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# The Water Economy and Its Organization

Vincent Ostrom

# THE WATER ECONOMY AND ITS ORGANIZATION*

by

VINCENT OSTROM**

Questions about organization have been the source of more extensive debate and controversy in the field of water resources development than in most other phases of American economic and political experience. Controversies over "public ownership" have reflected substantial anbiguity over whether the provision of water supplies and electric services should be organized in the public or the private sector of the economy. In the public sector, the problem of organization has been plagued by questions of functional and territorial allocation of jurisdiction among public agencies. The question has been often posed as one involving the organization of agencies devoted to single-purpose development as against agencies devoted to comprehensive, multiple-purpose development. Similar questions have often been posed about the need of special regional agencies for water development as opposed to reliance upon the states and national governments as the traditional units of political organization. Sometimes, demands have also been articulated for the creation of regional authorities with responsibility for comprehensive multiple-purpose development of river basins.

In undertaking a new examination of this problem of organization for water resource development I shall, first, turn to an analysis of the different types of goods and services which can be derived from a water supply system and of the amenability of these goods to allocation in the private market economy as against their provision in the public economy. The second section of the paper will examine the types of organization that have been developed in American experience to provide these different types of goods and services. The final section of the paper will explore some aspects of the problem of organization in relation to the task of planning for comprehensive multiple-purpose development of water resources.

## *Types of Goods in the Water Economy*

Water is the source of a complex multiplicity of "goods" which have value to us as human beings. In a fundamental way, water is essential to the continuity of life itself. All living organisms require a regular supply of water in

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** Associate Professor of Political Science, University of California, Los Angeles.

order to sustain their survival, growth and development. In addition to supplying water to meet the consumptive requirement of living organisms, flowing water may also be used to provide a major source of power. The same water course may provide a habitat for valuable supplies of fish and wildlife and a place for human recreation. It may be used to transport a variety of goods and commodities along its course. A stream may also be used to dilute and purify waste products, or it may be used for washing or processing purposes or as a cooling agent in industrial production. Finally, water may be the source of a substantial "negative good" when floods wreak injury and havoc upon human endeavors. To control or prevent floods then becomes a positive good.

The bundle of goods which can be derived from a water course include both the uses of water as water and the uses that can be made of the flow of a stream. The various uses of water are highly inter-related. One pattern of use frequently precludes some other possibility of development. As demands for water increase, the elements of competition and conflict among the various users of a stream are apt to become accentuated. The wastes of an industrial civilization, for example, place an increasing load upon water ways at the same time that new opportunities for leisure reflect a bounding demand for water sports. When demands exceed certain minimal levels, the use of a stream for sewerage is not easily reconciled with its use for recreational purposes. The maintenance of anadromous fisheries may pose a substantial conflict for large-scale water storage facilities essential to flood control and hydroelectric power production.

Theoretically, the competition for the different "goods" to be derived from the uses of a water resource system might be resolved by economic allocation in the market. Under market conditions, priorities would be determined by the preferences of users spending their earnings upon one or another water resource products. However, market mechanisms are only partially available in allocating water resource products or uses because a number of the goods derived from a water resource system do not meet the criteria for allocation in the market economy.

A private good must be "packageable" in the sense that it can be differentiated as a commodity or service before it can readily be purchased or sold in the market economy. It must also be appropriable in the sense that the commodity or service is subject to the legal claim of a property right which vests control in the owner as against other possible claimants and users. A loaf or bread, for example, is both packageable and appropriable. Those who are not willing to pay for the loaf of bread can be excluded from enjoying its benefits. These are the conditions for meeting the exclusion principle and the exclusion principle is the criterion which must be met as a necessary condition for the operation of a market economy.

In considering the economic character of the different uses of water, a rather basic distinction can be made between consumptive and non-consumptive uses.

A consumptive use implies that water is taken from its natural course and is used upon the land. Irrigation, domestic consumption, municipal and industrial uses are among the consumptive or "on-the-land" uses of water supply. Non-consumptive uses on the other hand are "'in-the-channel" uses. These include navigation, dissipation of wastes, recreation, propogation of fish and wildlife and flood control.

*The Consumptive Uses as Goods.* The consumptive or on-the-land uses are generally appropriative uses since they involve a taking of the water and placing it under control in an out-of-the-channel storage and distribution system. Both water used for consumptive purposes and electricity can be metered and sold in measurable units whether in gallons, cubic feet or in kilowatt hours. The conditions of the exclusion principle can be satisfied. Water can be sold as a commodity in relation to the demands of the various users who are willing to pay the market price to meet their various consumptive demands. As a result, the water supplies and water products which can be appropriated for on-the-land uses are generally more amenable to private organization and distribution in a market-type economy than are the non-consumptive or in-the-channel uses.

The competitive dynamics of the water economy, however, is seriously constrained by the relatively large proportion of investments required in fixed diversion and distribution facilities. These relatively large capital costs in fixed distribution facilities lead to two separate consequences. One result is the tendency to require organizations of a larger scale than the individual proprietor to undertake the provision of water supplies. The other result is that each water supply system tends to function as a natural monopoly in its service area. Both of these factors limit the operation of market forces in the water economy.

In the arid West, the individual proprietor could thrive only on land in close proximity to a stream or where there was an abundant ground-water supply. Beyond the limit of these opportunities, the provision of consumptive water supplies has generally been organized through non-profit co-operatives or mutual water companies, limited-profit public utility companies, municipal utility systems or public distribution systems organized by a variety of special public districts of quasi-municipal corporations established to provide special water supplies for various groups and communities of people. Today the special public water districts which have evolved from the irrigation districts and the municipal water systems are the organizations which assume the dominant role in the distribution of water supplies for consumptive use.

None of these agencies operate their water supply systems in a way that would conform to the rule for maximization short-run of profits. Even the privately-owned water company, which is organized for profit, is considered to be a public utility whose service arrangements and rate structure are subject to detailed control by state public utility commissions. Water is generally priced so that it functions as an intermediate product in the economy. The payoff is derived not by the water producer but by those who make use of water in the land-related economy.

Instead, water simply becomes one of the factors contributing to the land promoter's development scheme in which he derives his return from land values; or, in the case of a local community, water may be used as an instrument to attempt to control patterns of economic and political development in the community. The history of the growth and development of Los Angeles, for example, reveals its conscious use of water as a tool to build the "great metropolis of the Pacific".

*The Non-Consumptive Uses as Goods.* Most in-the-channel or non-consumptive uses do not meet the criterion of the exclusion principle. The benefits of flood control, for example, cannot be distributed only to those individuals who are willing to pay for the benefits. When flood control programs are undertaken all individuals in comparable situations on the flood plain are benefited alike. If the flood control measure is a local levee or dike, the group benefited may be relatively small and the enterprise might be organized as a public diking or flood control district. Where the flood control program involves the general regulation and control of a whole river system through large storage reservoirs, it becomes more difficult to allocate flood control benefits among the various beneficiaries even if they could be encompassed within a common political jurisdiction.

The fish resources of a river system pose a somewhat ambiguous problem for economic organization. The fish which are taken from a stream are as readily subject to the market allocation as are loaves of bread. The taking, processing and distribution of fish products are, thus, largely conducted in the private sector of the economy. However, the operation of a fisherie is not subject to the same type of organization and control. An entrepreneuer who decided to "farm" salmon, for example, would not be in a position to assure the exclusion of others from the benefits of his crop. As a result, the management of fish resources has generally been conducted as a public function.

The use of streams for the dilution and discharge of waste deals with a negative good or by-product which communities, firms and households attempt to dispose of at minimal costs to themselves. Unregulated use of a stream for pollution abatement is apt to poison the stream and destroy its usefulness for many other purposes. As a result the use of a stream for pollution abatement has never been recognized as a "good" for which a private property right vests. Rather it has been the subject of extensive regulation by state governments under police powers which emphasize the public character of the use of streams for pollution abatement.

The use of water in a water course for recreation poses another ambiguous problem for economic organization. Where access can be controlled, the conditions for the operation of the exclusion principle can be met and recreational uses can be organized by private enterprises. In this case, control of the land may afford control over the use of the adjoining stream. However, the use of the water course, *per se,* for recreational purposes is usually subject to the public use of all of those who can gain access.

The same principle applies to the use of a stream for navigation. All of those who can gain access to the stream are generally free to use it as a public highway subject to public regulations and control. However, particular works that may be constructed to circumvent natural obstructions to navigation could be amenable to private organization and use through the charge of a toll.

Other types of in-the-channel uses of a stream are usually intermediate aspects of transactions that are more clearly directed to the use of the water product for some on-the-land function. Hydroelectric power production, for example, requires the regulation of the flow of the stream to produce electrical energy, but the product is controlled and marketed on the land. Private development of hydroelectric power, thus, is usually associated with rather detailed public regulations which take cognizance of the public interest in the control of river flow.

Each of the various in-the-channel uses of a stream, thus, is not easily packageable or appropriable. They are not generally amenable to control by an individual proprietor who may want to produce the good or service for sale in the market economy. As a result, we must generally turn to public agencies to take appropriate courses of action in assuring adequate provision of in-the-channel uses of water resources.

The problem is further complicated by the high degree of inter-dependency among the various in-the-channel uses. It is the inter-dependency of one use pattern upon the other that requires those who plan any in-the-channel development to take account of the effect that each development will have upon the various possible patterns of use. This requirement for multi-purpose planning of inter-dependent uses poses one of the fundamental problems in the organization for the planning and administration of water resource programs.

Any effort to optimize output of in-the-channel uses of a river system depends upon the general regulation and control of flow characteristics. Reducing flood flows increases the benefits to be derived from flood control. Increasing minimum flows in turn increases the benefits that can be derived from most of the in-the-channel uses as well as increase the supply for on-the-land consumptive uses. Under these circumstances any water works project which modifies the flow of a stream must be evaluated in relation to the consequences which it produces. Each project which effects the flow pattern, then, has consequences for each other project and it becomes necessary to take account of each project as it affects the total pattern of development in a river system. This condition imposes another basic requirement that a water resource management system be organized so as to account for water production in a river system as a whole.

### *Types of Organization in the Water Economy*

The types of organization associated with the uses of water in the water economy have derived from quite different vantage points in the American political system and in response to different patterns of demands at different points in time. These organizations constitute quite different commitments to the

relative importance of different patterns of water resource development in relation to many different communities of interest. Since the different forms of organization tend to determine the capabilities for undertaking programs of water resource development, and, at the same time, to articulate demands in relation to planning for those interests, this analysis of the water economy and its organization will turn to a review of the different types of agencies and their function in water resource development.

*Organizations for the Development of Consumptive and Land-Related Uses of Water Resources.* The earliest use of water resources in the United States simply involved the use of the flow of a stream in its natural state. Under these circumstances no special form of organization was required for the individual enterpreneur to use the stream for navigation, for water power, for fishing or for the number of other uses that might be made of a stream in its natural state. The early water works which were constructed to make greater use of a stream's potential tended to be local single-purpose developments. These developments tended to emphasize consumptive or non-consumptive uses depending upon the region of the country.

In the humid regions of the eastern portion of the United States local projects involving non-consumptive uses took a higher order of importance. These uses might involve the diversion of water into a mill race where the flow could be directed over a water wheel to provide water power for the individual proprietor before the water was returned to continue its course in the natural channel of the stream. In other cases, local navigation canals and locks might be provided by private enterpreneurs or by public agencies to circumvent local obstructions to navigation. In a similar way, people in a local community might construct and maintain dikes and develop drainage works in order to reduce flood damage to their property. Diking and drainage districts were among the first local improvement districts used to undertake public water resource projects in the United States.

In the arid West, the use of water for consumptive demands took priority. The first appropriators were largely individual proprietors who diverted water from a local stream to their adjoining land. The centrifugal pump later gave many individual proprietors direct access to ground water supplies. As a result, the individual proprietor who directly appropriates at least a portion of his own water supply comprises a relatively large portion of the agricultural and industrial users in California, for example.

Apart from the individual proprietor who directly appropriated water from a stream or from ground water supplies to meet his own requirements, the early settlers of the arid West tended to rely upon mutual water companies as cooperative organizations to supply water for individual irrigators on a non-profit basis. These mutual water companies were either organized by a group of individual farmers who would pool their resources in developing a common water supply or by a land developer who organized a water company as an

adjunct of his land development and conveyed shares of stock in the water company proportionate to the amount of land sold in each farmstead. When the developer had completed the sale of land to local settlers, he had at the same time conveyed control of the water company to these same settlers who were then responsible for their own operation and management of the water company. In the course of time, the organization of mutual water companies developed a rather complex structure with new companies being organized by established companies to develop large-scale supplementary water supplies which would then be distributed on a pro-rata basis among the co-operating mutual water companies.

Where private companies have been organized to provide water supplies for a profit, they have uniformly come under state laws governing public utilities. These laws require a company to secure a license of "public convenience and necessity" in order to engage in a public service enterprise and the rates which they may charge for their services are subject to detailed approval by a public utility commission. Private companies providing water supplies as a public service are in effect limited profit enterprises.

The Wright Act, adopted in California in 1887, is generally used to date the rise of the special public district as an agency for the development of public water supplies. Earlier use had been made of special assessment and improvement districts to develop water supply or drainage systems in which local beneficiaries were assessed to pay for the local improvements made under the jurisdiction of local county authorities. The Wright Act, instead, made the general principles of organization in municipal corporations applicable to neighborhoods or communities which sought to develop common water supplies.

A municipal corporation is a legal device whereby a local community of people are permitted substantial authority to organize themselves and to govern their own local affairs. The government of a municipal corporation is usually vested in a governing board or council elected by the local people. The municipal corporation is usually vested with authority to enact ordinances, resolutions and by-laws in relation to its purposes and functions which are binding upon the people comprising the corporation, unless contrary to the general laws of some higher political jurisdiction. Similarly, a municipal corporation is usually vested with control over its internal administrative organization and the management of its own affairs. It may purchase, hold and dispose of property. If necessary, it may exercise the power of eminent domain to acquire property for public purposes. A municipal corporation is usually vested with the power of incurring bonded indebtedness to finance capital improvements, of taxation and of the management of its own fiscal affairs. A municipal corporation stands as an individual before the law; it can sue and be sued; and it has perpetual succession in its corporate name. In general, a municipal corporation has competent powers to develop, operate and maintain a public service program subject primarily to local responsibility and control. It is primarily an instrument of local self-government where the people of a local community are able to take public action in furtherance of their common interests.

From a beginning with irrigation districts, the special public districts, organized along the model of the municipal corporation or the quasi-municipal corporaton, have come to include a vast range of activities related to water resourse administration. These institutions have enabled a local community of people to use public authority to raise the necessary capital as a charge against the local community and upon the local water users subject to local political control. In California alone the state law authorizes the organization of some thirty different types of local government districts for various aspects of local water resource administration. The function of the local public district has been primarily directed to storage and distribution of water for consumptive, on-the-land uses for both rural and urban populations. These have included the irrigation districts, reclamation districts, municipal water districts, utility districts, county water districts as well as the cities themselves which maintain municipal water supply systems.

In more recent years other types of districts such as water conservancy districts, water replenishment districts, water storage districts, metropolitan water districts, county water authorities and county water agencies have been created to develop supplemental water supplies or to realize more efficient forms of water management by reducing the increasing costs of pumping or of salt water intrusion. This latter type of district often encompasses an area that may serve a variety of local water distribution systems. However, their function in the water economy is completely dominated by the consumptive demands of the various types of water distribution systems which are served by the supplemental supplies and the regulatory measures. They serve as water producers and wholesalers for the local distribution systems. The new form of organization simply allows the various units distributing water for consumptive purposes to develop a scale of organization adequate to undertake joint activities in larger scale water production and transportation programs.

In Southern California, where these various local government agencies have seen their fullest development, a complex structure of private and public agencies function as an inter-related system. Some are engaged in water production including surface storage and ground water spreading. Others regulate pumping, and control ground water extractions. The Metropolitan Water District maintains its Colorado River aqueduct to provide a supplemental supply for most of the region. Beyond this is a vast complex of private and public distribution systems. Each of these distributors may produce a portion of its own water supplies. Finally, there are thousands of industrial and agricultural users who maintain their own individual water supply systems largely by pumping from the ground water supplies.

Since an adequate supply of water tends to be the critical element in controlling patterns of development in the arid West, the policy pursued by many of the private and most of the local public agencies is one of securing an adequate supply of water to assure a favorable competitive position for economic and

social development of their local communities. As a result, a major investment is made in political efforts to influence decisions which will assure control over ample reserves of water and thus maintain a favorable competitive position in relation to other communities. The payoff is not measured in terms of the immediate dollar return upon the operation of the water distribution system but upon the adequacy of the reserve supply to meet future contingencies of growth. In many communities, the basic capital costs for developing new sources of supply are financed as a general demand upon taxpayers with the water utility, whether public of private, paying only a portion of the capital charges for its operation and maintenance costs. As a result, pricing policies rarely reflect the cost of water production and distribution, and values associated with the non-consumptive uses of water are apt to be completely subordinated to demands for consumptive supplies.

This vast sub-structure of local private and public agencies concerned with consumptive uses and land-related development of water resources function largely within the framework of state law. Since agencies will articulate the demands which they are organized to represent, the overwhelming political tendency of the western states has been to reinforce the commitments of these local agencies. Western water law, for example, is built around the concept of appropriating water for beneficial consumptive use. Water flowing to the ocean is frequently looked upon as wasted water.

The role that the states have defined for themselves in relation to non-consumptive uses of water has largely been that of a policeman seeking to regulate the behavior of persons making non-consumptive use of water systems for fishing, recreation, boating, pollution abatement and other such purposes. The emphasis is upon the regulation of the conduct of persons rather than regulating the behavior of the water course so as to realize a greater resource potential. The states have done surprisingly little in water resource management *per se.*

Rarely have the states developed a coherent water policy that takes cognizance of both consumptive and non-consumptive uses in a comprehensive state water plan. An exception to this general state of affairs exists in Oregon where a State Water Resources Board has, since 1955, been charged with the responsibility of formulating a comprehensive state water program which recognizes both consumptive and non-consumptive uses including, but not limited to, domestic use, municipal water supply, fire protection, irrigation, power development, mining, industrial purposes, navigation, sanitation, flood control, protection of commercial and game fishing, public recreation and scenic attraction as beneficial uses of the state's water resources. However, even in Oregon with a clear statutory mandate recognizing the beneficial character of non-consumptive public uses, it has been difficult to change the perspectives of some state administrative officials who are inclined to recognize only consumptive use as having a valid claim for a commitment of the state's water resources.

*Organizations for In-The-Channel Development of Water Resources.* The

organization for the management of in-the-channel control of large-scale river systems has posed a complementary set of problems which are fully as complex as the creation of institutions for the distribution of water supplies for consumptive uses. In fact, the two types of organization for consumptive and non-consumptive use may not always stand in contradistinction to one another. In-the-channel management of a river system affects the total production of the water economy in both the consumptive and non-consumptive uses. The stored waters captured during flood flows substantially increase the yield of a stream for both types of uses when these waters are released during the low-water season. Many of the early reservoirs built to store flood flows for subsequent use during the irrigation season also contributed to the general function of river regulation. As an agency responsible for some of the first large-scale, multi-purpose water resource projects, the Bureau of Reclamation was definitely committed to the priority of the consumptive use of water for an irrigated agriculture. Nevertheless, its operating responsibilities also involved major commitments to in-the-channel management of water resources for non-consumptive purposes.

Few questions of organization as such have been the subject of as persistent inquiry and controversy as the organization of programs of large-scale water resource management of America's major river systems. On the one hand there is the task of constituting a pattern of organization which recognizes the functional interdependencies among the various uses that can be made of a river system. On the other hand, in-the-channel management of water resources needs to recognize the integrity of the river system so that projects are operated in a way that will complement one another in a comprehensive system of control for the river basin as a whole.

Thus far the states have not demonstrated a capacity to negotiate a satisfactory interstate arrangement that would provide an adequate vehicle for the regional management of an interstate watershed system. The hope that the interstate compact might become the appropriate vehicle for realizing "the principle of a regional problem, regionally administered" has been marked with disillusionment since the first negotiation of the Colorado River Compact. The states with their orientation to the dominance of consumptive uses have been primarily concerned with getting their "piece of pie" rather than with the development of regional programs related to regional and national communities of interest as well as to state, local and private interests.

As a consequence, the federal government has become the most appropriate level of organization to undertake the development of water resources of the large interstate river systems. Furthermore, the U.S. Supreme Court has recognized that the authority over the development of waterways for purposes of navigation vests exclusively in the federal government by virtue of constitutional powers pertaining to interstate and foreign commerce. This constitutional authority coincidentally constitutes an important commitment to recognize the values of non-consumptive, in-the-channel uses of a river in planning the de-

velopment of its water resources. However, the proprietary interest of the Federal Government in large tracts of western lands has also been the source of important commitments to the development of the consumptive uses of water in that region.

With federal responsibility for in-the-channel water resource management in the large river systems has come the problem of formulating institutional arrangements which recognize the diversity of interests and potentialities for development among the different river basins while at the same time recognizing the extensive interdependence of interests within particular river basins. The Columbia River with its anadromous fisheries and arid lands, for example, poses quite a different problem of development than the Tennessee River. But within the Columbia basin the anadromous fisheries must be taken into account in the development of nearly every water works project. This task of recognizing a diversity of interests and potentialities as between different river basins and an interdependence of interests within individual river basins has been approached with some variations in patterns of organization in each major river basin in the United States. However, for purposes of analysis specific reference will be made only to experience in the Tennessee valley and in the Columbia basin.

The most heralded American experiment in the regional development of water resources is the Tennessee Valley Authority. The Tennessee Valley Authority Act stood for an integrated multiple-purpose river development program by a federal public corporation with jurisdiction over the whole Tennessee valley, a region impinging upon seven different states. The Act included sweeping powers to provide flood control for the Tennessee basin, the improvement of navigation upon the river, and the development of hydroelectric power. In addition, the TVA was authorized to encourage the conservation and development of natural resources generally in the Tennessee basin and specific reference was made to reforestation, the production and sale of cheap fertilizers and the proper use of marginal lands. The TVA, thus, was charged with the task of undertaking the comprehensive development of the Tennessee valley, which had been a seriously depressed economic area. Since this responsibility was primarily vested with one agency functioning at the regional level, the program was characterized as an integrated regional approach to comprehensive resource planning.

As a water resource management agency, the TVA is primarily concerned with in-the-channel management and control of the river system for purposes of flood control, navigation and power production. It excluded power distribution from its operating responsibilities while encouraging the organization of local electric distribution systems by municipal and co-operative organizations in local community areas. The TVA has also divested itself of responsibility for providing shipping terminal facilities and is inclined to look upon the construction of levees and dikes not directly related to the management of the river control system as a local matter which should be provided by the local community.

In regard to other values or uses to be derived from the management of a water resource system the TVA has indicated sensitivity to the problems while avoiding any primary operating responsibility. The TVA, for example, operates no recreational areas or facilities of its own, but has encouraged state and local government agencies to take advantage of the recreational opportunities created by the TVA river control project. It has maintained a small recreational staff in its division of reservoir properties to advise and consult with state and local officials and with representatives of private groups regarding the development of facilities and the management of programs in the field of recreation.

The TVA operations in the areas of resource management which relate to the general social and economic development of the Tennessee valley have also been conducted with primary reliance upon previously existing agencies and institutional arrangements. The TVA has defined its role as an agency to provide technical assistance, financial support and demonstration projects rather than to assume operating responsibility in those fields. Its operating methods have emphasized co-operative arrangements, advice and consultation. In these areas the TVA is obviously dependent upon the decisions of others regarding the course of action taken in these co-operative programs concerned with resource management and economic development.

Thus, the TVA has tended to impose functional boundaries upon itself which limit its commitments in relation to interests that diverge from what it has defined as its primary operating responsibility over the main-stream river control system. It is much less than a fully integrated water resource management agency for the Tennessee river basin. It has avoided or divested itself of responsibility for values that relate primarily to local communities of interest. It has greatly limited its operating responsibility for resource management problems that are directly involved in flood control, navigation and power production. What has been integrated are the dominant values relating to flood control, navigation and power production. Other values are realized only as other co-operating agencies are willing to co-ordinate their programs with the TVA.

These commitments are also reflected in choices made regarding fiscal policy. TVA's commitment to low-cost public power has led to rigid restrictions limiting the use of power funds to finance power developments only. This fiscal inflexibility has led a sympathetic commentator to observe that, over time, the nonpower programs have suffered "both a relative and an absolute decline." These nonpower resource activities, "almost wholly dependent upon congressional grants, have seen their appropriations dwindle year after year until they are in some instances little more than shadow operations."[1]

There is evidence that TVA's initial period of enthusiastic growth and development has been replaced by a more routine administration of an in-the-channel river control program operated as an adjunct of an electric power pro-

1. Martin, The Tennessee Valley Authority: A study of Federal Control, 22 *Law and Contemporary Problems* 351, 374 (1957).

duction and wholesale business. Since the early 1950's, the TVA has expanded its electric steam plant generating facilities until its hydroelectric facilities are being dwarfed by comparison. When hard decisions require choice about the employment of limited funds for resource management activities, those decisions are apt to reflect values which conform to the central commitment of an agency while sacrificing other values with a lower order of priority. In the long-term process, the TVA's experience seems to indicate that an integrated comprehensive approach to the regional development of water resources is apt to become something less than fully "integrated" and wholly "comprehensive".

In contrast to the valley authority approach to water management problems, the Columbia basin has often been referred to as a "piece-meal" approach involving competing agencies with overlapping jurisdictions. The traditional water resource management agencies of the federal government with their special-purpose orientation are all involved in the administration of water resource programs in the Columbia basin. The Corps of Engineers with its commitment to functions of navigation and flood control is probably the most significant single operating agency on the Columbia River. The U.S. Bureau of Reclamation has developed some of its largest reclamation projects and river control structures in the Columbia basin. The U.S. Fish and Wildlife Service has substantial program obligations in the Columbia with its vital runs of salmon and steelhead as well as other sport and commercial fisheries. The Federal Power Commission has jurisdiction in the Columbia basin over some of the best hydroelectric power sites to be found anywhere in the United States. Only the Bonneville Power Administration among the federal agencies has a regional jurisdiction exclusive to the Pacific Northwest. The Bonneville Power Administration is responsible for operating an integrated power transmission grid which distributes hydroelectric power from the various power plants at dam sites to the principal load centers in the Pacific Northwest.

In addition to these functions performed by federal agencies, the states have had important responsibilities for controlling stream pollution, in regulating both commercial and sport fishing and in operating fish hatcheries in co-operation with federal fisheries programs, in developing and operating recreational facilities, in determining water rights among different types of consumptive water users, and more recently, in comprehensive planning for the multi-purpose development of local water resources. The states of Washington and Oregon, in particular, conduct major programs in their fields of responsibility for water resource administration. Local government agencies or districts also perform essential responsibilities in the operation of local distribution systems for electrical power supplies, irrigation, municipal water supplies and for the maintenance of local levees and channel improvements for flood control. Several private electric utilities maintain extensive service areas in the Columbia basin. Both privately-owned public utilities and the publicly-owned utility districts and

municipal power systems operate large water control projects which produce a portion of the power load distributed to their local customers.

The growth of regional interests in the Pacific Northwest has been associated with the development of institutional arrangements for the preparation of research studies and planning reports and for fuller communication, consultation, deliberation and negotiation on a regional, inter-agency basis. The first effort to give a general regional focus to considerations of regional resource planning was the organization of the Pacific Northwest Regional Planning Commission as a part of the effort of the National Resources Committee (later the National Resources Planning Board) to deal broadly with questions of social and economic development. Its report on *Regional Planning, Part I: Pacific Northwest* was an important milestone in formulating basic perspectives regarding problems of regional development.[2] The development of the water resources of the Columbia River formed the central part of that report.

The Regional Planning Commission's concern for the development of a public power policy which would encourage the general economic growth and development of the Pacific Northwest region led to the creation of the Bonneville Power Administration and its low-cost public power policies. The Regional Planning Commission was also instrumental in organizing the Northwest Regional Council of Education, Planning and Public Administration to provide a common agency for the organization of research activities and a common forum for the exchange of ideas among professional personnel of the region's academic institutions, planning agencies and public administrative agencies concerned with resource problems and economic development.

Changing conditions of war and peace and of national politics and public policy lead to the demise of the Regional Planning Commission, of the Northwest Regional Council and of other particular institutional arrangements, but these have been replaced by rich and varied institutional arrangements for planning, consultation and negotiation on an inter-agency, regional basis. Many of the primary resource agencies have regional advisory committees which have become a part of their planning and decision-making processes. Inter-agency intra-departmental and inter-agency inter-departmental field committees have seen extensive use. The departments of Interior, Agriculture and Commerce have maintained regional representatives to facilitate co-ordination among and between departmental agencies. Finally, many of these arrangements have been co-ordinated since 1946 with the organization of the Columbia Basin Inter-Agency Committee. The CBIAC serves in part as a forum for the exchange of ideas and a conference for the negotiation of inter-agency interests. It also provides an important means for professional administrative personnel to co-ordinate operations through the work of the vital water and power committees.

2. National Resources Committee, *Regional Planning, Part I: Pacific Northwest* (1936).

As these arrangements have led to decisions and to programs of action, basic operating commitments have been formed which require the various operating agencies to take each other into account in the conduct of a co-ordinated resource development program. Today, the Corps of Engineers is dependent upon the Bureau of Reclamation, which operates the larger up-stream reservoirs, to provide its principal regulation for flood control. The Bonneville Power Administration depends upon the co-ordinated operations of the Bureau of Reclamation, the Corps of Engineers and a variety of publicly and privately owned electric power systems to produce the electric power transmitted over its regional grid. All of these electric power facilities are co-ordinated in a regional power pool. The financial feasibility of most of the region's reclamation projects are in turn dependent upon the pricing policies of Bonneville Power Administration. Some of the most imaginative work in engineering of fish facilities is being done by a private electric utility and by a municipal power system. These inter-agency operations have made regional, inter-agency institutional arrangements an imperative necessity in the Pacific Northwest. Independence of action without regard to other co-ordinated values can no longer be tolerated in the development of the Columbia River.

The differences between the patterns of water resource management in the Tennessee valley and in the Columbia basin is largely one of degree rather than one of kind. The TVA has a relatively more dominant position in the control of the Tennessee River than any one of the water management agencies in the Pacific Northwest. Even the TVA, however, has divested itself of primary operating responsibility for such non-consumptive, in-the-channel uses as recreation; and fish and wildlife. In both basins, the primary federal agencies can be viewed as the basic water producing agencies.

Water production is more nearly monopolized by the TVA in the Tennessee valley while a number of local government agencies and private companies maintain water producing facilities to supplement the basic federal control system in the Columbia basin. However, the licenses for these projects usually specify conditions that the utilities conform to requirements for maintaining public values regarding recreation, fish life and flood control in the design and operation of their projects. The problem of co-ordinating these systems in a water production program has been the source of some of the most intense controversies over water resource developments in the Pacific Northwest.

*Organization for Comprehensive, Multi-Purpose Development.* As the evolution of American institutions concerned with the development of water resources has unfolded, the earlier period of development saw a reliance upon private and local public agencies which placed emphasis upon the consumptive use of water supplies or upon water works related to on-the-land developments. These institutions were primarily related to local communities of interest in land and land-related developments. It was only much later that the concern for large-scale river control and management programs on a multi-purpose, regional basis

came to the forefront in water resource developments. These tasks have been predominantly organized through agencies of the Federal Government. Both sets of agencies have performed vital roles which are essentially complementary to each other. The one set emphasizes the retail, distribution function. The other set emphasizes the production function.

This specialization in function has resulted in selective commitments and biases in the development of water policies at the different levels of government. The private and local public agencies have been overwhelmingly committed to the priority of values related to the consumptive use of water supplies. The predominant interest of these agencies in state politics has tended to reinforce a comparable commitment in state water law and water policies. The federal water production agencies, on the other hand, have tended to emphasize the interests associated with non-consumptive uses of water supply to the extent that these interests have been reflected at all.

If all of the goods in the water economy were amenable to production and distribution in the market, the solution to the problem would be relatively simple; or, contrariwise, if all of the goods realized in the use of water resources were subject to provision as public goods for a single community of interest, the problem of comprehensive multi-purpose development could be solved in a relatively simple way. Instead, the water economy includes a variety of goods some of which are more or less amenable to allocation in the private market, others which might be organized through private agencies but are involved in substantial questions of public interest and finally there are those goods which seem to be amenable only to public provision if they are to be provided at all.

Furthermore, these goods affect many different communities of interest. The variety of local communities of interest alone is immense. In addition, regional interests in water resource development has been one of the chief factors directing attention to the problems of regional organization within the American political economy. Finally, inter-basin transfers of water and hydroelectric power indicates that the watershed basin is not an isolable unit for defining interests in water resource development, but these transfers tend to point up inter-basin regional and national interests of substantial proportions.

Theoretically, the allocation of water among competing demands for consumptive uses would be relatively simple to solve by market-type arrangements except for the essentially monopolistic character of water distribution systems and the necessity for making choices concerning the relative balance between consumptive and non-consumptive uses in the water economy. Any effort to recognize the place of both consumptive and non-consumptive uses of water will require a fundamental re-evaluation of state water law and of public policies regulating the consumptive use of water supplies.

State water law requires re-evaluation since it determines the nature of the property to which various proprietors can make enforceable claims to water supplies or in re-allocating surplus or waste waters.

the character of the use that can be made, and the degree of transferability of a water right are all defined within the framework of water law. Unfortunately, the bramble bush which some of the states have permitted to grow under the name of water law defies comprehension by even those who are the most learned in the mysteries of law. Many proprietors, unwilling to risk the security of their rights, insist upon an exclusiveness of control which denies many obvious economies of scale in interrelating distribution systems, in the interchange of water supplies or in reallocating surplus or waste waters.

If greater reliance is to be placed upon market allocation of water for consumptive use, the law must define the property in a water right with a view to the exclusiveness of proprietary interests, in relation to some readily specifiable and measurable unit of water which can be simply transferred in whole or in part. A definition of rights by reference to various correlative doctrines simply creates unavoidable confusion for market economies.

The interest of others, and especially the public interest in non-consumptive uses can best be recognized by an enunciation of public policies which specify the conditions for the allocation of water for consumptive uses as against the reservation of water for non-consumptive uses together with an indication of the public responsibilities of the various appropriators making consumptive demands upon water supplies. Here the state of Oregon has pointed the way with its emphasis upon comprehensive multi-purpose planning for water resource development. The amount of water available for appropriation for consumptive use is related to the development of plans which, when adopted by the State Water Resources Board, become a part of the state's water policy indicating the order of preferences among various consumptive and non-consumptive uses and the stream flows to be maintained for non-consumptive uses in particular watershed areas.

Any resolution of the conflicting interests of the federal and state governments over the validity of state water rights should take cognizance of the necessity of defining the public interests especially in relation to various public, non-consumptive uses of water resources. A comprehensive water policy can be developed only when these interests are articulated. The special federal interests regarding in-the-channel water management programs suggests that federal agencies should be concerned that these interests be formulated as a part of the federal water policies that bear upon state water law.

The task of making plans regarding the relative allocation of water resources to non-consumptive uses or in making allocations among the non-consumptive uses is the most difficult area for decision-making in water resource development. Reliance upon methods of economic analysis where a dollar value is assigned to public uses is only a partial solution. Since the non-consumptive uses do not have a directly salable market value an approximate dollar value must be assigned and this assignment of value must necessarily be somewhat arbitrary.

It is entirely possible that the commercial potentialities of the salmon fisheries,

for example, have been seriously underestimated. Anadromous fish have a built-in guidance system which takes them to the ocean to pasture and to mature unattended, and then leads them back to spawn in the stream of their birth. It is even unnecessary for people to engage in such inefficient games as salmon fishing when fish ladders could direct a run of salmon to a fish market as easily as they can pass brood stock upstream. If a reasonable portion of the effort that our state universities and agricultural experiment stations have devoted to animal husbandry had been devoted to salmon husbandry, we might find salmon to be an extraordinarily valuable water product which should be given a much more important place in the water ecenomy.

Since economic analysis at best provides a tool for making a gross approximation to questions of evaluation in planning for resource developments, attention should also be given to the way that organizations are constituted and related to one another as a political framework for making decisions and exercising control over events. The structure of organizational arrangements implicity determines the basis for distinguishing the sets of events to be controlled, the order of preferences for ranking the values to be achieved by organized activities and the standards for determining the relevancy of information to be communicated in the decision-making process. Since the patterns of organization have a fundamental influence upon the development of perspectives, values and ideas regarding resource policies and patterns of resource development, any question of comprehensive planning must necessarily involve comparable questions about the design of organizational arrangements.

All aspects of administration and of economic development are based upon the assumption that efforts to control events will produce some greater benefits than if the events were not controlled. The initial problem in organization is to determine which set of events is to be controlled in relation to some value reflected in the consequences to be realized. What these interests are and how they are ordered in relation to one another comprises the basic task in constituting any general system of organization.

In dealing with the development of water resources, the interests that are related to the various uses of water and of the flowing stream can theoretically be tied together in an integrated water agency. But such a decision necessarily means that land and water interests in recreation, energy, transportation, fish and wildlife and rural and urban community developments cannot be organized in similarly integrated agencies. The fact that the universe is not organized in mutually exclusive sets means that any form of organization must take account of the patterns of interrelationships among the different sets of events that are being controlled.

The experience in both the Tennessee valley and the Columbia basin would seem to indicate that the comprehensive development of water resources cannot be organized within the framework of a single integrated agency. Too many values are at stake in relation to too many different communities of interest.

Changing requirements and conditions of life do not permit a simple ordering of values in which one set of values can be arbitrarily rejected and subordinated to another set of values. The organization of planning for comprehensive development must be able to tolerate conflict so that the various interests about controversial issues can be clarified, adequate intelligence can be organized and decisions can be negotiated. If the diverse interests can be negotiated and decisions reached, program can then be co-ordinated, each with the other, through a variety of operational agreements and contractual arrangements.

Water resource administration, because of the rich interrelationships among the various values or goods which can be derived from water, will require a very rich and complex system of organization in realizing the diverse values of multipurpose development. As patterns of demand change, we can anticipate that the patterns of organization will also change. Increasing competition for the available water supplies will certainly require a much greater clarification of the place of non-consumptive uses in relation to the various consumptive uses of water. The choices among these uses will reflect the preferences which we as individuals make when we function as consumers and as citizens. If we are organized so that we can inform and articulate our interests both as consumers and as citizens, we should be able to arrive at those settlements in the use of water resources that represent the requirements for comprehensive development at any given period of time. A rich variety of both private and public agencies would be required in order to realize any such objective.