsequential effects downstream that they do not warrant consideration. In other cases, the external effects of a given use may extend only for a limited distance. In a large basin, for example, upstream storage is of limited significance in the lower reaches of the basin. Similarly, organic pollution may be completely oxidized after being in the stream channel for a certain distance. In short, external effects may not involve significant economic consequence even when the physical effects are large. And further, where they are economically significant, they may be limited to an area substantially smaller than the drainage area of a river basin.

It is evident, therefore, that the case for the river basin as the water development unit is not as absolute and clear-cut as it is often assumed to be. Actually, the critical factor in determining the geographic boundaries of a development unit would appear to be the extent and significance of the economic consequences stemming from hydrologic interrelationships.10

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9. Gilbert White has identified and analyzed the evolution and significance of these concepts in "A Perspective of River Basin Development," 22 Law and Contemporary Problems 157-87 (1957). The technical aspects of multiple purpose development and basin-wide water management are treated in detail in Ackerman & Löf, Technology in American Water Development (1959). See particularly ch. IV.

10. For an analysis of the physical effects of upstream measures on downstream flood flows, see Leopold & Maddock, The Flood Control Controversy, chs. 4, 5 (1954).
Indivisibility of Services

A second physical and economic characteristic of water development which has significance to organization structure is the indivisibility of certain water services. Flood protection is a good example of such a service. Generally it is impracticable to build a levee or a reservoir to protect the land of a single owner. Yet, all riparian ownerships in a given reach of a river will be protected by a flood control structure, and it is usually difficult, if not impossible, to exclude those who benefit but do not wish to pay. Since flood protection service cannot be marketed in discrete units, it is necessary to resort to government taxing authority to support the provision of a flood damage reduction service. The same principle is applicable to certain other water services. If an aquifer is recharged, the increased supply in most jurisdictions is available to all properties overlying the aquifer. Similarly scenic values of an area may be enhanced and these benefits become available to all who have access to the area. The natural quality of stream flow may be improved through regulation which will benefit all who hold legal rights to use the stream. In each of these examples, if the funds required for providing these services are to be secured from those who benefit or from others, it is necessary to resort to governmental authority.

Economies of Scale

The fact that water developments may provide opportunities for economies of scale is a third physical-economic characteristic of water resources which has organizational implications. Such economies of scale apply generally to reservoirs, canals, levees, and ground water recharge facilities. Optimum size for these facilities will vary depending upon physical conditions and the potential market to be served. However, unless organizational arrangements make possible such large-scale operations as may be desirable, economies will be sacrificed, and something less than an efficient allocation of resources will result.

Economies of scale in individual projects, combined with the physical interrelationship among projects, make a powerful case for large-scale hydrologically integrated development schemes. In some cases where the available market is of sufficient size, it is desirable to integrate the development and operation of two or more river systems. This may be done in several ways. Where power is an important product, dams and generating facilities on two or more river systems may be designed and operated to complement one another. Basins may be hydrologically interconnected and then managed to optimize water yields at given locations for withdrawal purposes. Or one river may be dedicated to limited uses which are incompatible with uses made of an adjoining river basin. This is done in the Ruhr Region of Germany where the Emscher is used primarily for

11. There are numerous examples of this in the West. Preliminary plans for development and management of water resources in Texas envisage an exchange of water supplies among five parallel river basins and coordinated management of the group.
waste disposal and the Ruhr is maintained primarily for water supply and recreation purposes.\textsuperscript{12}

There is also evidence of economies of scale in the provision of the technical skill required for efficient development and management of water resources facilities. This, no doubt, was an important reason for the early participation by the Corps of Engineers in river basin development.\textsuperscript{13} Because that organization had assembled a competent body of engineering skill, it could do a more efficient job of river basin development as a nation-wide organization than could have been done by assembling special engineering groups for individual river basin areas or projects. This situation has no doubt changed. Today it is doubtful that there is any particular advantage in having a large-scale national organization in order to provide the technical skill required for planning and managing a river basin efficiently. There still appears, however, to be one kind of service for which centralized facilities may be more efficient than separate facilities for each region or basin. This is the detailed design (sometimes involving a certain amount of experimentation) of specific engineering structures. To meet this need, the Corps of Engineers maintains a large-scale design laboratory at Vicksburg, and the Bureau of Reclamation maintains a somewhat similar installation in Denver. The indications are that it is more efficient to provide this type of service at one or two centralized establishments than through a number of facilities over the country.\textsuperscript{14}

Efficiency dictates that advantages be taken of such economies of scale as are possible. Although the conditions which once demanded that engineering skills be pooled in large national organizations no longer exist, compelling economies of scale are still possible in the selection of the geographic area to be treated as a development unit. In these, the desirable scale will depend upon the physical character and the development and market potential of the region. Achieving scale economies usually results in some degree of monopoly which in turn becomes a consideration in designing water development organization.

Benefit${s}$ Difficult to Quantify

A fourth aspect of water resources development that is significant for welfare maximization is that some of the benefits and costs identified with water development are difficult to quantify. In other words, it is difficult if not impossible to place a market price on some of the services people derive from water de-

\textsuperscript{12} See Fair, Pollution Abatement in the Ruhr District, \textit{Comparisons in Resources Management} 142-71 (Jarret ed. 1961).

\textsuperscript{13} For a discussion of the early role of the Corps of Engineers in water development, see Hill, \textit{Roads, Rails and Waterways, the Army Engineers and Early Transportation} (1957).

\textsuperscript{14} To our knowledge there has been no explicit study of this issue. Our judgment is based primarily upon a familiarity with the type of work done in these laboratories.
Not only does this mean that such services are non-vendible, but it is analytically impossible to make a quantitative determination of relative values and compare marginal costs and benefits.

These services are of three types, namely (1) those concerned with public health and safety, (2) those of an aesthetic nature, and (3) those concerned with certain other goals of a social nature. Public support for pollution abatement and flood control programs originally stemmed from a popular concern for the health and safety of those who might be adversely affected by pollution and floods, although monetary benefits to many individuals might also be realized. Recreation opportunities are often considered as meriting a measure of public support beyond what would be derived from the sale of recreation services. In many cases major opposition to reservoir construction stems from a concern over the adverse effects of such development on scenic values. Water development has long been viewed as an instrument for fostering economic development of particular regions or as an economic stabilization measure. Impacts of this kind have been difficult to quantify. No doubt much more could be done than is now done to measure benefits and costs of this nature. Also, some will hold that benefits and costs of this type merit little consideration. The fact remains that considerable significance has been attached to such benefits in the justification of water projects. Furthermore, there is little doubt that in the years ahead the effects of water development on aesthetic values and existing patterns of living will receive a great deal of attention. Where such values are considered significant, governmental institutions responding through the political process must be relied upon to weigh marginal social costs and benefits.

Some General Implications

The foregoing physical and economic characteristics of water development are of far-reaching significance for the design of water development institutions. There are four implications which we believe warrant emphasis.

First, the decision-making process requires that organization arrangements embrace a geographic area large enough to take into account the practical effects of physical interdependencies and economies of scale. This area may be a river basin, a major portion of a basin, two or more basins, or portions of two or more basins. There is no general answer. A determination should be based upon physical and economic conditions in the basin and in the market area to be served.

It does not follow necessarily that a single agency should have full responsibility for the development within the specified geographic area, although this may be the simplest solution. In theory, at least, the same result might be accomplished through a combination of agreements among two or more development agencies and public regulation. The alternative possibilities will be explored more fully in Part II. There is no a priori evidence that nationwide

15. Appropriate terminology for services of this kind is difficult to select. Wantrup prefers the term "extra-market" values (see Ciriacy-Wantrup, Resource Conservation, Economics and Policies 85 (1952); others have used the term "intangible.")
organizations for water development are superior to organizations which embrace an area of sufficient size to take into account scale economies and physical interdependencies. However, centralized design laboratories that serve a number of development units may offer opportunities to increase efficiency of development.

Second, private institutions operate under considerable handicap in seeking to maximize welfare for some services and under some conditions. Some of the services are non-marketable because of indivisibilities or because they are considered as having a public value not measured fully by market prices. Frequently, private development units are not large enough to take into account physical interdependencies. Because of economies of scale, development units capable of economizing tend to be monopolistic so that competitive forces do not function as effective regulators. These conditions invite public intervention, either through regulation, public subsidization of private development, or public development. All three approaches are currently utilized in the United States.

Third, public water development, particularly in view of the public involvement in related fields such as agriculture, transportation, power, recreation, and land use generally, results in a complex problem of weighing alternative means of improving welfare. The government seeks certain welfare objectives in each of these fields and at the same time may have certain economic stabilization, regional economic development, and income redistribution objectives. Public activities in the water development field may bear on each of these. In short, there arises a problem of determining what kind and scale of water development will maximize welfare in view of alternative ways of meeting specified welfare objectives. Is a proposed water development the least costly way of providing certain recreation benefits, agricultural products, transportation facilities, or for meeting certain regional development objectives, economic stabilization goals, or income redistribution objectives? Is it consistent with land use plans formulated by local jurisdictions? Private competitive forces cannot be relied upon to make this determination for the reasons already indicated. Involved are questions which cut horizontally across agencies of government and vertically through levels of government. If the alternatives are to be weighed in any systematic manner through public institutions, special machinery for this purpose appears to be required.

Fourth, although government may be called upon when private institutions are found to be incapable of satisfying the welfare objective, the problem of how to motivate governmental institutions to make welfare maximization decisions is central to organizational design. The private market, while suffering from the disadvantages described above, has the virtue of permitting each individual to express his choice through the way he spends his money.\textsuperscript{18} Government...
ment decisions, however, theoretically reflect the wishes of the majority. The question then becomes how to assure, on the one hand, that majority decisions do not veto all minority desires, and on the other, that a vocal minority does not command the governmental decision process to the disadvantage of a significant but unexpressed majority.

The Relationship Among Water Development Processes

The production of water services generally may be thought of as involving four processes: (1) the planning of production facilities and other measures, (2) the installation of facilities and measures planned, (3) the operation of facilities, and (4) the distribution and marketing of services produced, including the installation and operation of distribution facilities. Early water developments required little distinction among these processes. The need for a new facility to provide a water service appeared as a unitary job, and usually a single authority was engaged to do it. With the emergence of multiple-purpose technology, large-scale development, and a complex economic system, the situation has changed. Now any one of these processes may be a substantial task and therefore may conceivably justify a separate organizational entity. Accordingly, the relationship among these processes becomes one of the important issues in the design of organizational arrangements for water resources development.

Practices have varied and opinions have differed on the extent to which the processes of water development should be integrated, combined within a single agency, or divorced from one another. The National Resources Planning Board emphasized the planning process in river basin development. More recently the responsibilities of two interagency river basin committees and two interagency river basin commissions have been limited to planning. The TVA experience has supported the integration of all four processes in a single agency and the other federal agencies have to a major degree operated in this manner. On the other hand, the desirability of closely integrating the four processes has been questioned by some of the students of administration. For example, Charles McKinley, in analyzing the valley authority idea, has expressed the opinion that what needs to be treated as a unit for planning purposes, need not be treated as a unit for operating purposes.\(^17\) Fesler further challenges the demand to organizationally unify processes, by declaring that,

> The main point to be made in that planning-construction-operation can be thought of as a chain of weak links. So regarded, the argument that all three stages of water-related activities must be organizationally united loses its prima facie validity.\(^18\)

It is difficult to resolve this issue in a definitive manner, but we believe that


the problem can be illuminated through a more careful examination of the relationship between each of these processes as they bear upon water development decision-making.

Considerable importance is justifiably attached to the planning stage. It involves an assessment of demand for services that might be provided through water development, a determination of the potentialities for providing the services at a cost justified by the demand schedule, and the design of the facilities to be provided. In public agencies, it is the planning process that engages public attention. If this aspect proceeds effectively, public support is usually solidified behind the plan by the time the planning process is completed.

The installation process is usually thought of as the construction of some type of facility. Actually the term is used more broadly in this study to include all measures involved in implementation of the plan. It is conceivable that no construction of river engineering works will be necessary. The plan may involve certain land treatment measures, the purchase of certain lands, alteration in the operation of existing works, regulation of the type of water use, the adoption of certain pricing practices, land use zoning, and the adoption of certain pollution abatement practices. Often measures of this kind will be combined with the construction of river engineering works.

In the installation process, the specification of facilities and measures is the step that is critical to the water development decision. The integration of specification decisions with related decisions in the planning and operations processes is, therefore, a necessary objective of organizational design. Other phases of the installation process do not seem to possess such close interdependencies in the development decision as to require organizational unification with the other processes. In fact, there is considerable support for the view that the construction activities associated with river basin development should be insulated from the design and specification determinations. It is argued that existing construction agencies have become powerful units of government supported by their own clientele and with intimate ties to the Congress. Under this pattern of organization for river basin planning, construction has tended to become an end in itself. The amount of construction too easily becomes the measure of progress; and the goal implicitly becomes one of maximizing the construction budget instead of maximizing welfare. Separating construction from the other processes would make it possible to redress the balance between structural and non-structural

18a. In recent decades the water development planning process has been confused by efforts to identify it with a type of regional economic development planning. As a result its scope becomes unclear, and large amounts of economic data have been assembled by water development planning institutions which have little bearing on the demand for water development services. Our attempt to circumscribe water development planning is in no way intended to de-emphasize the importance of economic development planning. To the contrary, our position is that water development planning requires sound social and economic planning parameters which should be provided by organizations for that purpose, rather than by water development agencies.
measures in the process of choosing the most desirable combination of methods for the production of water services.

The operation of facilities is generally thought of as the regulation of stream flows through the control exercised by dams and diversion works. This type of operation is certainly an important one, involving as it does the production of power, the control of floods, and the rendering of a variety of benefits associated with streamflow stabilization. However, the operating process should also be thought of as including (1) the enforcement of land and water use measures, and pollution abatement practices, and (2) the management of lands intimately associated with river flows, such as those on which treatment measures designed to influence streamflow are practiced. A significant point about the operating stage is that it is of growing importance as development advances. The Columbia, the Missouri, the Colorado, and the Arkansas are rapidly approaching the time when operational questions will be among the most significant issues in efforts to maximize water services.

The distribution or marketing process is considered to involve three or more subprocesses. In these terms the process begins with disposition by the producing unit to the wholesaler, who in turn disposes of the service to a retailer who sells to the final consumer. Some water services follow this pattern while others may combine two or all three stages into a single process. At dams constructed by the Corps of Engineers, the Department of the Interior acts as wholesaler for power retailed by cities and co-operatives. Some power is marketed by the Department directly to individual industries. The Bureau of Reclamation may, in effect, sell water supplies to water districts which likewise retail the water to farmers or wholesale the water to cities for retailing to domestic and industrial users. Recreation benefits may be made available to the public generally by the development agency or the task of making recreation available may be sublet to a park and recreation agency. Waste disposal benefits may be received directly by individuals or via a municipal waste disposal system.

In the interest of decision-making that will foster welfare maximization, what degree of integration among the four processes is appropriate? Our conclusion may be thought of more as a hypothesis than as an established proposition. It is based upon logic and personal experience. Our view is that there should be close administrative and organizational ties among the process of planning, the design and specification of the measures to be installed or built, the operation of facilities, and the first stage of the distribution process. This general conclusion is based upon the following:

1. Although water development influences economic development and land use, it is generally a minor component of each of these.\textsuperscript{19} Water develop-

\textsuperscript{19} For a discussion of the relative significance of resources development in regional economic development, see Krutilla, Criteria for Evaluating Regional Development Programs, 45 Am. Econ. Rev. 120-30 (1959). See also Fox, Water Development as an Instrument of Public Economic Policy, Some Aspects of Water Resources, a series of papers
ment should be planned in light of the demand for services from water that arise from economic development and land use objectives. However, these ties need not be any stronger than ties to agriculture, power, or transportation. At the same time there are imperative ties to other processes of water development.

2. To be effective, planning must control the installation of measures and the construction of facilities. For this reason it is essential that the planning unit have control over the specification and timing of measures to be installed or built. Provided that planning has such control, construction facilities may be undertaken by a separate agency.

3. There should be a relatively close tie between planning and operations because (a) it is in operations that plans are realized and (b) as rivers are developed the major concern of planning will be with the adjustment of operations.

4. The agency concerned with planning, development, and operating facilities should be responsive to the practical problem of marketing the services it provides. This is not to suggest that the development unit should be responsible for retailing its services but it should at least face the problem of making its services available in a way that satisfies the purposes for which it exists.

In summary, then, it is our conclusion that a water development agency should have full responsibility for a range of processes extending from planning through to the first stage of the marketing process. Construction can be separate provided that the development agency is responsible for construction specifications. Contrary to some views and some recent practice, we believe that responsible decision-making requires the close linkages described.

INSTITUTIONAL ENVIRONMENT

By far the most complex group of factors and the most difficult to take into account in the design of organizational arrangements for water development stem from what we call the institutional environment. These factors are deeply imbedded in our history and tradition and reflect the complexity of modern social and political institutions. The statement which follows seeks to identify presented at a 1960-61 Seminar at Cornell University and published by New York State College of Agriculture.

20. Our conclusion conforms to the recommendations of Roscoe C. Martin and associates in River Basin Administration and the Delaware (1960), at 347-55. We recognize that it differs sharply from the views expressed by McKinley and Fesler. This difference may stem in part from a different conception of the planning process. The process as we define it is limited to water. There is much support for the view that there should be a type of broad regional economic planning that embraces water development. We would not preclude such a possibility. Water development plans, however, should be made in light of such over-all plans but the organizational connection between water development planning and regional economic planning should not, in our judgment, be as strong as the connection between water resources planning and the other water development processes.
the major features of the institutional environment that bear upon organizational arrangements for water resources development. There is no pretense that it is a definitive statement. The factors are classified into three major groups as follows: (1) characteristics of the economic system, (2) characteristics of the governmental system and (3) the urban-industrial nature of American society.

**The Economic System**

There are two features of the American economic system which have an important bearing upon the organization of water resources development activities. First, is the commitment of American society to the use of private economic institutions. In part, this commitment finds its basis in the classical economic model wherein it is believed that competitive forces result in an efficient allocation of resources, and the dependence upon the competitive market preserves a maximum freedom of choice for the individual. In addition, however, there are many evidences of strong cultural preferences for private enterprise which go deeper than these rational expectations. The net effect of this commitment is that generally speaking, the advantages of public intervention must be clear and demonstrable before there is widespread support for such action. Further, when the need for public intervention is accepted, there is a predisposition to favor public regulation of private institutions over the substitution of public development agencies for private organizations.

The fact that the American economic system is characterized by a mixture of public and private endeavor is a second feature of significance to water development. Thus water development — whether by public or private enterprise — is, and must be, constantly influenced by governmental actions. Most of the services with which water is concerned — such as agriculture, transportation, power production, and recreation — are influenced in large measure by governmental action, apart from such considerations arising from public water developments *per se*. As a consequence, there are public policies in each of the fields (at times confused and conflicting) which bear upon the welfare maximization objective of water development. The presumption must be that these policies are designed to maximize welfare, and therefore water development policy must be consistent with them if it is to maximize welfare. Thus it becomes necessary to establish relatively close linkages between public water development policy and public policies relating to the services with which water development is concerned.

**The Governmental System**

Since government becomes deeply involved in water development, certain basic features of our governmental system have an important bearing upon the organization of water resources activities. Although these features are interrelated in a complicated manner, we seek to differentiate among three types that bear upon the organizational problem. These are the constitutional framework, the changing role of the national government, and the nature of the political process.
The constitutional framework of American government as it has evolved over time. Three elements of this framework are of major significance to the organization of water resources activities:

1. The pattern of authority, responsibility and relationships which has emerged between the federal and state governments.¹¹

The geography of the federal system presents a pattern in which major river basins, with a few exceptions, transcend state boundaries. As a result, many of the external effects of water development are interstate in character. This situation is a major factor in the organization of public water development programs.

The responsibility of the national government for foreign affairs,²² for the control of interstate and foreign commerce²³ and for the management of federally owned property²⁴, are the keystone to water development relations between states and the national government. Wherever the development of river basins shared with Canada and Mexico results in externalities affecting those countries, the national government will have a major concern. Under the Commerce Clause as it has been interpreted by the Courts, the federal government is permitted to undertake broad programs of water resources development, not only on navigable waterways but also on tributaries and watersheds that drain into navigable waterways.²⁵ The property clause has been interpreted to permit the federal government to engage in water development activities involving the use of its properties. As a result, the federal government may and has engaged in a full range of water development programs in spite of the constitutional concept that the states exercise all residual powers of government not specifically designated as federal powers.

In addition to the specific powers of the federal government as a consequence of the Commerce Clause and federal control of international relations, there has been a general shift in the balance of power over time to the federal government. This shift may be attributed in large measure to the transformation of American society as a consequence of industrialization and urbanization which has made the various sections of the nation increasingly economically interdependent. The shift has been associated with some lack of confidence in state government which many students believe tends to continue in part because of under-representation of urban areas in state legislatures. The early preemption of the income tax field by the federal government has provided it with a superior


24. U.S. Const. art. IV, § 3.

financial capacity and thus strengthened the central government in relation to the states.

The foregoing factors have combined to establish a powerful role for the federal government in the water development field. It has become a major source of capital investment funds, and it supports, as federal programs, practically all of the large scale basin-wide developments. At the same time, the role of the states is not insignificant. The framework of law governing property rights in water is largely state law. Much of the public regulation of water use is based on state law although on navigable waterways the federal government has been playing, to an ever increasing degree, an important part. Local public and private water development institutions are established and operated in large measure under a state legal framework. And there is a growing need for the states and the local units to exercise their power of benefit assessment and land use regulation as supplementary measures in comprehensive river basin development schemes. In short, there is a complex interrelated pattern of federal and state institutions involved in water development. The basic features of this pattern are unlikely to change in the foreseeable future.

2. The relationship between the executive branch and the legislative branch that prevails at the federal level and to some extent in the states.

The prevalent view is that most of the initiative for policy change as well as responsibility for conducting governmental programs rests with the executive branch whereas the legislative branch reacts to and endorses, modifies, or rejects the proposals initiated by the executive. The actual situation is not so simple. As experienced federal officials are well aware, Congress is deeply involved in both initiating policy and in administration through a web of informal relationships between individual members and committees of Congress on the one hand, and executive branch officials on the other. As government has become more complex, this web of informal relationships has become more significant in decision-making. Public organization for water development must be designed in light of the fact that this is the way government functions in the United States and that decisions bearing upon welfare maximization will be made in this way.

3. The fact that representation in legislative branches of government is based upon a geographic area.

This feature of the American constitutional framework has posed a special
problem in the field of water resources development. Water development has its greatest impact in the area in which the development is located. If the costs are borne by taxpayers generally, there is the quite natural inclination of local constituencies to support politically a proposed development even though such development is contrary to the interest of the national community. This is not to imply unethical behavior but to recognize the natural inclination of people to identify self interest with the larger community interest. In Congress this has led state delegations to trade support for water development programs, or the process that is derogatively referred to as "log rolling." 27

Although the practice has been sharply criticized, it stems from a basic feature of American government. Thus a major task in the design of public institutions for water development is to establish arrangements for decision making which will encourage members of the Congress to face up to the broader questions of social welfare which are involved in each development proposal.

THE FOCUS AND COMPLEXITY OF THE NATIONAL GOVERNMENT

Another feature of the American governmental system which bears upon the organization of water development activities is the revolutionary change in the focus of the federal government which has occurred since 1940. Prior thereto the principal concern of the national government was with domestic problems. Since then the federal government has been profoundly altered in two respects. First, problems of national defense and international affairs have moved to a central position and now constitute the major concern of the national government. Second, domestic problems have ramified as a consequence of major changes in American social and economic life — particularly those associated with urbanization and further industrialization — and much of the leadership in these problems has fallen upon the federal government. As a result, the complexity of the federal government has multiplied and the difficulty of reflecting accurately the public interest in a manifold range of governmental decisions has increased immeasurably. Thus water development decisions in which the federal government is involved not only tend increasingly to have their primary impact upon specific areas, but they must be made in a governmental environment burdened with a tremendous range of problems, including international issues of momentous importance.

THE NATURE OF THE POLITICAL PROCESS

Related to both the constitutional framework and the rapid changes that have occurred in the national government, is the nature of the political process as it has evolved in response to a variety of forces. A complex political and economic system based upon an advanced technology has meant that complex considerations underlie the decisions made by public agencies. Organized interest groups have developed to keep abreast of these considerations and to reflect their positions on issues before the electorate, the legislators and the administrators.

Such interest groups and their activities have come to be relied upon as essential ingredients of the political process in modern society, but an important problem remains. A large unorganized sector of society tends to be under-represented in the political decision-making process. Not only do the interests in this segment of the electorate lack organized representation at key points in the decision-making process, they frequently do not have facilities for examining the ramifications of a problem, many of which, in today's world, may be highly technical.

As applied to water development, the tendency is for the public agencies to respond to the wishes of the organized interest groups in planning and undertaking programs. The broader public, which as taxpayers may be bearing a major share of the cost, may not even be aware of the issues. If the welfare maximization objective is to be taken seriously, some means must be found to overcome this problem.  

The Urban-Industrial Nature of American Society

The nature of American society determines the nature of the demand for water and water-related services which in turn bear upon the organization problem. Much could be said on this subject, but this analysis will be limited to two aspects of the relationship between the urban-industrial nature of society and the organization of water development activities.

First, this kind of society makes a heavy demand upon water resources for (a) waste disposal and (b) what may broadly be called recreation. In many regions of the nation these demands will dominate the water development picture in the future. It is difficult to meet these demands at optimum levels of resource allocation through the operation of market forces. The values are difficult to quantify and the external effects may be large. Thus the nature of demands of an urban-industrial society suggests that services demanded of water development will increasingly be those associated with an urban society and that public intervention will be required to approach the welfare maximization objective.

Second, an urban-industrial society has a great interest in the influence of water development upon land use. Such influence may stem from flood control, irrigation, the location of recreation facilities, and the inundation of lands by

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28. For discussions of special interest groups in the natural resources field, see Maass, Muddy Waters at 37-60 (1957); Wengert, Natural Resources and the Political Struggle (1957); and Ridgeway, The Missouri Basin's Pick-Sloan Plan, 35 Ill. Studies in the Social Sciences (1957).

29. Although the estimates are admittedly crude, it is noteworthy that projections of water demand for the Senate Select Comm. on Water Resources suggest that in the future waste disposal will, by far, place a greater demand on our water supplies than all other uses combined. See Comm. Print No. 32, Water Resources Activities in the United States, 86th Cong., 2d Sess., August 1960.

30. This judgment is widely accepted. It underlies the report of the Outdoor Recreation Resources Review Comm'n, Outdoor Recreation for America (1962). For a discussion see Clawson, The Crisis in Outdoor Recreation, 65 American Forests (March, April, 1959).
reservoirs with consequent effects upon the location of transportation facilities
as well as upon the use of lands for other purposes. In an urbanized society land-
use decisions like water development decisions involve important externalities.
In response thereto, governmental institutions become involved in regulating
land-use in a variety of ways. Accordingly, when water development is under-
taken, it not only is of concern to the owners of the land affected, but in addition
it is of vital concern to the governmental entities concerned with land use in the
area. In short, water development decision-making aimed at welfare maximiza-
tion must be coordinated with the land use decision making processes of other
governmental agencies, frequently at the local level.

Some Implications of the Institutional Environment

A variety of important implications for water development organization may
be distilled from the foregoing analysis:

1. Because of a commitment to private economic institutions, private de-
velopment will be favored unless the advantages of public involvement are
clear and demonstrable. Furthermore, even where public intervention is
accepted, regulatory type action will be favored over public development.

2. A large federal role in water development has become clearly established
and is not likely to change substantially. Yet, it appears that state govern-
ment will retain a prominent position in the regulatory field, in the field
of property rights in water, and in providing the legal basis for private
development institutions.

3. The revolutionary change in the size, complexity, and focus of the federal
government in recent decades creates serious problems in making it as
responsive to the public interest in water development as it once was.
This suggests the need for simplifying the federal function in the water
resources field, as in others.

4. Since congressional decisions that bear upon the welfare of a particular
geographic area are subject to "log rolling"-type of agreements, organ-
izational arrangements should be such as to encourage Congress to con-
sider water development decisions in the broader context of social welfare,
rather than in a context that fosters a trading of support. Nevertheless,
the arrangement of water development activities at the federal level must
be designed to include Congressional participation in decision making in a
manner consistent with the constitutional framework of American gov-
ernment. Since these requirements tend to a degree to be incompatible,
they pose a difficult problem.

5. The nature of the political process and the problems requiring political
resolution suggest the need for special machinery to inform the unorgan-
ized sector of the public of the implications of alternative development
possibilities.
6. The urban-industrial nature of American society suggests that the demands upon water resources will be of a type involving serious external consequences and benefits and costs that will be difficult to quantify. Thus, this feature adds pressure for public intervention.

7. Two factors stress the need for coordination of water development decisions with related public policies and programs. The "mixed" nature of our economic system generally results in public programs in agriculture, recreation, power, and transportation supposedly designed to maximize welfare. Urbanization results in a major public interest in the pattern of land use as influenced by water development. Thus water development decisions must take into account the policies of other public institutions designed to maximize welfare, and alternative possibilities for meeting a given schedule of demand by both public and private institutions.

**Summary**

The factors examined in the foregoing analytical structure in some cases offset and in other cases reinforce one another. Unfortunately they cannot be assigned quantitative weights that can be used in the development of a precise decision-making model for which organization can be designed. However, they can be summed up in a manner that is useful in applying the structure to specific situations.

The value system establishes the objective of water development institutions, namely to maximize welfare as determined, insofar as possible, by individual preferences. The appropriate size for the water development unit and the degree of integration that is desirable are determined by (a) the relevance of interdependencies in the hydrologic unit, (b) the potentials for realizing economies of scale and (c) the unity among the processes from planning through to the disposition of services to the wholesaler. Because of the indivisibility of some services into discrete, saleable units, the difficulty of quantifying the value of some services (which are growing in importance in an urbanized society), and economies of scale (which make some development units monopolistic), public intervention is demanded to maximize welfare.

The nature of public intervention will be conditioned by certain basic features of our institutional environment. The case for such intervention must be clear and demonstrable and public regulation of private institutions will tend to be preferred over public development. A large measure of intervention by the federal level must be accepted because of (a) federal control over matters affecting other countries, (b) federal responsibilities that have been assumed under the Commerce and Property Clauses of the Constitution, (c) the growth of federal responsibilities that has occurred over the past century in many fields including water development, and (d) the fact that many river basins are interstate in character. But the state role is not insignificant because much of the legal basis for water and land use regulation, for the establishment of
property rights in water, and for the establishment of private water development institutions is provided by state governments.

But public intervention faces four difficult problems. Foremost among these is the problem of weighing alternatives. This is especially troublesome because some of the benefits are difficult to quantify, and because there is public involvement in areas such as recreation and agriculture for which water development provides services and in the determination of land-use by private institutions as well as by public agencies.

A second difficulty is that of finding an appropriate role for the legislative branch in participating in the development decision-making process. Legislative bodies not only have a policy making responsibility but under our constitutional framework they participate in decisions about individual projects—tasks usually thought of as being executive in nature. How can legislative responsibility be discharged satisfactorily in light of the fact that since legislators represent geographic areas, they tend to trade support for development programs in one another's districts?

A third problem results from the fact that development decisions involve complex considerations, many of which are of a quite technical nature. Organized interest groups examine these considerations and articulate their desires, but this leaves a major section of the electorate under-represented in the decision-making process. How can the relevant considerations be examined and brought to the attention of the unorganized public?

A fourth problem stems from the danger that majority decisions about water development will preclude realization of many individual demands. How can the public decision-making process be designed to permit minority interests to be taken into account in consideration of the demands for water development services?

The analytical structure set forth herein does not offer clear solutions to the organizational problem. It is hoped, however, that it may provide an improved research framework. For example, it suggests the desirability of empirical studies of particular geographic areas to examine the organizational relevance of interdependencies, economies of scale, and other factors for the design of water development institutions within the region. It also suggests the kinds of problems to which the design of public institutions should be addressed. Part II of this paper carries these suggestions a step further by posing some possibilities for organizational improvement that appear to warrant further examination in light of the analytical structure proposed in this section.

**Part II**

**APPLICATION OF THE ANALYTICAL STRUCTURE TO EXISTING ORGANIZATIONAL ARRANGEMENTS**

In the preceding section four groups of factors that bear upon the organization of water resources development activities in the United States were identified
and analyzed. In this section these factors are weighted as they might apply to efforts to improve the organization of water development activities. We seek to establish the main avenues through which improvement might be sought, rather than to prescribe a comprehensive solution.

THE BASIC FEATURES OF EXISTING U.S. ORGANIZATION FOR WATER RESOURCES DEVELOPMENT

There are three features of existing organizational arrangements which are of paramount importance in considering possible avenues of improvement. First, there are a relatively large number of generally single-purpose, separate agencies concerned with the production of services from water resources in a portion of a hydrologic unit. Second, the large development agencies with responsibilities that embrace whole river basins or major portions thereof have been established for the most part under federal law, their decisions tend to be dominated by clientele-oriented organizations, they emphasize engineering works, and historically they have been concerned with particular water uses. Third, to deal with the external effects of water development and use, existing institutional arrangements rely to a large extent upon regulatory law and administration, subsidy, and formal and informal coordination machinery. These three features are examined more fully below.

The Large Number of Small Single-purpose Water Development Units

Many services of water may be secured through relatively modest investments, provided that supplies are available. As a consequence, in practically every hydrologic unit the production of services from water is undertaken by many individual units which have little reason to be concerned with the external effects of their actions. Even when relatively large investments are necessary, the public or private agency seeking the services of water may confine its interest to a relatively small portion of a hydrologic unit. Thus we have an elaborate pattern of public and private agencies which develop in one way or another water services within practically every hydrologic unit.

The private institutions include farmers who develop surface or underground water supplies for stock, domestic purposes and for irrigation. There are private companies which have constructed dams for the production of hydroelectric power. Today self-supplying industries use large quantities of water for cooling and processing purposes. In these cases, the development facilities may be quite modest, no more than a pump or a stock pond for a farmer and possibly little

1. Many people consider that the large federal water agencies dominate water resources development. Actually about three-fourths of the irrigation in the U.S. has been developed by non-federal institutions. Other than irrigation, the major withdrawals of water are by industries which supply themselves. Municipal withdrawals and waste disposal are preponderantly non-federal activities. Even flood control was primarily a non-federal activity prior to the 1936 Flood Control Act. Only in the field of navigation has the federal government been dominant.
more than a diversion dam and pumping facilities for industry. The significant point, even when a large investment is made in a hydroelectric plant, is that the developing agency is concerned with only a portion of the hydrologic unit and has no economic motivation to take into account the external consequences of its action.

Most of the public agencies, as well as the private ones, are organized under state law, although some receive a measure of federal financial assistance. In some states, state agencies engage in water development activities in a modest way. These include Montana which constructs irrigation facilities, and Kansas, West Virginia, and a number of other states which have constructed water facilities for fish and game and recreation purposes.2 There are other states, such as Utah, Wyoming, and North Dakota, which assist in financing water development by local public units. Every municipality requires a public water supply and a means of disposing of its wastes. These facilities are generally supported through local fees and taxes, although some federal grant funds are now available to assist with the construction of waste disposal facilities. In several parts of the country, there are local public power agencies which construct hydroelectric facilities. These include the public utility districts in the state of Washington, the Grand River Dam Authority in Oklahoma, and the river basin authorities in Texas.3 Most states now have what are called watershed districts. These are formed under state law but are eligible for technical assistance and grants of funds from the federal government operating through the Soil Conservation Service.4 Although multipurpose in concept, they have been primarily concerned with flood control and drainage.5 Then there is a large miscellaneous group of special districts concerned with one type of water development or another.6 In the West there are irrigation districts and throughout the country there are flood control and drainage districts. In some areas recreation districts may be found. Some of these districts are eligible for federal assistance of one kind or another—through grants of funds, federal construction of facilities, or technical aid.

It is noteworthy that these smaller organizational units are designed to provide a particular type of service—such as irrigation water, a municipal supply, etc.—for a particular group of users and are primarily interested in serving those users. Thus they tend to be indifferent to interdependent uses and the effect of their actions upon others as a result of such interdependence. Also, it would

2. California is unique among the states. It has a very large program of development under way.
6. For a description of these districts see Bollens, Special District Governments in the United States (1957).
appear that many of these units cannot take advantage of economies of scale.

Although in the absence of other institutional arrangements, these units are not motivated to take into account the external consequence of their activities, it should be emphasized that the significance of such effects varies a great deal with local conditions. If the flow of a stream is large and the demand upon it is small, external consequences may be insignificant. The kind of use may have very modest external effects. In other words, it does not follow, because water development has external consequences, that these must always be brought within the decision-making structure regarding specific water use. In fact, it can be argued that under our economic system which requires competitive economic units in order to function effectively and in view of our value system which emphasizes determination by the individual of what is best for him, a variety of units has advantages. Similarly, the significance of the losses attributable to the inability of water development units to take advantage of economies of scale has not been appraised and may or may not be large.

The Basin-wide Development Units

With few exceptions, the federal agencies are the ones primarily engaged in multiple-purpose development of whole river basins or major portions thereof. California, which now has a large program of water development, is the major exception. The recently established Delaware River Basin Compact Commission, formed through joint state-federal action, is another special case, inasmuch as both state and federal authority are involved. Nevertheless, measured in terms of investment or geographic area, federal agencies have been dominant. These include principally the Tennessee Valley Authority, the Bureau of Reclamation and the Corps of Engineers. Increasingly, the public health service programs in water pollution control are an important aspect of federal involvement in river basin development. There are several features of federal organization for water development that are important for the purpose of this analysis.

First, these agencies tend to emphasize particular purposes, although they are multi-purpose in their outlook. The Bureau of Reclamation has tended to emphasize irrigation and power. The Corps of Engineers has tended to emphasize navigation and flood control, while the Public Health Service traditionally has been concerned with the quality of water supplies. The Tennessee Valley Authority has been more broadly oriented than the Bureau and the Corps, but it has given special emphasis to power production. For the most part, all federal water agencies have considered recreation as incidental to their primary objectives. Likewise, they have given relatively little attention to the management of rivers so as to take into account ways of minimizing the costs of pollution. This latter situation may be changing.

7. The Soil Conservation Service is also concerned with water resources development. Instead of being a basin development agency, it provides technical assistance and funds to local agencies responsible for tributary watersheds.
Second, these agencies have emphasized structural solutions to water problems. They are led by engineers with a strong motivation to build engineering works with the result that non-structural alternatives tend to be neglected. 8

Third, these agencies have tended to be identified with a particular clientele. Available evidence suggests that the Tennessee Valley Authority has broad support within its region but little support outside of it. 9 The Bureau of Reclamation and the Corps of Engineers are supported by effective and well organized special interests. These include the National Reclamation Association and a combination of special interest groups called the Rivers and Harbors Congress, organizations which have established effective relations with the Congress and the Executive Branch. 10 The Public Health Service finds its support largely from those concerned with the health and amenities of urban environments. Presumably one of the objectives of the inter-agency committees and commissions has been to offset such pressures through representation of countervailing influences on the committees. It is doubtful that they have been very effective in this respect.

Fourth, the Bureau of Reclamation, the Corps of Engineers and the Public Health Service each are concerned with multiple services of river basin development. In the same manner their activities overlap those of the numerous single-purpose development units described above. The result is a confused pattern of authority and responsibility.

Fifth, they do not perform the full range of closely linked processes which poses questions about the dependability of follow-through from one process to another. The Public Health Service emphasizes planning and has little responsibility for implementation or operation, 11 the Corps of Engineers has no responsibility for any stages of the marketing process for hydroelectric power, and official inter-agency coordination efforts have emphasized the planning process.

Sixth, no effective machinery has been designed for coordinating federal investments in water development undertaken by these agencies with federal investments in associated fields such as agriculture, transportation, and recreation. How can, for example, efficiency in federal investment in transportation be assured unless proposed investments in navigation are demonstrably the least-cost alternative in providing similar transportation services? The same kind of question can and should be raised with regard to flood control, agriculture production from irrigation, recreation, and regional development and stabilization.

8. Recent legislation authorizing the Corps of Engineers to make studies of flood hazard for local communities as a basis for non-structural flood damage reduction efforts is a significant departure from past practice.
10. See Maass, Muddy Waters (1957), Ridgway, Missouri Basin's The Pick-Sloan Plan (1957), and Hart, The Dark Missouri (1957), for an analysis of special interest group activities in water resources development.
11. The Public Health Service can implement its plans through grants of funds to municipalities for construction of sewage treatment facilities and through enforcement proceedings falling within the scope of its legal authority.
Likewise, the same question should be faced with respect to the investment on one region as compared to another. Yet seldom are these questions considered in the water development decision. Efforts have been made to deal with this problem in several ways. One device has been to utilize inter-agency committees, both in Washington and the field. The theory is that representatives of major purpose agencies on the inter-agency committees will insist that the policies and alternatives with which they are concerned will be considered. A system of benefit-cost analysis has been applied and the Bureau of the Budget reviews investment proposals prior to transmission to the Congress. It is generally conceded that these devices have not functioned very effectively in assuring consistency of federal investment policy as it bears upon water development.12

Regulation, Subsidy and Inter-agency Coordination

The external consequences of water development and use have long been recognized and a variety of means have been utilized to deal with them.

This is one purpose of water allocation law through which individual users secure their right to a given supply, and determine how it must be used so as to minimize adverse effects upon others. Where supplies are scarce, the appropriation doctrine, which seeks with some care to protect the individual rights of use in light of possible infringement by other users, is applied. Where supplies are large in comparison with use, the riparian doctrine is applied. Riparian laws do not define individual rights and responsibilities very precisely but do emphasize preservation of quantity and quality for other users. In both cases emphasis is placed upon the definition of individual rights rather than upon maximization of social satisfactions through the production of water services.

A specialized body of state and federal water law relating to pollution is concerned with the external effects of withdrawal use and waste disposal. This in effect determines the extent to which a water user is entitled to degrade the supply in a stream. A major objective of such legislation, however, is to provide equity among users rather than to minimize social costs. More recently the federal government has sought to share in the social costs of pollution by assuming a portion of the cost of constructing waste disposal facilities by municipalities.13

Through this procedure part of the costs of minimizing pollution in particular communities are being distributed among the general taxpayers. Again, it should be noted that these policies and programs are based upon rights of the individual to use the water course for waste disposal. They provide no economic incentive for the polluter to support within-channel techniques for maintaining quality (such as dilution) or within-plant techniques for improving the effluent through treatment. Also there is no economic motivation for the water user to minimize

12. A number of recent studies have focused on deficiencies in benefit-cost evaluation practices. See particularly Eckstein, Water Resources Development: The Economics of Project Evaluation (1958).
downstream costs of pollution except to the extent that wastes, if recovered, may have some economic value.

There are also special laws relating to the use of navigable waterways. The states and the federal government generally require that a license must be secured to obstruct a navigable waterway.\textsuperscript{14} At the federal level, licenses to build hydroelectric power facilities are granted to non-federal entities by the Federal Power Commission.\textsuperscript{15} Other types of obstruction are licensed by the Secretary of the Army.\textsuperscript{16} It is noteworthy that the Federal Power Act requires non-federal licenses to reimburse the federal government for benefits from upstream federally constructed storage.\textsuperscript{17} On the other hand, the licensee is not reimbursed from downstream benefits he provides to the federally owned plants. The theory is that use of the river is a privilege and the downstream benefits are in partial payment of that privilege. In other words, there is no economic incentive for the licensee to provide downstream benefits even though the facility he is constructing may offer the least-cost opportunity for providing such benefits.\textsuperscript{18} On the other hand, to be eligible for a license, the proposed project must "be best adapted to a comprehensive plan for improving or developing a waterway."\textsuperscript{19} This would imply that scale economies and interdependencies would be taken into account. However, the Federal Power Commission has never been staffed to develop a comprehensive framework for each major hydrologic unit, which is a prerequisite to satisfying these two criteria.

One objective of the interagency committees and inter-agency commissions in the water resources field has been to coordinate agency activities in such a way that the external effects of projects undertaken by one agency would be taken into account in the planning and operation of projects undertaken by other agencies. The limitations of the inter-agency committees have been described elsewhere.\textsuperscript{20} Here we need only emphasize that the members of such committees are motivated to maximize benefits from projects they build, rather than from the river system as a whole. Also, it is noteworthy that the large number of independent units concerned with the development and use of water resources is not

\begin{itemize}
  \item \textsuperscript{14} A navigable waterway may be defined differently under state law and federal law.
  \item \textsuperscript{15} See \textit{Water Resources Law}, The Report of the President's Water Resources Policy Commission, Vol. 3 at 278-85 (1950), for full discussion of this authority.
  \item \textsuperscript{16} See \textit{Water Resources Law}, id. at 112-21.
  \item \textsuperscript{17} 49 Stat. 842, 16 U.S.C. § 803(f) (1950). This requirement has been applied in very few instances.
  \item \textsuperscript{18} For a discussion of the economic significance of this provision in the Hells Canyon Case, see Krutilla & Eckstein, Multiple Purpose River Development, 159-66 (1958).
  \item \textsuperscript{19} 49 Stat. 842, 16 U.S.C. § 803(a) (1950).
  \item \textsuperscript{20} See Pealy, \textit{Comprehensive River Basin Planning: The Arkansas-White-Red Basins Inter-Agency Committee Experience}, Institute of Public Administration, University of Michigan (1959); Fox & Picken, \textit{The Upstream-Downstream Controversy in the Arkansas-White-Red Basins Survey} (1960); Martin et al., \textit{River Basin Administration and the Delaware} 155-56 and 266-76 (1960); Hart, \textit{The Dark Missouri} 197-99 and 205-06 (1957).
\end{itemize}
represented on such committees, so the committees do not provide an effective instrument for reconciling the externalities which may arise between the large federal agencies and the small units. This might be considered the task of the state representative on the interagency committee, but there is no evidence to indicate that they either do or are able to serve this function. It appears that most of the coordination between the small water development units and the large agencies is achieved informally through direct negotiations between them.

**Weaknesses of Existing Organizational Arrangements**

Available evidence suggests that the existing pattern of organization for the production of water services suffers from four major deficiencies:

First, the devices utilized for taking into account external effects and potential economies of scale do not function as effectively as might be desired. When there is little competition for water, it is possible to ignore interdependencies without serious consequences. And when markets are small, economies of scale are relatively unimportant. Demand for water is multiplying, particularly for those uses which involve substantial external effects (such as waste disposal) and those uses adversely affected thereby (such as recreation). We have sought to meet this problem to some extent through organizational arrangements capable of internalizing these effects. Regulatory powers of governments provide opportunity to regulate use in such a way as to minimize damage in light of external effects, but here the primary objective has been equity rather than welfare maximization. These efforts have only been partially effective.

Second, devices for taking into account substitution possibilities for providing equivalent services have not been fully effective. For reasons previously cited, the services sought from water entail a deep involvement by government. Substitution possibilities must be considered through political, legal, and administrative processes rather than through the operation of market forces. Governmental programs tend to be organized around kinds of services—energy, transportation, agriculture, recreation, etc. At the local level the influence of water development upon land use impinges in a significant way upon land use planning. Water development cuts across all of these as well as comparable areas of the private sector. Through systems of inter-agency coordination and benefit-cost analysis, efforts to weigh alternatives have failed thus far to meet the need. The result is that there is considerable inconsistency between water development policy and governmental policies governing the provision of similar services by other public agencies. Since some of the services are not priced, or if so not on the basis of cost, competition from the private sector is not an important regulation device. The net effect is a tendency for a misallocation of investment in the provision of water services.

Third, the overlapping of agency responsibilities and interests, combined with divided responsibility for closely related processes, has led to complicated and
cumbersome machinery for water resources development which has been largely a response to symptoms rather than causes.

Fourth (and closely related to the previous points), there is considerable evidence that existing institutions are not fully responsive to responsible demand for water services. In particular, the kinds of demands—aesthetic, recreational, waste disposal—of major concern to an urban-industrial society find difficulty in receiving the consideration they merit. Organized interest groups play a large part in determining the amount of public investment in water development. Public agencies rely upon a few dominant interest groups for support and reflect their particular interests in the design of programs. These ties, combined with a devotion to traditional structural solutions, have impaired or distorted the political process in its effort to define the public interest. One result is to emphasize the services desired by the special interest groups and to leave a large sector of the public unrepresented in the decision-making process. Another is the failure to provide analyses of all relevant alternative development patterns for consideration by the executive and legislative branches of government.

Although perfection is an elusive goal, it is abundantly clear that there is ample room for improvement in existing organizational arrangements.

THE DIRECTION OF IMPROVEMENT

Implicit in the preceding analysis is the thesis that measures for improving organizational arrangements will vary from basin to basin depending upon the amount of competition for water services, the significance of external effects of use, and the institutional environment. It follows that research directed to studying the factors described in Part I as they interact within a given basin should help reveal how organizational arrangements within a particular basin might be improved. This is contrary to the often held view that water development organization must be approached on a national basis and that a single uniform pattern is possible and desirable. This is not to deny that there are national problems, nor that there is need for federal action. We support fully the need for more rational organizational arrangements among federal agencies concerned with water resources in Washington. However, we do believe that federal headquarter arrangements must be permissive of a variety of organizational forms for water development agencies within river basins.

The effectiveness of organizational arrangements in maximizing social satisfactions depends upon a variety of considerations. Among these is the capability of individual institutions to function effectively. Capability depends upon the adequacy of their legal authority and of their administrative machinery. Water development agencies must be responsible for a sufficient amount of the production of services from a hydrologic unit and control enough of the processes of water development if they are to be capable of maximizing social satisfactions. But agencies must not only be capable of maximizing social satisfaction, they must be motivated to do so. Therefore, a second consideration is whether the
relationship between the water service producing agency and other institutions (the legal framework, other agencies, the electorate, interest groups, etc.) is such as to motivate the water agency to reflect what is commonly called the public interest. Efforts to improve organizational arrangements for water development must take into account both of these considerations. They underlie the four hypotheses set forth below relating to the way organization for water development may be improved.

Hypothesis No. 1. In many areas it will be desirable to achieve a much higher degree of integration than now exists within the geographic area in which interdependencies are significant (a) among services provided, and (b) among the processes of development. The organizational and procedural forms adopted and the boundaries of the geographic area covered should be determined by the relative significance of the factors set forth in the analytical structure in Part I.

The need to move in this direction has long been recognized and has been the basis for what is usually called "comprehensive river basin planning and development." What is not so well appreciated is that the kind and degree of integration warranted varies widely. Within some sections of a river basin various uses may be highly interdependent, requiring coordinated decision-making on almost a day-by-day basis. On the other hand, between some sections of a basin the interrelationships may be relatively simple and subject to satisfactory handling through periodic agreements between producing units and by general regulatory measures. Where the interdependencies are great it may be necessary for the integration process to embrace many of the small producing units, especially to permit decisions about withdrawals to take into account the impact upon within-stream uses, such as waste disposal. In such cases, it may be important that the "production" function of the small units be absorbed by large-scale units that embrace an appropriate geographic area and a full range of services. Under some circumstances, however, agreements among producing units might operate with a reasonable measure of success. Evidently the Northwest Power Pool, which is such an agreement governing the operation of dams in the Columbia River Basin, works reasonable well. If there was a much larger number of small units involved, it is doubtful that this type of arrangement would be satisfactory.

An important question is how is it possible to move in the direction of greater integration, keeping in mind that all three levels of government and many private institutions are involved and that special interest groups and bureaucratic ambitions tend to maintain the present balance. Attention to date has focused upon two alternative approaches. One approach has been to establish new basin-wide multi-purpose agencies to displace existing agencies and to take the lead in water resources development. Since the establishment of the Tennessee Valley Authority, this approach has only succeeded in one instance—the Delaware Basin Compact Commission. This agency has the authority to

21. This did not come about easily. See McKinley, Uncle Sam in the Pacific Northwest 178-80 (1952).
displace other water agencies in the basin if it needs to in order to achieve the degree of integration in water development deemed necessary. It remains to be seen whether it functions in this manner or merely becomes a competing agency operating in the basin. The other approach has been to utilize various devices for coordination of state and federal agency efforts, the latest of which is the inter-agency river basin commission. Although experience with the inter-agency river basin commissions is limited, there is little reason to believe that such commissions will be greatly superior to the inter-agency committees.

Our thesis is that this problem should be approached on a basin-by-basin basis. The economic and institutional situation in the basin should determine how much integration is desirable and what kind of agency should serve as the focal point for such efforts. Analytical studies of the situation within a particular area are needed to make an intelligent determination of the desirable course to follow.

In basins where a high degree of integration is called for, it probably should center in a particular agency. Studies of individual basins might examine at least four possible alternatives, namely (1) establishing new federal river basin administrations, (2) establishing new state or interstate river basin administrations, (3) combining the functions of existing federal water development agencies into a new single agency, and (4) using existing federal agencies for this purpose.

The concept of the federal basin agency has many advantages. The TVA has demonstrated the effectiveness of a federal river basin agency in providing the required integration. Yet there is much opposition to the establishment of additional federal valley administrations. Much of this opposition, in our judgment, does not stem from the physical and economic integration which it has provided within the valley, but from other features of TVA. One obvious such feature is the fact that the Authority has become a symbol of public power. Another less obvious one is the fact that TVA found few if any national, state or local development parameters to guide its development scheme. Consequently it assumed a position of dominant leadership in an effort to establish goals and policies at all levels of government throughout its region. As indicated more specifically

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22a. In our judgment inter-agency commissions and committees suffered from five weaknesses. First, they are cumbersome and costly to administer and responsibility becomes diffused instead of fixed which encourages irresponsibility. Second, since a relatively few organized interest groups tend to dominate the agencies which control these institutions, they tend to become a vehicle for implementing the desires of such interests rather than providing an effective vehicle for taking into account interdependencies and for assessing the full range of alternatives. Third, they do not embrace the small units which may be an important element in the picture. Fourth, they have usually sought to cover too large a geographic area. Fifth, they have frequently been limited to the planning stage.

23. Although widely known for the integrated approach to river basin development it has adopted, such integration is far from complete. So far it has not gotten deeply involved in water quality management.
in later sections of this paper, the water development agency should not have such responsibilities thrust upon it.

A second possibility is to center integration efforts around state or interstate agencies. California, Texas, Florida, Alaska and Hawaii embrace major hydrologic units and could conceivably utilize or establish state agencies for this purpose. In other states there may be major sections of hydrologic units within which a high degree of integration is desirable and which do not extend beyond state boundaries. In theory, interstate agencies could be established to deal with situations where external consequences or possible scale economies are of interstate significance. Three factors will tend to limit the application of this approach. Wherever hydrologic units involve Canada or Mexico, the federal interest in international affairs will dictate a large measure of federal control. In those cases where a large number of states are involved or past history has been marked by controversy over water, interstate agreement to establish an effective agency will be difficult to accomplish. Finally, wherever federal agencies have large-scale, long-established programs, a change to interstate institutions does not seem practicable. These factors suggest that potentials for interstate agencies may be limited largely to the eastern part of the country, exclusive of some portions of the Mississippi drainage and the drainages shared with Canada.

Are there inherent advantages in having national as opposed to state or regional water development organizations? Our analysis in Part I indicates there are no economies of scale (except the design laboratories) that require national organizations. In theory, national organizations, through central offices, can assure imposition of federal policies and see that water policies are consistent with the major purpose policies of the federal government. There is little evidence that the central offices of the federal water development agencies have played an effective role in achieving consistency between water policies and the major purpose policies of the federal government. In fact, one can argue with some justification that the central offices have been in effect the Washington exponents of specific regional or economic interests, which have maintained effective ties with the Congress in protecting those interests and tend to prevent a degree of policy coordination which would be adverse to those interests. Furthermore, state or interstate agencies may not be inconsistent with a large measure of federal participation in water development. The federal government could help finance water development through grants and loans. If a suitable federal agency for administering such grants and loans were established, assurance could be obtained that funds would be expended in accord with federal policies.24

24. This view is contrary to the views expressed by McKinley (See McKinley, *Uncle Sam in the Pacific Northwest* 567-68 (1952) and McKinley, *The Valley Authority and its Alternatives*, 44 Am. Pol. Sci. Rev. 619-22. His argument is that national organizations have values that include "(1) greater assurance that similar treatment will be accorded similar problems throughout the nation, (2) the utilization of central services which cannot be afforded in each regional area; (3) the restraint of sectionalist and provincialist tendencies" (*Uncle Sam in the Pacific Northwest* at 567). We doubt that the national
A third possibility is to combine existing federal water agencies into a single federal water development service which would operate regional water development agencies in those major river basins where organizational integration is called for. This approach seeks an easy solution to the duplication and conflict which seems constantly to plague relationships between existing agencies. Perhaps administrative relationships within the federal government, including relationships in the field would be simplified. However, we fail to see how this approach is superior to individual river basin administrations, either federal or state. As previously noted, there do not appear to be any economies of scale to be realized through a nationwide organization. Nor does such an agency promise a better assessment of alternatives to water development in providing transportation, agricultural production, recreation, regional development, etc. Furthermore, a nationwide organization may have the disadvantage of compelling a degree of uniformity among the approaches adopted in various regions inconsistent with varying organizational needs.

The fourth possibility is to use an existing federal agency as the focus of integration efforts. The Corps of Engineers or the Bureau of Reclamation might be selected, depending upon which agency tended to have the dominant program in the area. Some western basins, such as the Colorado, obviously would fall to the Bureau of Reclamation. The difficult problems would arise in such basins as the Columbia and the Missouri, where each agency is heavily committed at the present time. In view of the forces that support the status quo, this approach may be as difficult to accomplish as the establishment of valley administrations or a single federal water agency. Eventually it would entail major transfers of authority and responsibility now jealously guarded by individual agencies. Moreover, like the proposal to combine existing agencies, the desirability of maintaining nationwide organizations is not evident. Its virtue is that it could begin on a piecemeal basis under the leadership of an executive interested in more effective discharge of federal water resources activities. This is the way policy changes have often been made in the United States.

To provide any agency with the capability to integrate development considerations within a river basin implies a concentration of authority. This is inimical to those whose existing authority will then be compromised, and it will be argued that a multiplicity of agencies provides a division of powers that results in development decisions which more nearly reflect the public interest. Although as a general thesis there may be validity in this principle, it is our view that when water agencies have demonstrated the first and third of these values, and utility of central services is limited to the design laboratories. We feel that a federal loan and grant agency might be more successful in realizing these values than a national water development agency.

such a division of powers is haphazard it may impair the operation of the political process in its search for the public interest. Therefore we would contend that the validity of this principle can be supported only if the division of powers is rationally designed to motivate the water development agency to seek maximum social satisfactions. Then the sharing of the decision by other agencies is likely to enhance the public interest. Providing institutional arrangements which will motivate a river basin agency to seek to maximize social welfare in its water development schemes is a corollary step to making it capable of functioning effectively. The remaining suggestions are directed to this problem.

Hypothesis No. 2. As one means of motivating public water development agencies to reflect more accurately the values and objectives of society, serious consideration should be given to possibilities for using to a greater extent "market-life" forces to determine the kind and amount of water services provided.

For many services of water development, market prices or the cost of providing the service is accepted as a reasonably accurate reflection of value. This is true of power, municipal water supply, and industrial water supply. For a number of purposes, including navigation, irrigation, recreation, waste disposal and flood control, market values, even if they exist, are not considered an appropriate determinant of the level of investment either because market prices are not viewed as a satisfactory measure of value, or because of an implied income redistribution objective in public policy. A complex system of water law governs the allocation of the services of water for all purposes. Thus, a rather complex interplay of market forces, legal institutions, and the political process have been relied upon to determine the level of investment in water development and to allocate water services.

The pricing of services in accordance with costs has the advantage of permitting the consumer to indicate directly the value he attaches to the service provided. Individual preferences are expressed and development can proceed in accord with those preferences. As has been pointed out above, a number of federal water development programs have been characterized by a lack of direct confrontation by the beneficiary of the costs of providing water services he receives. The federal taxpayer bears much of the cost of providing flood control, navigation, and irrigation which benefit directly a small segment of the population. This has created an environment which has encouraged special interests to seek federal investment in water development without regard to a comparison of marginal social costs with marginal social benefits. Thus, the water development agency is motivated to join forces with these interests, which only incidentally produces programs consistent with the public interest. Greater use of direct charges for the services provided to consumer groups might help offset this problem.26

26. This problem has also been discussed in Your Investments in Land and Water, by Clawson & Fox, 67, Am. Forests (January and February 1961).
Several possibilities for using "market-like" forces could be utilized. First, public water development agencies might be authorized to extend the use of revenue bond financing for provision of marketable water services. Under present policy this would apply primarily to power, municipal and industrial water supplies. Thus investment would be based upon an estimate of the prospect of returns by the investment market.

Second, sale of water services instead of water law might be relied upon more extensively than at the present time to allocate water services. This could apply to all withdrawal uses and to waste disposal. This device would only be practicable in those instances in which a high degree of integration is justified. In such cases, the water development agency might be licensed as a utility to sell such services after buying out existing rights and observing certain restraints relative to protection of those values that are incapable of maximization in this manner—e.g. scenic and recreation values.

Third, the major purpose agency (such as the park agency or the agriculture agency) might be given a more effective voice in determining the level of investment warranted in water development to provide a given type of service in those cases in which market prices are not considered a satisfactory measure of value. Under present policy, this would apply primarily to irrigation, flood management, navigation, and recreation. Two devices could be utilized. One possibility is for the major purpose agency—such as the agricultural agency, the transportation agency, or the recreation agency—to be given responsibility for determining the level of investment warranted to produce a given quantity of benefits. Another possibility is to require the water development agency to secure funds for such investments through the major purpose agency. For example, the water development agency might "sell" to the local, state, or federal recreation agency specified recreation services from its water development program.

These devices, by themselves, have limitations. Certainly it would be a large task to change from a major reliance upon water law to allocate water supplies and services to a greater reliance upon the marketing of such services. Numerous problems would require resolution. For example, how would the third party effects of major transfers in use be taken into account? When changes in water use occur, the user is not the only party affected. If irrigation is discontinued, the merchants who supplied the irrigator with services may be adversely affected. How will such costs be taken into account? If the major purpose agency determines the value of certain services, will it be unprejudiced or will it tend to understate the value of services produced under the auspices of another agency instead of as a result of its own program? If the water development agency is

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27. A proposal along this line was outlined by Mason Gaffney at the Southeastern Water Law Conference in Athens, Georgia, in November 1961.

required to "sell" certain of its services to the major purpose agencies, will not this tend to result in under-investments in water and a maldistribution of costs? The recreation agency might consider that a water project will be built in any event and provide a large measure of recreation benefit without investing recreation funds in the water project. This could mean, in effect, that recreation values are not appropriately considered, or that other uses are bearing the costs of recreation, or both results could occur.

Obviously such possibilities will require careful study. They may, nevertheless, be useful components of a total framework of organizational arrangements which will reflect with reasonable accuracy the values and objectives of our society. Studies directed to exploring these possibilities more fully appear amply justified. Again the approach adopted should be designed to fit the situation in the region concerned.

Hypothesis No. 3. Specific institutional arrangements are needed to assure consistency of water resources investments with public policies and programs for the major purposes that water serves.

The problem may be subdivided into two parts. One aspect is that of assuring consistency with national policies and programs in such fields as agriculture, recreation, transportation, economic stabilization, and regional development. This problem is of primary concern at the federal level, although other levels of government have an important interest. The other aspect concerns coordination of water development programs with state and local land-use policies and programs. Although the federal government has an interest, local units of government tend to have the dominant concern with this problem.

There has been a widely held view that the first aspect (the federal problem) could be solved through a system of benefit-cost analysis. Procedures would be devised for evaluating federally financed water development projects and if the benefits exceeded the costs, federal investment would be justified. Many thousands of man hours have been devoted to the development of such procedures. The benefit-cost approach has, however, had several limitations. Water policy has been noteworthy for its confusion of objectives, and the absence of agreement on suitable criteria for public investment. For example, a large measure of political support for federal investment in water development stems from the belief that such investments will stimulate regional and local economic development. Others have felt that the only justification for investment in water development is the contribution water can make toward providing particular services. Thus there never has been a clear understanding on whether the Bureau of Reclamation is concerned with development of the West or with increasing the production of food and fibre, or if both, to what extent each objective is relevant.

The problem is complicated further because of inconsistent policies in such fields as agriculture, transportation, and recreation. One cannot be too critical of water policy in view of the current confusion in these areas. In other words, one can say that water policy as it relates to navigation should be consistent with
transportation policy, yet transportation policy is far from consistent in itself. Nevertheless, it is evident that much could be done to increase the returns from federal investment in water development by giving greater consideration to alternative ways of providing equivalent services.

The problem may be expressed as follows: First, we do not know what the political process would reveal as investment criteria, because it has not operated effectively in establishing the objectives of water development or in expressing the relative values of water services. Second, some means is needed to assure consideration of relevant alternatives by the development agency in addition to that provided by a benefit-cost evaluation. This need stems in part from the fact that many of the values involved are difficult to measure in quantitative terms. This is particularly true of aesthetic and some recreational values. The need also stems from the fact that alternatives are subject to continual change and evaluation procedures tend to become crystalized unless subject to continuous scrutiny and revision. Third, evaluation procedures are not used as effectively as they might be. Agency personnel in the field are quite naturally motivated to justify projects they wish to build and for which there is local support. There is a tendency to select data (where there is no choice) most favorable to the project and to avoid examination of alternatives that might demonstrate that a project is unnecessary or another project is preferable. This problem cannot be met through a post-audit of project proposals because political forces form around a project as it is planned and once it is recommended by the field office it is next to impossible for action at the Washington level to do more than delay the investment.29

The situation suggests that the federal establishment requires a better means of defining and clarifying federal water investment objectives, for identifying and assessing alternative ways of realizing those objectives, and for applying relevant evaluation practices. To be effective the Congress must play an important part in doing these things because they involve basic policy and because water projects have a local impact of major concern to the Congressmen and the Senator. To try to isolate the Congress from these decisions is to attempt something that is both undesirable and impossible. Any agency established to serve these purposes must, therefore, work in harmony with the Congress. How can this be done without encountering the evils of log-rolling? In addition, an agency performing this policy and program function must, to the fullest extent practicable, be insulated from the pressures of specific local and economic interest which bear upon the development agencies. This suggests that this function cannot be within a development agency or subordinate to a cabinet officer who has water development responsibilities.

29. In our judgment this aspect of the evaluation problem has received too little attention. It is futile to promulgate theoretically advanced evaluation practices if data used in the evaluation process are in error. Neither theory nor computing machines will solve this problem!
This, then, is the problem that requires study: to devise an institutional arrangement that involves the Congress fully in determining water investment policy while avoiding the evils of log rolling, that insulates the policy and program unit as much as possible from specific development pressures, and that is capable of applying with reasonable objectivity and accuracy adopted evaluation practices.

Several approaches merit consideration. One approach is to assign the task to the Executive Office of the President. Under one concept there would be a council or a board of review in the Executive Office of the President. Another concept is that the President should have an adviser on natural resources matters (including water) who with a small staff would perform these functions in the name of the President. These ideas have been widely discussed for many years but they have received little acceptance at either end of Pennsylvania Avenue. Lack of interest by the Congress may be attributable to a feeling that these devices would function in a negative way, i.e., they would be used to inhibit water resources development. Executive Branch agencies probably have not looked with favor upon the establishment of any institution that would tend to limit their freedom of action. At the Executive Office level there has been opposition to adding more units to the President's staff. The preoccupation of the President with many matters of far-reaching significance suggests that the President's immediate staff and the President himself feel that they can only afford to concern themselves with the broad aspects of resources policy rather than with the type of policy clarification, coordination and evaluation techniques which is needed.

A second approach now receiving serious consideration is to assign essentially these responsibilities to a Cabinet committee with a permanent staff. This, in effect, is the kind of device upon which major reliance has been placed in recent years. The FIARBC, established through informal agreement, functioned for a number of years and took the first steps toward the design of uniform evaluation practices. It was replaced by ICWR, established by executive order, has functioned in much the same manner. These devices suffer from the limitations of any committee arrangement as well as not providing insulation from development pressures. It is difficult to see how the council now proposed by the President could be much more effective than ICWR or FIARBC, except that provision is made for a full-time permanent staff. Conceivably, as in the case of the Federal Power Commission, it might lead eventually to a separate entity. In spite of its limitations, this may be the only approach that is politically practicable at the present time.

32. One may, however, question the wisdom of crystalizing this approach through legislation.
A third approach would be to establish a semi-autonomous unit to serve this purpose. Such a unit might be headed by a small council appointed by the President with the consent of the Senate. It could be located in one of the Departments for housekeeping purposes. Its responsibilities might include:

1. To recommend to the President and the Congress appropriate policies in the field of water development with a view to achieving an appropriate rate of development and consistency with other federal policies.

2. To sponsor studies of the outlook for the supply and demand for water services as a basis for policy and program formulation. Such studies might be undertaken by the council, or by other agencies, or in a cooperative fashion.

3. To keep abreast of planning efforts by federal and non-federal entities that may result in requests for federal funds, and to keep such entities advised at each stage of the kind of data and analyses that will be required for federal evaluation purposes.

4. To evaluate proposals for federal financing of water development submitted for consideration by the President and the Congress.

Would such an institution be politically viable? It is difficult to tell. Congress may be suspicious of such an idea and never be willing to authorize it or appropriate the funds it would require to be effective. On the other hand, if the council would not seek to displace the Congress in policy making but would work with it and would seek to provide the President and the Congress with better information on which to base decisions, the effectiveness of both branches could be enhanced. A council that operated to attain this end might gain the confidence of the Congress. It is abundantly clear that policies now are confused and inconsistent, that neither branch has the assistance it requires to straighten them out, that the information provided on proposed federal water investments is inadequate for the purpose of evaluating such investments in an intelligent manner. Further, it is clear that some institution independent of the water development agencies will be required to perform the tasks outlined above if the President and the Congress are to secure control over federal water development investments. They share a large measure of the control at the present time with the water development agencies and the special interest groups.

33. Recently it was announced that the President would recommend a federal grant of about $60,000,000 to California to assist in the construction of Oroville Dam. The outlook is that requests for federal funds to assist in non-federal water development will increase. Who will evaluate such requests?

34. Possibly a new federal water resources agency is needed. In addition to the functions listed above, it might license non-federal hydroelectric projects now the responsibility of the FPC and assume the functions of the Corps of Engineers relative to licensing obstructions of navigable waterways. Also, it might administer grants-in-aid to the states provided for under Title III of the Administration's proposed water resources planning act.
Whichever device is adopted, the key to effectiveness is the maintenance of Congressional confidence on the one hand and on the other hand, the ability to see that potentialities for development are in fact evaluated in accord with specified policies consistent with policies in the major purpose fields. If these results are achieved, it will be difficult to marshal support for proposals grossly inconsistent with the welfare maximization objective, in spite of log-rolling potentialities in the Congress.

The problem of coordination of water development with land use planning at the local level has not received as much attention as the federal problem discussed above. No doubt appropriate solutions will vary from area to area, depending upon the seriousness of the task and the kind and number of public land-use agencies involved. Provision for "sale" of recreation benefits to state and local recreation agencies, as described under Hypothesis No.2, would not doubt facilitate such coordination in a meaningful way. But this procedure is not applicable to many elements of the problem, such as those relating to flood management, the location of highways, and inundation of lands by reservoirs. In such instances, it may be desirable to establish formal coordination machinery (possibly a committee) embracing the public land-use agencies and the water development units to consider alternative possibilities.

Hypothesis No. 4. Special machinery is needed to assure that a full range of alternative water development potentialities are presented to the public in order that the unorganized public as well as organized interest groups can play an effective and intelligent part in the decision-making process.

Contrary to a widely-held view there is seldom, if ever, a clearly evident superior water development program. Some of the values are difficult to quantify. Market forces do not function effectively so that the demand for water services is not clear. The whole supply-demand picture is technically complex. In this situation development agency representatives, often responding to articulate organized interest groups, render judgments that in effect are water development decisions. The unorganized uninformed sector of the public does not articulate its demands so that an accurate reflection of the sum of individual preferences never takes place.

An obvious response to this situation is to seek some way of informing the unorganized public of the range of alternatives that warrant consideration. The water development agency may be staffed and equipped to present the range of alternatives and analyses of their relative values, but for reasons previously discussed, the water development agency may not be motivated to make a useful presentation. Experience has demonstrated that such agencies develop what they consider to be the "best" plan and then seek support for it. When alternatives have been presented they generally have been minor variations of the "best" plan idea.

Establishing government operating procedures providing for alternatives to be presented is no assurance that meaningful analyses will be made. It is all too
easy to give lip service to the idea without producing data and analyses that are at all helpful in understanding what the choices really are. It is difficult indeed to inject into the governmental framework a means of assuring that this will be accomplished. Possibly we must rely upon universities and similar institutions to accomplish this objective. Yet, this type of thing must be done if the political process is to have any meaning.

If federal investment tends to dominate water development in the years ahead—and the indications are that it will even if state and interstate agencies play a more prominent part—the problem might best be attacked at the federal level. One possibility is to assign this task to whatever instrumentality is established to make water policies and programs more consistent with related public policies and programs. Our discussion of Hypothesis No. 3 emphasized that something more than issuance of pronouncements would be necessary to achieve that objective. In addition, it would be essential that whatever unit is set up for this purpose be in constant communication with development agencies that may seek federal financial assistance and keep such agencies advised of the kind of data and evaluations required in view of the situation faced within the region. It would be but a minor extension of this idea for such an instrumentality to specify as well the alternative possibilities it would want examined and presented for public reaction.

Again the major question is the political viability of such a practice. Certainly it would be a prime target of organized interest groups. But the problem is a fundamental one in modern society where issues are so complex and technical that highly specialized skill and a great deal of time and money are required to understand the many considerations that are involved in water resources development. Accordingly, it deserves high priority in the list of problems meriting further study in the field of water development organization.

CONCLUSION

This paper has sought to establish an analytical structure for considering organization arrangements for water resources development and to assess some of the implications of that structure for the organization of water development in the U.S. Although we feel that this structure provides a useful framework for considering the organization problem, it does not suggest the availability of simple solutions. Instead it helps identify the areas fruitful for further study in depth. The analytical structure itself is far from perfect and may be elaborated and modified. In particular, the institutional environment deserves much more attention than it has been given.

The organization problem identified in the application of the analytical structure divides conceptually into two interrelated parts, namely (a) finding ways of providing organizational arrangements that are capable of maximizing welfare, and (b) finding ways of motivating water development organizations to maximize welfare. Our hypothesis is that suitable arrangements for achieving capability will vary greatly with the regional environment. Wherever interde-
pendences and economics of scale are significant, capability will be increased through integration of the decision-making process within the area where these factors are significant. This may be accomplished by consolidating agencies or through tightly-knit operating agreements among agencies. The river basin unit may or may not be the relevant geographic area. Motivation poses a difficult and complex problem for which there is no panacea. We suggest that improvements be sought in three ways, namely (1) through greater application of "market-like" forces, (2) through special machinery to coordinate water policies and programs with related policies and programs, and (3) through special machinery to assure presentation of data and analyses covering the relevant alternative development potentialities so that the unorganized public as well as the organized interest groups may better understand the possibilities. Each of these, we believe, merits priority in further study of this problem.