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The Texas Water Plan and Its Institutional Problems

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ABSTRACT

An expansion of the supply of water and greater efficiency in its use are necessary for the future economic development of the state of Texas. Imported water, supplemental to that available in the state, is an important part of development plans as outlined in the Texas Water Plan, a proposal of the Texas Water Development Board.

Implementing the Board's plan to reallocate water supplies and improve the efficiency of land and water use will raise many serious problems. Solutions will be required in a wide array of institutional problems that will extend to such areas as the interstate diversion and interbasin transfers of water, doctrines or water rights and legislated water use-priorities, acreage restrictions established in federal reclamation law, comingling public and private water, construction financing, revenue production through a system of taxation and water sales, and the organizing of new institutions for governing the entire System.

As the need for master or other special districts is faced, decisions will be required as to whether to organize for centralized control from the state level or with emphasis on control by the local area. Reorganizing institutions, or their formalized cooperation, will be necessary to permit local control, yet be able to induce the desired efficiency in resource use that will make the Texas Water System succeed. Failure to achieve efficiency in the functioning of institutions may result in an institutional overhead so high as to prohibit realization of the anticipated System benefits.

KEY WORDS: Institutions, Water Rights, Costs and Benefits, Cost Sharing, System Financing, Overhead and Operating Costs, Master Districts, Institutional Jurisdiction.

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This publication should not conclude the examination of institutions affecting the successful implementation of the Texas Water Plan. Not all institutional arrangements useful to diversion, transfer and distribution of water among regions have been explored. Interested persons are urged to communicate their ideas, criticisms and proposals to the authors or to agents of local, state and federal agencies having responsibilities for the planning of water transfer systems. Careful considerations of alternatives will promote the development of an institutional structure which will provide for an efficient system.

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by

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INTRODUCTION

The importance of water in all life processes is easily recognized, but unless one happens to be in a situation where his own physical needs exceed the amount of water available such a statement of fact is apt to prompt a "So what?" response. Only when a water shortage arises that has a direct impact on the individual does he begin to give serious thought to how he might improve his situation, with the degree of concentration likely related to the immediate seriousness of his problem.

Water "problems" are not recent phenomena: they are as old as mankind. Many of the words we use today stem from word descriptions of water and water-related problems of ages past. The English word "rival" stems from the Latin "rivalis". The original definition of that word was based upon the conflict arising from two people living on opposite banks of a stream, suggesting thereby the long history and importance of opposing interests in water.[3] And our numerous water laws testify both to the importance we attach to water and to the dimensions and complexity of conflicts over the use of water.[2]

Conflicts arise as the pressures on any given source of water intensify.

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[1]Professor, Department of Agricultural Economics and Economics, Montana State University (while on leave associated with the Water Resources Institute, Texas A&M University), and Associate Professor, Department of Agricultural Economics and Sociology, Texas A&M University, respectively.

[2]Hutchins, for example, required 673 pages for his encyclopedic treatment of Texas water laws alone.[27]

With increases in urban population, real incomes and living standards, and as technologies in agriculture and industry have improved, ever increasing supplies of water have been required.

In the early stages of water development the least complex (often single-purpose) and less expensive projects were first undertaken. As the needs for water have continued to grow, development projects likewise have grown in scale, complexity and cost. The multiplicity of uses to be served have included some combination or all of irrigation, navigation, flood control, provision for sanitation and water quality and recreation. Going to more expensive projects, and developing more costly sources of supply, for more widely diversified users, has called for greater public involvement in their support.

When the public becomes more deeply involved in supplementing existing supplies, the question of efficiency in the use of resources committed to development projects, and in the uses to which water is put, is the more frequently considered. The "proper" allocation among all uses becomes more critical because the losses to society from a malallocation of water becomes greater.

Economic efficiency is a valid concern of the public particularly when resources are taken from uses in the private sector and used to produce goods and services for either public or private consumption. That concern is often expressed by public policies and their attendant programs with specified goals and objectives. Such terms as "maximum benefit", "maximum efficiency", "optimum use", etc., are mere catch-phrases however unless they are sincere goals of all participants, with an organizational structure

so devised as to permit their attainment.

The use of water (or any other resource) is economically efficient when a reallocation of a given supply will not increase the total benefits to society, with the concept of economic efficiency pertaining to the ratio between useful output and useful input.[46] The criterion implies an equating of costs and benefits at the margin, comparing the increment to benefits generated with a given increment to costs.

Viewed in this light, water exhibits all the characteristics of any other productive resource: it has value in use because it yields a product of value; it is capable of a variety of uses; yields in different uses vary according to the mix of other resources used with it, as well as with the quantity of water used (thus the law of diminishing returns applies); and other resources can be substituted for it at the margin. Such characteristics create the economic problem of use, and the optimum amount of water to commit to any use can be determined by answering the twin questions of "how much" and "for what purposes".[1]

When water is considered as an ordinary factor of production the need for a mechanism by which to regulate the quantities used and types of uses becomes evident. Serious students of the water problem have been led to a variety of recommendations ranging from rigid public controls to a free market for water.

A free market can easily be demonstrated to be the most efficient allocator -- efficient in terms of the total resource (including adminis-

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[1]For a more thorough treatment of the concept of economic efficiency, see [33, Ch. 2]; [46, Ch. 8]; and [9].

trative) costs of producing the assortment of goods and services in the quantities, at the time, and in the place of the wants of consumers. Kohler calls our price system "incredible" in discussing the way in which it is able to bring forth the proper amounts of goods and services through the unconsciously coordinated actions of millions of people responding to the stimulus of prices, rather than being administratively directed to act. We "sleep easily at night without the slightest fear of breakdown of the complicated machinery that supports our lives -- trustingly believing that we will find in a nearby store any of the hundreds of thousands of items to eat, drink, wear, and play with".[32, Ch. 2]

There are reasons why the resource water is not handled so simply or easily through the existing market price system. Water is, in fact, no different from any other productive resource, but certain institutional attributes have been attached to it making the use of water different in many respects. These special conditions act to restrain freedom of exchange and use, emphasizing proprietary rights in water and its apparent critical need for all life processes, and causing us to ignore important economic relationships in the use of that resouce. Some ascribe such a degree of importance to water that the values of all other resources would fall to zero in the absence of water [4, p. 1] without recognizing that the identical result would obtain if the same were done with any other resource needed in the production process.[1]

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[1] Of what value would water be in the absence of labor, capital, nitrogen or other nutrients for growing plants, or salt, heat, etc., that are used in combination with it?

In spite of such speculation there are certain characteristics which do give to water a special uniqueness. Numerous studies have analyzed and described such features as externalities or "spillover" effects [30, Ch. 5], extra-market values and interdependencies [3, Ch. 3] which, along with the commonality of interests in most sources of water, forces the question of allocation out of the free market and into special public administrative devices.

Attempts to establish measures that would improve the efficiency with which the existing supply of water is used has brought an awareness of the economic content of the problem. The concept of the river basin as a logical unit for planning and development slowly emerged following the urgings of the conservationist movement for more efficient use and management of the nation's water resources. Such projects as the Hoover Dam and the Tennessee Valley Authority demonstrate a significant change in national water policy.[49, p. 103] As the years have passed, we have progressed from the simplest of interbasin transfers of water to the massive and complex international projects. An example of the latter is the North American Water and Power Alliance proposal, involving a diversion of surplus water from the Canadian Northwest and Alaska to water-short areas in many parts of the continent.

Numerous states presently have large projects either under construction (e.g., The California Water Plan) or in the planning stages. Texas' water needs have become critical, with relief anticipated in the proposed Texas Water Plan.

Some proposals involve the investment of many billions of dollars in facilities to move large quantities of water from one basin or region to another, with numerous barriers to overcome before the project can be brought into operation. Many of these problems are serious, ranging from the physical and engineering through legal, political and administrative, with comparable informational requirements upon which to base judgments regarding the feasibility and desirability of the project in question.

Officials and agencies in Texas who are charged with responsibility for planning the efficient and orderly development of the state's land and water resources are especially aware of numerous problems stemming from the way in which this society is organized. Their efforts involve the analysis of such diverse activities as the interbasin transfer of water, integrated storage reservoirs and transport systems, navigational improvements, flood and hurricane protection, and pollution control, with supplies of water to all types of uses throughout the state. Although water development is the primary concern, there will be far-reaching implications to other resources as well. Relevant institutions ultimately will determine whether and how those plans are carried out.

INSTITUTIONS

As a society progresses from the most primitive level to increasing degrees of interdependence, its requirements for some regulatory and directing force also expands. A man alone -- a Robinson Crusoe -- has no need for rules to guide his activities. Having neither dependence nor effect on others, his conduct need be conditioned only by his desires, with the results of his actions affecting him alone. But any grouping of people requires a group-oriented control structure capable of protecting and guiding their contacts with each other whenever one man's actions may affect another. Such direction is provided by "institutions" which serve the group. They become the integrating mechanism without which we would have perpetual chaos and conflict. Any action, whether it be for the public development of resources or any other individual or group process, is conducted within an institutional structure. Every action or reaction, every pressure to change, to do or refrain from doing, is the pressure stemming from the directing or controlling nature of an institution.

These institutions do not simply spring up of their own accord, but are brought into being by the group itself to solve problems or to meet special needs caused by those problems. Professor Young says that it takes repeated problem situations or crises to generate institutions, and from these, groups develop certain standardized rules or methods of performance which become crystallized in definite forms that hold the interests and attention of men.[64, Ch. 13] These rules or standards of conduct develop

first as folkways, grow more rigid and become sanctified in mores, evolving into specific institutions prescribing acceptable individual behavior. Each member of a societal grouping is "made aware of prohibited actions with his continued membership depending upon his acceptance of those limits". [41, pp. 315-62]

Kelso used an interesting approach in explaining institutions and their functions by comparing them to the "rules of the game" in a sport. [29, pp. 187-96] Rules are required lest the game be nothing more than mass confusion for the participants, yet be something of interest to spectators. Individual and group behavior are prescribed by these rules of the game which specify the playing members, their roles in the game, the field of play, the goal of play, and the duties of the game's officials. They also provide for ruling bodies which establish (and change) the rules of the game. In addition to "the formal and codified rules, strategies and tactics of play become generally established with the passage of time; customs and practices ancillary to the actual play of the game emerge and become part of the total behavior" of all participants in the sport.

The institutions we have today are the result of a long evolutionary process of growth and change, being deeply rooted in history. They are a social heritage, invented, given shape, meaning, and power by the diverse interests and needs of people in specific areas, reflecting the socio-political value systems peculiar to those people. And since man is much the product of his environment, institutions, by their pervasive everywhereness, in turn shape and condition the attitudes and beliefs of the individual.

The variety of institutions within contemporary society is as broad as the various activities in society, encompassing our legal, political,

cultural, social, religious and economic interests. Their influence and powers extend to such diverse things as the family, school, church, law, property, taxation, firms, markets, banking, transportation, communication, government in all its functions, our political system, the basic freedoms, and any other of the activities expressing numberless individual or group needs and desires. Having developed around each different human activity, they tend to produce conformity rather than change, stability rather than progress -- a type of constancy and certainty in each of our activities.[1]

Institutions provide a framework or environment, at whatever level of social grouping, within which our everyday lives are regulated. They involve habit, custom and cultural organizations from the smallest group unit and on up, and laws and legal statutes with their restrictions and requirements, leading to Commons' definition of institutions as being "collective action in restraint, liberation and expansion of individual action", [14, p. 73] at once controlling individual action and freeing him from the necessity of protecting himself from the actions of others.

Permanence and continuity, yet with a degree of adaptability, are suggested by Barlowe where he indicates that the institutions incorporated in our social heritage often change with time, all the while "dictating what is and what is not acceptable behavior."[2, p. 317] A life span greater than any of its individual members is attributed to institutions by Commons when he wrote, "Instead of isolated individuals in a state of nature they are always ... members of a concern in which they come and

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[1] Yet the concept of "progress" embodied in the freedom to adopt new technology (implying that change is acceptable at whatever rate it comes) is itself an institution.[17, p. 42]

go, citizens of an institution that lived before them and will live after them."[14, p. 74]

Such institutional longevity suggests rigidity, and it is evident. But needed institutions (and institutional needs) change as the elements of society change. Pressures on our institutions to redirect their functions come about from changes in our values, goals and needs, in our incomes, tastes, spending patterns, and technologies, all of which put differing pressures on different types of resources. As certain institutions are outgrown they can be a "hindrance to action in the public interest," [25, p. 185] and their restructuring then becomes necessary.

Institutional longevity and rigidity is at once a virtue and a hindrance. The response to one's actions can be known beforehand, thus removing much uncertainty about the outcome. Yet some planned action that may even be vital to the group will be prevented by the restraining function of an institution. Problems arise when guidance is expected, or some change is proposed that is contrary to the purpose of that institution. Such efforts cannot succeed until the framework within which that activity is to take place is changed.[1]

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[1]Visualize a change in land use, for example, that runs counter to the institution of personal property, with its attendant rights of use. That institution (with the court's backing) will be a barrier to change so long as it remains a viable and controlling force in the holding and use of land.

A specific instance of likely conflict in water rights is embodied in the Wagstaff Act which states, "... all appropriations or allotments of water hereafter ... shall be granted subject to the right of any city, town, or municipality ... to make further appropriations ... without the necessity of condemnation or paying therefore ..." This right is yet to be tested in court [51, p. 15] but it has legislative sanction in spite of being directly contrary to the security of tenure inherent in the institution of property. [55, p. 263] Domestic and municipal appropriations made after 1931 are junior to all appropriations perfected before that date, but are senior to all other appropriations made after that date.[27, p. 255-6]

Since all institutions, as well as the results of the activities of people, are involved in the satisfaction of wants and needs, institutions do have an impact on the utility that is generated. Economic efficiency is an important criterion in regard to any economic activity; it is equally important in evaluating institutional performance. When institutions block needed change, because of their obsolescence or simple rigidity, it would seem necessary to restructure them so as to foster those activities which yield the greatest utility to society. A social optimum is to be preferred, but such an optimum cannot be achieved when an institution prevents the attainment of desired objectives of society.[1]

It is the restrictive institutional performance of this sort that is often the subject of criticism. Invariably the profession has regarded institutions as blocks or obstacles to economic change, and this has not escaped criticism.[2] The extent of serious problems in the areas of income distribution and poverty, inflation and unemployment, resource use and environmental degradation, etc., are testimony that present institutions

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[1]Given carefully specified conditions, a social optimum may be defined as a situation in which society obtains all its goods an services in the quantities, in the place, and at the time they are most desired. A system is economically efficient when it is not possible to increase the output of goods and services by any readjustment of resources without making someone worse off than he was before.[20, pp. 15-16; 43, Ch. 4] Adding institutional efficiency as a further requirement means that, e.g., legal problems are settled without undue delay or excessive costs, or that social and other services are provided efficiently in accord with society's goals and values.

[2]Dr. Penn criticizes the economic theorist for assuming that institutions are "fixed," suggesting instead that institutions should be regarded as "tools" which can be used to resolve problems and help us to "get where we want to go."[39, pp. 182-84]

are not performing according to the standards of society, leading to proposals for changing them. But because institutions involve our values and beliefs, utility or disutility are also derived from the institutional structure. Thus institutional change must be accomplished within the framework of the values held by society, or disutility will result.

With institutions and their performance so interwoven in the overall of the system's total productivity, institutional obsolescence is a cost to society, borne by someone, either individually or in groups. The cost shows up in the form of serious social problems "such as poverty, pollution, crime or overpopulation. Yet people know so little about their institutional systems whose performance was intended to avoid these ills, that they search for hidden villains, blame their elders, or rebel against the system."[48, p. 16]

An impersonal discussion of institutions should not divert us from recognizing the involvement of people. It is not institutions in and of themselves that act to hinder or foster change. Many if not most significant institutional organizations can be traced to the activities of a relatively few people, or even just one person. Any transition proposing a new or a changed institution will face the power of vested interests. The loss or sharing of present functions will be resisted, with any replacement being (justifiably) required to demonstrate a significant improvement in services or benefits before that new organization is acceptable.

THE TEXAS WATER PLAN

People and their agencies in Texas have linked much of the state's potential for significant growth and prosperity to securing adequate supplies of usable water. Water is regarded as potentially the most limiting factor in the state's future development; it presents a real threat of causing a plateau above which the state cannot rise in the absence of a solution to its water supply problem.

Projections of Texas' future needs far exceed the available supply of water, and numerous studies have been conducted over the years with many others now in process searching for feasible alternatives to supplement and to improve the quality and quantity of its internal sources of supply. Problem oriented research and public efforts have increased substantially, particularly in the past decade. This does not mean that people in this state have previously been unaware of their water problem -- it has long been recognized -- yet considerable time has elapsed between recognition and positive action (triggered by the severity and duration of the drought of the 1950's, and the destructive flooding in 1957).

Given the distribution of water throughout the state, Texas is approaching the maximum level of water use that can be sustained by the present supply. West Texas (especially in the High Plains and the Trans-Pecos regions) is rapidly depleting its underground water where the rate of use for irrigation far exceeds the natural recharge. With no increase in water supplies, irrigated acreages will begin to decline by 1985, and by the year 2020 is expected to fall to only about one-third of the six million acres projected for the 1980's.[21, p. 12; 52, pp. III - 10-12]

Other irrigated areas throughout much of the state (the Lower Rio Grande, Winter Garden, and North Central Texas, for example) face a similar but less drastic change, with the acreage reduction approximating one-third of the present total land irrigated.[1] [52, pp. III - 8-13]

Less noticeable is the depletion of groundwater and the resulting damage and increased pumping costs from continued overdrafts in urban areas that have obtained much of their domestic and industrial water from this source. The Texas City experience, which was recorded long ago, has involved salt water intrusion in supply wells and land surface subsidence averaging 2.4 inches per year.[8, p. 18] Some major cities have been pumping water at a rate exceeding natural recharge in the area of pumpage, with Houston as probably the most striking example. Despite pumping from a major aquifer with a relatively high rate of recharge, the water table in Harris County has fallen from 40 to 50 feet below the surface in the early 1930's to 250 feet or more presently.[52, p. II - 11] The current rate of use is considered sustainable but a projection to the year 2000 indicates a 35 to 50 percent increase in water requirements to a rate of

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[1] The total acreage reverting to dryland agriculture could approach five million acres, with production losses of considerable value to the state's commercial sector as well as to the agricultural industry. If we can accept the (1959) $63 per acre difference in value production due to irrigation in the High Plains [1, p. 8] as a rough estimate generally applicable to the other irrigated areas in the state, this lost production would amount to about $300 million per year. Capitalized at the same 3.5% rate used by the Board in determining present values of costs and benefits [52, p. I - 32] this $300 million has a present value of more than $8.5 billion, an amount larger than the entire proposed Texas share of total System costs.

use in excess of 1,500,000 acre-feet per year, with 60 percent of that amount having to be obtained from surface water deliveries.[1]

These are only the more spectacular example of the seriousness of the water supply problem which is expected to intensify in the future. Problems such as these have caused local areas to attempt to solve their particular problems through local action. Numerous legislative enabling acts have provided the bases upon which a large number of local organizations have been established for a variety of purposes -- power generation, irrigation, flood control, drainage, etc., each basically a single-purpose, intrabasin organization, and each (usually) providing for a new institution to conduct the affairs of the project.

Part of the current problem is simply a distribution of the state's water supplies out of harmony with population concentrations and areas of highest need.[1] Intrastate redistribution and water quality improvement would alleviate the present problem, but these measures are viewed as short-term solutions only. An increase in over-all quantity, and improved distribution as well as quality, are needed for the longer term.

Responding to the impending urgency of water resource problems, the 55th Texas Legislature passed the 1957 Water Planning Act. This Act set up the Water Development Board, transferring some of its responsibilities from

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[1]The physical supply would probably be adequate to meet all needs in the foreseeable future.[44] Annual precipitation over the entire state amounts to an average of 413 million acre-feet, with runoff averaging 39 million acre-feet per year.[52, p. II - 14-15] Some areas in the state receive far too little rainfall, others too much, and in many areas quality needs cannot be met unless a technological break-through permits an increase in the economic supply of water.

the State Board of Water Engineers and the Texas Water Commission.[36, pp. 3-6] The Water Development Board is charged (among other duties) with responsibility for the preparation of a comprehensive plan for the orderly development and management of all the state's waters.

Early in 1969 the Board publicly released "The Texas Water Plan."[52] From among numerous alternatives,[1] the plan outlined in that document is considered the most feasible. It is an ambitious proposal aimed at developing the in-state water resources, supplementing these resources by an import of surplus water from the Mississippi River,[2] and distributing water for a wide variety of purposes throughout the entire state by way of several coordinated transfer systems.

Texas has an opportunity to generate an unusual breadth of economic growth with its proposed water plan. The anticipated effects of such a development will be widespread and diffused throughout the state, with benefits extending beyond its boundaries as well.

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[1] Imports from basins other than the Mississippi (including Canadian water), from desalted sea water, or the possibility of altering the distribution of rainfall through weather modification were all evaluated and dropped because of uncertainty of the possible supply, the extreme length of time that would be required before deliveries could be made, or the too highly speculative possibility that new or improved technology might provide the needed water before retrogression and decapitalization in the state had taken its toll.

[2] The proposal for an interbasin transfer of water follows established national policy. In assessing the nation's water resources, the Water Resources Council states: "In view of the present and projected inadequacy over the next 50 years of the water supplies available to meet requirements ... the Council finds that ... alternative means should include consideration of transfer of water between basins ..."[61, p. I - 32]

A publicly sponsored investment of this magnitude gives rise to huge monetary commitments with large attendant costs. The prospect of such an undertaking offers an exciting possibility to many people; others feel it will be an impossibly large mortgage on their future. The lump-sum estimate of $8.996 billion is a staggering amount of money. But what will be the burden (in annual terms) on the people who ultimately must pay for this water system?

Project construction is estimated to extend over a 12-year period from the initiation date, with major intrastate work to be completed by about 1985. The annual spending for construction thus amounts to about $750 million, in 1967 prices. If we divide that $750 million by the 1967 population of 10,869,000 [6, p. 75] we get a capital construction cost of $69 per capita per year for the 12 years of major intrastate construction. This, however, is not to be a "pay-as-you-go" project; it will be amortized over the life of the physical assets of the project. If we use a 75-year amortization period, and a five percent interest charge, the annual per capita burden would be less than $35. Because the project includes a number of national benefits, it will be proposed that the federal government's share in the costs of constructing the Texas Water System be about two-thirds of the total,[1] thus the direct per capita share of construction

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[1]Several purposes -- flood protection, fish and wildlife, water quality improvement, recreation, navigation, -- are an integral part of the System, and, because of the national interest, parts or all of the costs for these purposes will be nonreimbursable.

costs will amount to less than $11 annually.[1]

How does this compare with other state expenditures? In 1967, Texas made capital (construction only) outlays of $508,703,000 for its highway system (the per capita share being $46.80), and $124,718,000 for sewerage and water supply system construction costs ($11.46 per capita); and total spending for colleges and universities, local schools, hospitals, welfare programs, and interest on general debt [6, pp. 55-56] each exceed the above estimated $11 per capita share.

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[1]Increases in construction costs through inflation (over the 1967 price levels used in the Plan estimates) could average more than 5 percent per year to the year 2020, without increasing the per capita dollar costs, because of the projected population growth (estimated to total 30,546,378 by the year 2020). It should be noted, however, that the projections of economic growth and population increase are based on the assumption that adequate water of acceptable quality at reasonable cost will be available as it is needed.[50, p.3]

TEXAS WATER SYSTEM PROBLEMS

For a huge water development and transporting system such as that contemplated in the Texas Water Plan, institutional needs will be numerous and complex. Some significant changes in present institutional structures will be required; new institutions must be established where needed, incorporating functions of other existing institutions in some instances; and the unworkable or unnecessary institutions must be abandoned.

Institutional arrangements necessary for interstate diversions of water, for the mangement of improvements and transport system, for establishing and maintaining rights to water resources, and for developing repayment responsibilities among water users and other beneficiaries will be essential to the implementation of the Texas Water Plan.

How powers and spending authorities are shared among the several levels of government (federal, state, county, city, and the variety of special and other districts) carries important implications for the efficiency with which the Texas Water System will be operated. The effects of these will extend to the quality and promptness of services performed throughout the system, and to attitudes relating to acceptability of the system by the citizens in the regions served.

Federal Reclamation Law

Scale economies in irrigated agriculture must be utilized to their fullest lest the value output from System and other water be too low relative to the cost of water to the users. A threat to Texas agriculture exists in how the Reclamation Act and its amendments will be interpreted and applied as a result of federal participation in developing the Texas

Water System. That Act became the primary vehicle in the use of federal funds to reclaim and develop land for irrigation, intended as an instrument of social policy to encourage family-sized farming units.

The extent of departures from full application of the Act and its amendments in Texas will be determined by the U.S. Congress. How that Act is applied can be of both benefit to and restrictive to state interests and purposes. On the one hand, reclamation expenditures by the federal government are to be repaid over a long-term period without interest;[1] at the same time the 160-acre limitation holds a serious threat for much of the state's irrigated land. As originally written, the Act prohibited water deliveries to individual irrigable land holdings in excess of 160 acres.[2][48, p. 173]

It is the hope of the Texas Water Development Board that this provision of the Reclamation Act can be avoided, and there is precedence for such an expectation. Blanket application of the 160-acre limitation has been waived on a number of projects, with such exemptions being granted by acts of Congress. A variety of reasons have been accepted and used in approving those exemptions, some of which may serve as important precedents

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[1]Irrigation facilities construction charges are repaid over a 40-year contract period. A 10-year farm development period is provided for in the Reclamation Act, following which the 40-year repayment period becomes effective, giving rise to the occassional statement that such debt payment is made over a period of fifty years.

[2]A husband and wife are each entitled to a 160-acre ownership unit, but even this is regarded as too severe a restriction for most irrigation farming in Texas. A Solicitor's Opinion upheld an administration determination that 320 acres of irrigable land held in community ownership by a husband and wife was a "reasonable construction of the excess land provision of the Federal Reclamation Laws."[59, p. xv]

in securing adjustments to the Act to more adequately meet the needs of water development plans in Texas.

The first irrigation project to be granted a waiver of the excess land provision was the Colorado-Big Thompson project, the reason being that federal water was supplementary to the original project.[25, pp. 58-9] Other projects exempted on the same basis were the San Luis Valley project in California (granted supplementary water for up to 480 acres per farm unit), and the East Bench Unit in Montana.[60, pp. 238, 467]

Land in the Santa Maria project that was previously irrigated by pumping ground water was granted a waiver from the excess land provision of the Act.[60, p. 360] Previous irrigation was also the basis for an exemption granted Columbia River project farmers in Washington. That exemption was given to certain farmers who had been irrigating their farms with other water prior to the initiation of that project.[60, p. 449]

The excess land provision was held to be inapplicable on the Mercedes Division of the Lower Rio Grande project for land with an existing water supply "from sources other than a Federal reclamation project, and for which no new waters are being developed."[60, pp. 523-4]

The high altitude and short growing season were used as a basis for waiving the 160-acre limitation on two Nevada projects in the Truckee Storage project.[25, p. 59] Adherence to the acreage limitation would have resulted in "uneconomic" farm units, and this criterion may be of importance to Texas.

Acreages the equivalent of 160 acres of Class I land were established for the Eden Water Conservation project in Wyoming, with up to 220 acres

permitted each farm unit, [25, p. 59] and the Kendrick irrigation project in Washington, with acreage limits ranging from 160 acres of Class I land to 372 acres of Class IV land.[60, p. 501]

The Water Conservation and Utilization Act of 1940 gave the Secretary authority to establish sizes of farms for projects developed under that Act. That authority was used in waiving the acreage limitation on the Balmorhea project in western Texas, [59, p. xxv] and the Owl Creek Unit in Wyoming.[60, p. 388]

The excess land provision has been further weakened in a ruling by Judge Howard Turrentine of the U.S. District Court in San Diego, California.[35] He ruled that privately owned land in the Imperial Irrigation District was exempt because that land had been irrigated from Colorado River water prior to passage of the Reclamation Act of 1902. It is expected that ruling will be appealed by the federal government, but if not overturned it could provide another exempting basis for Texas.

Interpreting from these instances would suggest that, because of the precedents that have been set, Texas farmers would likely be granted exemptions. Previous irrigation by pumped ground water, existing surface water irrigation, instances of supplemented irrigation water supplies, and uneconomic farm units resulting from strict adherence to reclamation law are some of the more important bases for exemptions that have proved acceptable in the past.

Water Rights

Many difficulties can be expected in the complex area of rights to water. The established private right will be guarded jealously because of

its economic importance to present owners. But increasingly there is concern about the public interest in water supplies, and in the use of water. Conflicts of interest will have to be overcome lest an inefficient water system becomes established. Doctrines of rights in water will not be especially useful in resolving problems of conflicting interests for they are protective devices rather than institutions designed to foster economic efficiency in the use of water. Yet efficient water use is essential to the economic success of the Texas Water System.

Each of the sovereign states has adopted and developed its own code of rights to water, with variations or combinations of two basic doctrines of water use: the common-law right gained by virtue of a water source that abuts one's land, i.e., the "riparian" doctrine; or the right gained by diverting water to one's property from some source, within specific rules of diversion and use, i.e., the "appropriation" doctrine.

The state of Texas uses both doctrines with governing principles either derived from court decisions or laid down by statute.[27, Ch. 6] Texas has further declared itself to hold title in trust to all waters in the state, with those waters appropriable as provided by law.[27, p. 79]

Riparian Doctrine.[1] This doctrine grants the riparian owner a right to use water while it is flowing past his land (a usufructuary right), rather than a proprietary right in the water itself. The right of access to and use of water are private property, however, and inhere in the land.

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[1] Riparian rights and correlative rights mean essentially the same thing, with riparian rights applying to surface flows and correlative rights pertain to percolating groundwaters.[29, p. 191]

In being considered a part of the land these rights are protected in the same way as is the property right to the land itself.[27, Ch. 8]

The strict natural flow doctrine gives the riparian owner the right to the flow of water undiminished in quantity or quality, and undisturbed in time of flow except for domestic uses and stock watering, [2, p. 355] with other uses in a somewhat inferior rights position. By limiting riparians to beneficial uses, adaptations from this doctrine in Texas became the basis for later established priorities in water uses.

Appropriation Doctrine. Water not already the property of a legal claimant may be diverted from a source to uses not necessarily bordering that water source. Each right obtained by appropriation specifies the quantity to which the appropriator is entitled.

This doctrine uses the principle of "first in time, first in right," and establishes a priority ranking of claimants giving seniority of right to those who have perfected their claims earliest in time. Major features of the doctrine are:

1. It gives an exclusive right to the first appropriator; and in accordance with the doctrine of priority, the rights of later appropriators are conditional upon the prior rights of those who have preceded.

2. It makes the doctrine conditional upon beneficial use --- as the doctrine of priority was adopted for the protection of the first settlers in time of scarcity, so the doctrine of beneficial use became a protection to later appropriators against wasteful use by those with earlier rights.

3. It permits water to be used on nonriparian lands as well as on riparian lands.

4. It permits diversion of water regardless of the diminution of the stream.

5. Continuation of the right depends upon beneficial use. The right may be lost by nonuse. [25, p. 43]

Prior to 1913, Texas statutes on the appropriation of water required the filing and recording of sworn statements in counties of the diversion or intended diversion of water for beneficial use. Since 1913, a permit must be issued by the State Board of Water Engineers, and the provisions of the permit complied with before an appropriation is valid.[27, p. 185]

Neither of these doctrines, in themselves, foster economic efficiency. They are protective institutions designed to make rights that anyone may legally hold to water for his use secure against the actions of others. Private property rights, so much a part of a competitive system, are basic to both doctrines, yet they also prevent more valued uses from competitively displacing existing uses.

Shifts to more valuable uses of water are prevented by the riparian doctrine because of its requirement that the flow of a watercourse not be diminished and by limiting use rights to those landowners whose land borders the stream.

Modifications of the doctrine limiting rights to those uses that are considered "beneficial," plus a scaling of superior uses, causes some uncertainty in itself. What is presently deemed by society to be a beneficial and preferred used may not be so interpreted in the future, making investors more hesitant to commit funds to a long-term investment.[1]

Despite some drawbacks, the appropriation doctrine is more economically oriented in this respect than is the riparian doctrine. Irrigation

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[1]See S. V. Ciriacy-Wantrup [13, pp. 251-71] for a discussion of the economic significance of tenure uncertainty and flexibility of water rights.

development was encouraged since water under that right was assured and financial needs were more easily met because of the certainty of the water right for those with earlier perfected claims. But this doctrine does not accommodate progress where that infers new uses, except as the doctrine holds a water right as a property that can be sold separately from the land to which it has been applied.[54, p. 1] Numerous exceptions and restrictions make the transfer of water rights by outright sale nearly impossible.

Ground Water. The pumping of ground water is an important source of water in Texas, for municipal and industrial uses as well as agricultural irrigation. It has been estimated that in 1960 nearly 12 million acre-feet of water was pumped for these purposes, [52, p. III - 16] with a significant increase having occurred since that time.

Complex as are the institutional problems in regard to this water source, they can be expected to intensify with the delivery of water through the Texas Water System. Although the Texas Water Plan is carefully specific regarding ground water rights,[1] much will be done by the Texas Water System that will affect ground water availability, pumping costs, and capitalized values of that resource and other properties used in conjunction with water. Water from the System will likely influence total surface evaporation, rainfall, stream flows, percolation and aquifer recharge (either directly by intent, or by subsurface seepage into the

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[1] "It is not the intent nor can it be the effect of the Texas Water Plan to quantify, alter, increase, or diminish in any way the existing water rights of any individual or entity within the State."[52, p. V-4]

underground water-bearing strata), with attendant physical and economic effects on the ground water resource.

The law grants property rights in subsurface water that, in many ways, are as absolute as the rights in the land above. Property rights in land extend vertically above and below the earth's surface, including any water that may be found underground. With certain exceptions,[1] ground water is the exclusive property of the surface landowner, and is usable by him at his pleasure. The landowner may not have a quantifiable claim to the resource itself but, in the absence of special institutional restrictions, may use as much of that water as he wishes, with uneconomic exploitive mining being the result.

The nature of the ground water resource is in itself unique, with problems related to rates of use ranging from pumping only the "flow" (natural recharge) component to a rate of use exceeding the recharge of the aquifer which means using up the "stock" component of the resource itself.[7, pp. 632-3]

Much has been written about the problem of externalities, or "spill-over" effects, where one person's actions result either in harm or benefit to a third party.[34, pp. 31-45] Private (internal) cost and returns calculations do not take account of these third party (external) effects because the market system is not devised to do so, thus special institu-

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[1]Water taken from a subterranean source is treated under both riparian and appropriation water laws in Texas. However, all underground water is presumed to be percolating water unless it can be proved otherwise, thus it is the "exclusive property of the owner of the surface soil, and subject to barter and sale as any other species of property."[27, pp. 559-66]

tional arrangements are required to bring the external effects into the private decision-making framework.[45, pp. 692-98]

Ground water pumping is a particularly good example of the problem of externalities. External effects are especially severe when surface landowners pump water from a common-pool aquifer beneath their properties. Each will utilize an amount of water that is to his best advantage in the short run, knowing all the while that, if the other landowners over the pool act in the same way, depletion of the resource will be the longer-run result. Each user will disregard the needs of other users and find the water table in his wells falling as a result of the actions of all pumpers. Pumping costs continue to rise until group action responds to the danger of overdraft[1] and forces a reduction in use.

System water will be comingled with private water in streams and reservoirs, with questions of ownership certain to arise. Properly managed flows and deliveries should avoid most problems of claims to quantities of water or priorities in time of use. These problems should not be as severe as those with ground water.

Underground water supplies will be augmented through percolation, injection wells, as well as integrating supplemental surface and ground water. Identifying and measuring benefits to surface land and other types of property will be complex but necessary, in view of the need for equity

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[1]The danger of overdraft pumping is twofold in that the stock of water might be reduced to such a low level that there is no contingency reserve against uncertainty. Pumping costs will also be increased in perpetuity [7, p. 632] where there is compaction of the aquifer sufficient to prevent later recharge, in which case even the storage space is forever lost.

in securing financial support for the System in some relation to benefits received from it. What is the value of halting the downdraft, or even raising the water level, in an owner's well? Of preventing further land subsidence? Of preventing additional salt water intrusion? These are benefits that could be of great value to recipients, particularly in the more heavily built up urban areas with their primary source of water being underground water.

Other Complications. Barring previous solution, numerous other problems of rights in water will arise with the activation of the Texas Water System. These relate to past legislative actions which were intended to protect the rights of owners but which will be the source of many difficulties in devising and operating an efficient water delivery system.

A variety of laws prevent the movement of water to its highest paying use. These restrictions may have been good and valid at the time they were enacted, but it does not follow that they are good and valid now or for the future. Such limitations as the prevention of riparian water transfer, basin-of-origin protection with its 50-year local area guarantee, the statutary heirarchy of preferred uses, and the local option to use System water create institutional barriers to efficient water use, at the same time they present some inconsistencies that will have to be overcome.

Efficient resource allocation and production, with a maximization of welfare generated for society, requires the freedom of all resources to shift to those uses where their returns are the greatest. Recommending greater dependence upon a market price for water, and all that implies,

will be beneficial only if extra-market problems (externalities and use-interdependencies) are also solved by group action.[1]

Even though many states have the basin-of-origin protection in their own statutes, this technicality will be of no aid to Texas in getting additional water from a source that other states consider "theirs." Upstream states will not be inclined to kindness simply because the water is needed. Basin states can hardly be expected to transfer their water to Texas so long as water transfer is prevented on a basin-to-basin, or even a person-to-person, basis within the state. The implied restriction to a more efficient use of in-state water is too obvious to be ignored.

Water rights are a necessary adjunct to meeting the physical and economic needs of society, but they are no more crucial than the need for rights to other productive resources. It would not be difficult to speculate with considerable reliability as to where this nation and its people would now be were we to have had the same export restrictions applied to oil, gas, coal, manufactured goods, electric power, etc.

The economic results of a free market exchange of water can easily be demonstrated. Given different value productivities from an increment of water, both users and society will gain if low value uses may transfer some or all of their water to higher valued uses.

An example used by Hirschleifer, et al, [23, pp. 38-9] is a hypothetical case of one user whose last acre-foot of water is worth $10 to

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[1] See, for example, the treatment by Castle and Stoevener on the importance of price competition in water, [12, pp. 199-210] and that by Hirschleifer, et al, on the need for freedom to negotiate rights in the market for water. [23, pp. 2, 38, 222-54]

him, while another user would pay $50 for that same unit of water. With transfer permitted, society gains by the $40 of increased production that is generated by the transferred water. Thus if transfer is prevented by law, efficient water use is also prevented -- a meaningful point for the Texas Water Plan with its many references to the need for efficiency in all aspects of the proposed water system.

With a given amount of water institutionally locked in specific uses,[1] that water cannot realize a higher return elsewhere no matter how much more valuable other uses might be. Preventing competition from being operable in water allocation is a political solution to an economic problem with high (and unexpected) costs in benefits foregone. With its low benefit-cost ratio, the Texas Water System cannot afford such a restriction on the earning capacity of water.

Unless everything is done that can be done to improve the profitability of the System, it is doubtful that this nation will commit public funds to such a low pay-off in the face of many other pressing (and costly) domestic problems. Based upon some necessarily conservative estimates of benefits resulting from the completed Texas Water System, the benefit-cost

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[1] Priorities were established in the following order: (1) Domestic and municipal, (2) Manufacturing, (3) Irrigation, (4) Mining and recovery of minerals, (5) Hydro-electric power, (6) Navigation, and (7) Recreation and pleasure.[51, pp. 14-15]

Such a statutory preference-ordering ignores values in use and renders the price system incapable of properly registering values, resulting in a reduction of water productivity and efficiency of its use. As stated by Hirschleifer, et al, an administered principle of "higher" - "lower" limits the "perfection of property rights in water applied to 'lower' uses, however productive such uses might be."[23, pp. 42-43]

ratio is only 1.1 when a 3.5% discount rate is used to determine the present worth of those value flows.[1]

In questioning legislated priorities one must also recognize the need for restructuring or reallocating existing water rights. The process of adjudicating claims has been slow and very costly. An early attempt to provide for a more orderly procedure in settling disputes failed.[2] Although the need for action has long been recognized,[3] it was not until 1967 that the Water Rights Adjudication Act was passed, which makes the Texas Water Rights Commission responsible for adjudicating water rights, with final judgment to be made by a district court.[10, pp. 51-2] The Act holds promise for more rapid settlement of water disputes which will make more certain the amount of water that riparians have claim to.

Quantifying riparian rights has been opposed by many but, without that having been accomplished, it is doubtful that System water could be

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[1]Two points with opposite influences on the benefit-cost ratio should be mentioned here. Primary benefits only are estimated when the 3.5% rate is used; secondary benefits for irrigation only are included at the higher 4-5/8% rate. No estimates of secondary benefits for nonirrigation water have been developed [52, pp. I - 32-3] which, if quantifiable, would increase the ratio accordingly. Another factor is the choice of a rate to use for discounting. Many people are advocating a much higher rate of discount to more adequately reflect the opportunity costs of public funds. A team of economists has criticized the Water Resources Council's "Proposed Principles and Standards for Planning Water and Related Land Resources," and recommend no less than a 10% discount rate.[12, pp. 11-13]

[2]The Water Appropriation Act of 1917 gave the Board of Water Engineers authority to adjudicate water rights but that act was declared unconstitutional in 1921.[27, pp. 478-80]

[3]The Texas Research League discussed the "Valley Water Case" where years of hearings have been conducted, beginning with a suit filed in 1956 that involved 42 special districts and about 2,500 people, with legal costs by that time of five to ten million dollars. They refer to the case as "a nightmare under any system or procedure."[51, pp. 9-19]

comingled with riparian water and not intensify disputes over water. The benefits to a riparian owner from having an "assured right to a definite quantity of water" should exceed any loss he might feel over having to give up a "vague and doubtful right," [28, p. 48] particularly when the high cost of protecting that right is considered.

It should be possible to devise a system of rights to water that will not deprive anyone of his present supply. And it should not be necessary, simply because of the institutional pattern, to take away a future additional supply if one could make more efficient use of that water than someone else, nor to make his water supply any less certain than it is at present. The state could acquire water rights through an exchange of permits to System water, purchase, or other means acceptable to present owners. Such acquisition would permit better management and coordination of ground and surface water to improve the economic use of all water in the state. With greater certainty of water supply, users would be more able to plan their water uses and thereby increase the efficiency of such use.

One of the problems of economic development is that industry groupings are not apt to maintain the same ratio one to another through time. Their relative needs for water and other resources can therefore be expected to change also. Even if the institutional structure is such that an earlier allocation of water to different users was correct and efficient, it must permit changes to occur or economic progress will be stifled. A market system, with rights transferable, holds greater promise of fostering the required level of System efficiency than simply extending or adding to the present structure of rights and restrictions.

The Diversion

Several institutional factors have been recognized as important to the diversion of water from the lower Mississippi River to supply the special needs of the Texas Water System. This proposed source of supplemental water is an interstate stream, and it is shared by the many states in which its waters originate and through which that river and its tributaries flow; it is navigable for a considerable portion of its length; it has a high socio-economic value to the nation's heartland, supplying water for agriculture, municipalities, industries, power generation, and scenic and recreational uses; and there are existing water rights which must be recognized and protected from any diversion to other areas since there is heavy dependence upon water within the whole drainage basin. Existing rights to water have been granted in the sovereignty of the several basin states, rights with a security of tenure sufficient to encourage investments in developing water and related resources of long-term duration.[1]

Only surplus water is to be diverted for use in the Texas Water System. But "surplus" is a term that will require definition and quantification by the states and the federal government. Some states may have water leaving their borders which is in excess of allocated right. This is obviously a surplus. But they argue that such a surplus is only a temporary thing.

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[1]Security of tenure is an important prerequisite to efficiency in the private economy; the longer the life of the investment in question the more severely will the efficiency of resource use be restricted where there is tenure insecurity.

We might also view a surplus as that water in excess of the amount that can be used efficiently, both now and within some reasonable period in the future.

Rates and seasonality of flows will require far more institutional coordination in the management of the river than presently exists. Because of heavy flows during the spring runoff, and a much reduced volume during late fall and winter, storage and releases from reservoirs in all basin tributaries will have to be more closely regulated and coordinated than at present in order to stabilize the availability of surplus water at the point of diversion.

Stability of the supply of water for import is important not only to water users, but it will have a strong influence on power costs as well. The cost of power for pumping will be a sizeable factor in annual System costs, and minimizing the variation in power requirements will also help minimize the cost per unit of that power.

For many people, "Old Man River" has a strong subjective value; there is and will be important personal and public resistance to any diversion. But there have been changes in the river since Tom Sawyer floated down that river on his log raft, and the prospects for further changes seem likely if projected benefits are realized.

To make a water transfer system functional, a diversion in perpetuity must be made, rights to the diverted water must be secure to prevent waste and inefficient use of either water or other resources, and an agreement on the amount of compensation if any must be negotiated.

The Congress will be called upon to judge the feasibility of the proposed diversion, to guard the rights to whatever flow may be diverted,

and to provide for federal participation in this phase of total water development. To this end studies of the uses of water in the basin, the flow of the river, documenting the existence and seasonality of occurrence of water surplus to all upstream needs now and in the foreseeable future, and the existing institutional arrangements associated with water uses are underway.[11, pp. 151-52]

The Transfer System

If a diversion is approved, the transfer system must be created. As envisioned in the Board's proposal, the Texas Water System would involve four major components -- the interstate facility to convey import water from the Mississippi River to the state boundary; the Eastern Division, expected to be the point of delivery of that water; the Coastal Division to transport water throughout southern Texas; and the Trans-Texas Division delivering water across upper Texas, with New Mexico accepting delivery of their share of water at the Texas-New Mexico boundary. Each intrastate part of the system will contain numerous storage and regulating reservoirs with pumping stations and interconnecting conveyance works. How will federal, state, and local governments cooperate to design, construct, finance, and manage the facilities?

The federal government will be concerned with such matters as an equitable apportioning of surplus Mississippi River water among claimant states and regions with a view to improving the efficiency of water use in the nation, a sharing of costs among states and the federal government according to principles of equity, the coordinated management of the System in water transfer, flood control and conservation storage which it will

provide, and the application of federal conservation and reclamation policy wherever appropriate according to established law and precedence.

The state will be interested in such things as the allocation of water among uses according to state established priorities, the distribution and use of water without unwanted federal restrictions, the pricing and sale of water according to policies and procedures developed by the state, and managing the entire system to serve as fully as possible all private and public interests in the state.

Local government entities, including special districts, water or other authority, municipalities and county governments will be interested in maintaining their activities in water supply management with a local interest point of view, in guarding their present and future investments in water supply facilities, in protecting their positions as debtors, and in preserving other interests for which they may have been created.

Some interests of these various levels of government may be harmonious; some may conflict. To the extent that each unit of government represents a different constituency and different points of view, we can expect that conflicts will arise. There must be a resolution of such conflicts through negotiation and compromise involving legislators, agency heads, important interest groups and other concerned persons and groups.

For the purpose of creating and managing the System, we conceive of three alternative, cooperative relationships among federal, state, and local governments. Each has precedence in various existing institutional arrangements; each is a possible relationship with respect to the Texas Water System.

A Federal Project. One type of relationship would be dominated by the federal government, reflecting the considerable federal interest and giving the System a "project" orientation. Design and construction of the transfer system would be a primary responsibility of the federal government but with involvement of both state and federal agencies. Costs would be shared in traditional ways, with the federal government assuming a major responsibility for the costs of flood control, navigation, and other non-reimbursable activities, while irrigation, municipal and industrial storage facilities would be the responsibility of state and local government units.

Many will feel that the substantial national interest would be best protected by this type of arrangement.

A Cooperative Approach. A second possible intergovernmental relationship would not reflect dominance by any particular governmental entity. It would provide for a "partnership" approach to planning and developing the System. It could be organized as an intergovernmental commission or council with representation from federal, state, and local governments, with advisory groups as may be required to obtain expressions of different interests and points of view. Such an organization might devise significant new approaches to water development and management. As an example, cost-sharing arrangements based on projections of benefit accruals at all levels might be developed. This would be quite different from the usual legislatively-defined interests in water development and use. A group more equally representative of diverse interests would likely give more attention to municipal, industrial and recreational uses of water.

A commission or council responsible for management of the System may question traditional priorities in water use and base their allocative and pricing policies on concepts of multiple use and measures of the value of water in various uses. Perhaps the broader yet more locally representative scope of interest and activity in such a management group might serve to influence congressional decisions to provide for greater flexibility in managing this large water supply system.

A State-Local System. A third method of organizing various levels of government in planning and developing the Texas Water System would give the intergovernmental structure an appreciable state-and-local interest bias. The recent realignment of Texas' water agencies resulted in a relatively strong Water Development Board. That Board, with some technical assistance from federal and state agencies, local districts and authorities, and technical consultants, could take primary responsibility for the design and construction of the transfer system. Cost-sharing and financing would be worked out by federal, state, and local government entities.

This institutional structure would also provide for a strong state and local responsibility in management. The legislation prescribing the responsibilities of the various units of government could provide that the transfer system would be turned over to the state for full ownership and management.[1] There are state and local agencies which would welcome

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[1] A decision to allow for full state ownership of the Texas Water System is possible by act of the U.S. Congress, even though the federal government has accepted full financial responsibility for providing certain phases of a multi-purpose development project. The contract between the U.S. Department of the Interior and the Canadian River Municipal Water Authority is

(continued, next page)

such a delegation of managerial responsibility and authority because it would allow them to serve the state's interests better, as they see them.

With the acquisition of greater decision-making powers in creating the System, it would seem likely that it might also require the state to assume a larger share of the costs than would the first intergovernmental relationship described above.

These alternative institutional relationships have been suggested to stimulate thought and discussions about possibilities for organizing the efforts of various levels of government in implementing the Texas Water Plan. Each of them, plus some other alternatives perhaps, needs careful evaluation. Their effects can only be hypothesized, with the type of institutional structure that is finally developed utilizing the judgment of all concerned.

System Financing Problems

Problems of concern at all institutional levels, but of greater immediate urgency to the state and local governments, involve the question of obtaining financial support for the System in as equitable a manner as is

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one example within this state of the attainment of title to parts of the facilities with the further possibility of obtaining title to all project works upon repayment of all money due, as implied in the contract wording (Article 10): "Title to the dam and reservoir shall remain in the United States until otherwise provided by the Congress ... Title to the aqueduct shall pass to the Authority ..." [15] (Aqueduct is therein defined as including "all pipelines, conduits, pumping facilities, and related works, and the land and rights of way for such works and facilities.") These contract specifications were made in spite of the fact of sole federal provision for flood control, recreation and wildlife facilities, in addition to its participation in the construction of Sanford Dam for its municipal water supply.

possible. Federal policy has been to have benefits generated serve as the basis for project reimbursement. An early water policy commission made clear that "Although the main impetus ... comes from the federal government ... very significant benefits accrue to private individuals. The costs of providing these should be reimbursed."[40, p. 68]

Revenue Sources. Since the benefits from such a large public investment will be widely diffused throughout all sectors of the state, financial support for the System ought also to be as widespread. If equity is accepted as a socially desired standard, this concept would require that all beneficiaries should share in financially supporting the System in some relation to the benefits they have received from it.

Nonbeneficiaries within the state will be difficult to find -- they may not even exist -- if economic benefits are traced to their ultimate end. Economic interdependencies preclude the clear identification of an "end beneficiary" from an economic activity generated within the system. Publicly supported roads or schools, for example, yield a direct benefit to the user, but others in the economy also realize a gain. Their benefit is indirect but no less real or valuable as the direct users are enabled to perform their economic and other functions with greater efficiency. Equitable treatment of beneficiaries would require that if direct users only are to be charged for System water, supplemental support must also be obtained from the less direct beneficiaries.

The method for recovering Texas Water System costs is indicated in the following general statement of policy:

> "The formula for payments for water under water service contracts will be such as to assure the State, as operator of

> the Texas Water System, of sufficient revenues to meet its financial obligations to the United States to the extent these pertain to water supply, to repay the State's investment allocated to water supply, and to operate and maintain the water supply components of the System."[52, p. I - 7]

The Plan makes provision for flexibility in the specific means that are finally adopted to meet the System's financial needs. The pricing and repayment policies are intended to be in full compliance with federal laws and policies regarding repayment of the federal investment in the Texas Water System.

The funding, taxation, and water pricing policies designed to cover construction repayment, operation, and maintenance costs can significantly affect the degree of resource development and economic efficiency that will result when the System is activated.

Two general problems (one dealing with how the burden of repaying construction costs will be shared among each of the multiple uses that the System was designed to serve, the other with how the annual operation and maintenance costs are to be recovered) will influence the mix of resources used with water as well as the rates and purposes of using water itself. Effects will reach throughout and beyond the Texas economy, and to the efficiency with which it functions, with impacts on the generation and distribution of System benefits.

In any multi-purpose development an equitable means of jointly sharing all costs arising from constructing the System must be decided upon. The Texas Water Plan has utilized the "Alternative Justifiable Expenditures" method of allocating joint (or common) costs among the different purposes

of the System.[1] We here begin with the assumption that all joint costs, as between functions and purposes, have been determined and allocated as acceptably as possible.[2] Thus our concern at this point is in how support for the System is to be generated by revenue producing measures in such a way that all determinable repayments on construction costs and contributions to operation and maintenance costs are shared as equitably as is possible.

With an interdependent, decentralized economy where individual production and consumption decisions are privately arrived at, some benefits and costs are easily derived; others defy clear identification. Should those hidden from System management observation escape bearing their fair share of costs because of this? We think not.

System revenue production must somehow combine a number of measures or sources in order to reach as many recipients of benefits as is possible. But some simplification of these methods is essential lest the burden of identification and collection becomes too costly, with net System benefits reduced thereby. Simplicity would involve both a minimum of complexity

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[1]See the Texas Water Plan for an explanation of how the method determines what these costs are and how they are allocated. Some may disagree with the method and the allocated joint cost shares. Yet this procedure is no more dependent upon the subjective judgment of analysts than any other method, and, along with a similar method (Separable Costs-Remaining Benefits), is considered superior and more acceptable in common practice than others.[52, pp. I - 31-2]

[2]Since there is no scientific basis for allocating joint costs, there is no test for "correctness." It is a subjective allocation in a way that appears to be most reasonable among many possibilities, and is dependent upon criteria accepted by policy makers and those who pay.

for measuring delivered water and levying charges for that water, as well as being so devised that users can recognize the purposes and objectivity of whatever pricing structure is finally adopted.

The inequities that would result from attempting to make only "first-use" beneficiaries pay System costs[1] would mean that some revenue producing structure other than those traditionally used must be devised.

All residents of an area in which public funds are used to develop certain resources should expect to contribute their fair share of the costs of that venture.[16, p. 46] A wide variety of possibilities to obtain this support exists, and should be examined.

Cost Sharing. The Texas Water Plan leaves it up to the local area to determine the means by which the area will meet its financial obligations in the reference to raising revenue " ... from executed water sale contracts, or tax revenues, or both, ..."[52, p. I - 7] This implies an attempt to gain support for the System from beneficiaries other than direct water users only.

One alternative that warrants careful consideration would prevent an unequal burden among beneficiaries. The method would view the major cost components of the System in much the same light as any business operation might. We suggest this as a possible means to bring in those extra-market values and other public benefits that would otherwise escape notice and a coincident financial responsibility to the System.

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[1] Costs for recreation, navigation, flood control, etc., can be allocated to each of those purposes of System water, but the balance remaining is still not clearly identifiable as benefitting only direct users of water.

After deducting nonreimbursable costs there are two clearly identifiable, general cost elements: (1) the annual payment (covering principal and interest) that may be looked upon as an "overhead" cost of the capital investment, and (2) all other costs incurred in delivering water through the System, which may be looked upon as "operating" expenses. An equitable allocation could be made that distributes the burden of overhead costs to all the state's citizens, while water users themselves could pay all the System's operating costs.

Overhead Costs. With the citizens of Texas owning the System, it would not be inequitable for them to accept the financial responsibility for such ownership costs, as the value of the capital investment will be reflected in the increased market values and value-productivity of land and other property in the state -- a recognizable benefit to the owners of such resources.

It can be demonstrated that a capital investment will enhance the productivity of associated resources. The value of that investment is reflected in an increment to the market values of those resources, and particularly adjacent real property.[31, pp. 321-43] This increment to value can be substantial as other resources, because of their immobility, cannot move competitively into that economic service area.[1]

The Arkansas River Navigation Project in Oklahoma is a striking example of value gains in real property, with economic benefits spreading regionwide, generated by public development of a related resource.

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[1]It is a recommended policy that "... assessment and recapture of private benefits should be a main objective of reimbursement policy. Capitalizable increments ... in land values ... should either be prevented or recaptured by appropriate charges."[40, p. 69]

Industrial sites have been purchased along that waterway with construction in process or completed amounting to $800 million -- already equal to two-thirds of the total project cost in the three years ending in early 1971. Early recognizable benefits include freight reductions of $12.20 per ton of Pittsburgh steel, $4.00 per ton of newsprint, and $2.00 per ton of fertilizer.[62, p. 60] There undoubtedly are or will be a great many other such savings that result in immediate cost economies to users, with area consumers sharing in these savings benefits.

Taxing only the increase in property values that are generated by the Texas Water System might be the ideal tax, but it would be extremely costly and complex. Such a tax system would require the specification of before and after values, or some other quantification of the enhancement of all individual net gains as the basis for support -- a prohibitive staffing and data collection problem. On the other hand, relying on the existing institutions for valuation and taxation could yield the desired revenue at a much lower institutional cost overhead. Where the net earnings of real property are enhanced, such an increase will be capitalized in the market values of these resources. Detecting such changes would be unnecessary if a combination of ad valorem or other tax on all property, plus possible use of the state sales tax were to be developed to satisfy reimbursement requirements of the System. A further advantage would be that existing institutions could be utilized without causing conflicts with their basic purposes. State and local area tax agencies could be given full responsibility for assessment and taxation. A further problem of tax equalization would have to be met in order that potential inequities are not simply shifted to certain classes of taxable property.

The need to shift utilization of ground and surface water supplies (so as to encourage use of the least costly source, as well as providing for aquifer recharge) will also cause problems. An annual property tax, and pumping taxes, coupled with water pricing policy, may be found essential as a tool to encourage uses of ground and surface waters in changing proportions at different times of the year. This could be accomplished by adjustments in relative costs of the two sources (through adjustments in pumping tax rates and surface water prices). These tax and price policies will be an important part of state and local water conservation programs.

Some will argue that in the interests of fairness all should pay, no matter what the cost of finding them might be, so that they might recognize their part of System benefits and support. But this is economic nonsense. It would simply add a greater burden on all other contributors, and be a waste of resources. Economic justice would require that as many beneficiaries as feasible should support the System, but economic feasibility would dictate that adding property to the tax rolls be stopped where the increment to the costs of taxation (administrative, etc.) equals or exceeds the increment to tax revenues.

It would be inconsistent for the people of Texas to plan for so large and complex a development as the Texas Water System, then to throw up their hands in defeat because the capture of value increments to land and other resources is "too complicated."

Operating Costs. If it can be accepted that a tax structure should be the source of project reimbursement funds, the remainder of all System costs could properly be derived from direct-user water charges. A separation

of total System costs into overhead and operating categories makes a price for water more easily determinable. Numerous pricing methods have been used in the past, each method having its advantages and disadvantages.[5, pp. 228-42] The method and relative levels of prices will have a bearing on the kinds of water uses and on the efficiency with which it is used, as well as having some influence on the relative rates of economic development in different areas of the state.

The Texas Water Plan proposes a zonal pricing system whereby different regions in the state will be charged different rates depending upon distances and delivery costs.[52, pp. I - 7-8] These can be regarded as akin to wholesale points, with distribution and sale to users being accomplished by the local district (or other entity holding the necessary powers to meet all local area obligations to the Texas Water System.

A competitive market for water necessitates some institutional changes in the area of water rights and preferred uses. If users are free to take any amount of water they can effectively use at a price, being able to buy more or less from the local distributing agency, or by an exchange of rights with others, the supply of water will be directed toward its best and most productive uses.[1] [23, pp. 36-42]

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[1] If a water market price is not to be the basic allocator, then the institutional structure must be so devised as to be sensitive and capable of determining water demands and productivities, and to make appropriate adjustments in its allocative policies so as to attain the efficiency goals of the Texas Water System. This presupposes a central authority with some sort of barometer which can do a better job of "reading the public mind" than the mechanism of price. But the political-litigative process is cumbersome at best. "Neither the political process, nor administrative rule-making, nor court decisions offers the possibilities for efficient decentralized decisionmaking that a smoothly functioning market can."[19, p. 200]

Given the above categorization of cost elements, System costing and pricing of water would be relatively direct. The problem can be made more complicated at the local level, particularly if price differentials between different types of uses or other discriminatory price adjustments are to be permitted.

The Texas Water Plan does not mention local area use of the almost typical (yet questionable) practices of promotional pricing and volume price discounting. The concept of marginal cost pricing (difficult to carry out, but theoretically correct) would restrict the use of either of these practices. They are defensible only when there is surplus capacity, or with administratively-known subsidy intent.

Promotional pricing can be justified locally if there is idle capacity or if it is intended as a subsidy to attract new industry into the area. The same is true of variable pricing where the price per unit of water declines as the volume of water used increases. The effects of such pricing may be desirable locally but still be undesirable from the standpoint of the total System. Such pricing encourages inefficient or wasteful use of water. Where water shortages are used as the basis for public development it would seem more appropriate that standards and procedures be developed by System management and given the local districts with requirements that they be met. If a surplus develops in any area it would be preferable that sufficient institutional flexibility exists whereby management could reduce that area's allocation and distribute it where it could be better utilized and sold for the appropriate price.

The Texas Water System may be self-supporting (paying off during its life-span), but with loss periods in the shorter run. If the citizens

of Texas will be expected to "backstop" the System during those periods, no matter their frequency, the only justification must be the knowledge that there are "public benefits" accruing to the general public, and it is therefore justifiable. If so, then a specific program of intent via a combined tax/water sales arrangement should be devised to obtain that support as openly as possible.

Such a suggestion as has been outlined here is not presented as being "the" answer to the problem of obtaining the revenues necessary to operate the Texas Water System. Since benefits are so difficult to identify and measure, a correct sharing of the cost burden will be equally difficult to determine. Imprecision of this nature cannot "permit the public share of development costs to be represented simply as a residual after private benefits have been determined and costs allocated."[26, p. 680] Cost sharing is necessary to bring about sufficient revenue to cover reimbursable and all other costs of operating the System, recognizing the importance of a "proper" incidence of all costs as well as to be so structured as to encourage efficiency in the use of water and other resources.[12, pp. 6-7]

Working rules in a free society include dependence upon the market price mechanism to allocate resources by providing for the voluntary acts of participants.[38, p. 170] The alternative is a complex package of judgments at all levels (from the state on down to master districts and local organizations of water users) to establish different prices for different users also likely, with volume-based price discrimination to encourage or discourage use. Given established block rates (minimum charges) plus typically decreasing unit charges for greater volumes used, there is no

assurance whatever that such a pricing system will be either equitable or efficient. The traditional economic evaluation and recommendation is for marginal cost pricing; [24, p. 332] any deviations from this would likely be equitable and efficient by accident rather than by design. Institutionalized allocation and water pricing policies too often have little relation to cost of production or values in use, being administratively determined rather than market directed.

System Management Problems

The problems of managing so large and multi-purpose a facility as the Texas Water System will be numerous and severe. Problems of coordination and operational adjustments would be far too complex for the human mind to grasp and react correctly to as they occur. All water movement, and the timing of such movement, must be accomplished within the criteria for engineering and economic efficiency.

Management of the System will depend in part on the specific federal-state-local relationships that are finally established. If the System has a traditional federal reclamation project orientation, the structure and procedures of management would be somewhat different than if it is to be managed cooperatively or be a distinctly different state-and-local project.

We here view management in a composite, responsible for establishing the System, and its goals and policies, as well as being responsible for the operational and fiscal aspects of "running" the facility. As a preliminary, management must first arrange for the basic institutional relationships between all interested governmental units. Interstate and other agreements must be formalized to secure title to surplus water and any

changes that may be necessary (and possible) in the flow of the Mississippi River, plus all needed facilities to move that water supply to the state's receiving point.

Within the state of Texas management problems will center on capturing flows from intrastate areas of water surpluses and moving that water in such ways that delivered water costs are held to a minimum, that water also is delivered to the points and users at the times of need, and within the capability of the System. A determination must be made as to what existing waterways, reservoirs and other facilities are to be incorporated into the System. Further agreements will be necessary on outright purchase, contracting, or otherwise enlisting responsibilities in existing facilities as they are to become integral parts of the total System.

The voluminous flow of information on needs, requirements, capabilities, and responsibilities between all management levels and all parts of the System will be exacting. It will mean the full coordination of all parts of the System, accounting for all water in transit and in storage, and that required for industry, municipalities and agriculture, water quality improvement and management, flood protection, navigation, fish and wildlife, aquifer recharge, recreation, and the host of other responsibilities that will be management's.

Politically feasible and economically efficient solutions to the problems of providing the minimum supplies guaranteed to exporting areas in the state, allocating water to (and contractual arrangements with) local entities, and rights to both surface and ground waters must be reached. Comingling of System and private surface water, and ground water through aquifer recharge,

will surely intensify problems of ownership and rights to water. The need to manage the state's water supplies so as to establish the proper balance in the use of ground and System water will require changes in the relative costs of these two sources in such a way that pumped water will at one time be supplemental, and at other times be the major source of water. Within established guidelines project management will be faced with the need to formulate an equitable and efficient taxing/water pricing structure, collecting appropriate charges from those benefiting from the System.

Understandably, the Water Development Board intends that the System will be fully automated. It proposes the establishment of a "fully automated control center" able to receive and analyze all relevant data, that will respond to all possible operational requirements -- even catastrophic events -- within a matter of minutes.[52, p. I - 19] It thus poses for management the duty of determining beforehand which informational bits will be needed at specific locations, and when those needs are to be met. Such data management is essential so that efficiency in the use of resources is not inhibited by operational problems that make the System sluggish or too insensitive to respond to conditions requiring operational adjustments.

Organizational Problems

The Water Development Board expects to function as coordinator of the Texas Water System. That function may be made extremely difficult, or eased, as the people decide in organizing all the institutions that will be necessary for the operation of the System.

Institutional Reorganization. There is reason for urgency in the consideration of how the new institutions will be blended into the existing pattern

of institutions. To make a choice that just adds new institutions where new service needs accompany development of the System may serve only, because of institutional duplication, to increase administrative costs through an unnecessarily heavy institutional cost overhead. On the other hand, simply adding new responsibilities to existing institutions may create new problems of conflicting procedures and objectives, and make them so inefficient (and costly) as to destroy the System's anticipated benefits.

In one study of institutions the problem of overlapping units of local government was considered one of several weaknesses of these governmental institutions.[1] Superimposed one on another, they compete for financial support in a way that reduces the local community's ability to cope with important local needs, rendering popular control ineffective because the allegiance of individuals is diluted when spread among so many diverse institutions of government. Rather than serving as the source of improved public services, these institutions are "centers of strenuous resistance to change of any kind."[42, pp. 9-17]

Such a pyramiding of institutions is the antithesis of efficiency in government. Frequently, however, it is the most easily accepted solution to the problem of new service needs, and Texas communities do not escape criticism in this respect. A study of special districts and authorities

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[1]Fridley, Minnesota, with a population of just over 15,000, was used as an example of overlapping units of government. A citizen of that city is expected to exercise an "informed control" over eleven (counting only one of the 14 school districts) different units of government, with the majority of them being special districts.[42, p. 12]

identified no less than 829 nonschool special district governmental units as being "active" in Texas by 1959.[53, pp. 3-6]

Texas laws permit as many as 21 different types of special districts to be formed with "virtually no limit" in the number of special districts related to natural resources that may be created.[53, p. 6] The incentive for creating new governmental institutions originates in the inability of existing governments to provide the desired services, and special districts, varying widely in their structure and financing, constitute one form of government that has shown a consistent growth throughout the nation. In Texas, counties and municipalities, school districts, and other special districts each made up about one-third of the total of local governments by 1967. The change in makeup of such government from ten years earlier was significant, where nonschool districts at that time made up less than 20 percent of local government, and school districts were more than 50 percent of the total.[1]

Implementing the Texas Water Plan will force the issue of meeting the needs for more governmental services. Aside from the sheer economic waste of separate institutional bodies attempting to perform similar services in the same area, overlapping governmental units cannot serve the people well. A confusing maze of bureaucratic jurisdictions will make it too difficult for citizens to be fully aware of the local public

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[1]Sufficient consolidation of school districts had occurred between 1957 and 1967 as to reduce the percentage of governmental units accounted for by all special districts. While nonschool special districts increased by 182, school districts were reduced by 484 in those 10 years.[58, pp. 26-7]

services available to them, to make use of those services, or even to acquire a voice in the decision making of these institutions.

In the absence of careful institutional reorganization, problems that affect the efficiency of both institutional performance and resource use will be severe because of overlapping jurisdictions, divided allegiances of citizens among an excessively large number of institutions, and piecemeal local solutions to broader area problems of water distribution and use that do nothing to improve those services.

The seriousness of these problems is well documented in the Casbeer-Trock study of the Lower Rio Grande Valley.[10, Ch. V] That analysis, in itself, ought to give pause to those who would prefer simply to give new System responsibilities to existing institutions rather than to consider a much less complex yet more efficient structure of institutions.

> "When the people understand how inefficiently the water resource is being used, and how costly the floods and poorly drained lands have been, it is reasonable to suppose that their institutions will be altered to a point where, with the consent of the people, effective action can be taken."[10, p. 127]

More efficient government can be implemented by choosing the "correct" type, level, and size of institution that will provide the services desired by the local community.[47, p. 28] Only that one correct institution can be efficient, with all other possible arrangements being of lesser efficiency with a correspondingly higher cost per unit of services performed.

Sheer "mechanical" efficiency in moving water, allocating costs and collecting fees or other charges for water, and in adjusting the types and rates of use for all resources is not sufficient to maximize the System's net output. Centralized decision making might best achieve these functions

but still be far from maximizing the social, economic and political values of the citizens. The ultimate objective of all economic activity is the generation of utility. If very many people are dissatisfied with the way in which a (centralized) system is operated, disutility has been created. A higher regional product may have been produced. But at what price?

The more centralized a system the farther removed it gets from local problems, with a corresponding reduction in its ability and willingness to respond to those problems. With new problems being the rule rather than the exception, centralized government is too inflexible to meet those problems. Since it can't "duplicate the variety and diversity of individual action ... the role of the state can never be spelled out once and for all in terms of specific functions."[18, p. 4] Obtaining direction by higher authority is no easy solution to needed institutional services, nor is the record of direction by higher government one marked by successes as compared with traditional market results.[23, p. 362] The central government often replaces the market as the decision maker in order that society may be "guided" to an "optimum position" in overcoming difficulties with spillover problems and other market imperfections. This presumes that a centralized system "is an inherently superior form of social organization not beset by imperfections of its own."[22, p. 455]

With personal attitudes generally opposed to a centralized system, the wish for decentralization will likely predominate. Fundamental to this is the "close to home" decision making, with its obvious advantages of being in closer touch with problems and the results of their attempted solution, and with those responsible also being nearer at hand. This alternative will also have its serious problems, however.

An equitable, decentralized System must overcome problems of market imperfections and existing restrictions in the use of water.[1] And solving the problem of market externalities will require institutions with areas of responsibility that may not fit one's concept of "local" government.

Institutional Jurisdiction. An institution's boundary would ideally encompass the same area as that of the problem with which it deals. Where costs and benefits span two or more geographic areas or governmental units (river basins, local districts, counties, etc.), the appropriate administrative unit should also be of that size. Benefits and costs can then be "matched up" and internalized.[37, pp. 479-87] But the many separate problems in any locality (water pricing, taxation, cost/return externalities, and water quality maintenance, for instance) would only by chance have the same boundaries. The alternative to submitting to direction by a higher level of government is a much closer cooperation than now exists between areas with common problems. It would require strict adherence to agreed upon special charges for water users in one area being made so as to compensate others (locally, or in other areas) from the effects of those uses. Local control could solve these and other allocative problems if

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[1] Removing established use priorities, basin-of-origin protections, restrictions on the transfer of water, and an early adjudication of claims to water will be necessary before the market can direct resources to their most efficient uses. Eliminating these barriers is a necessary condition for achieving the degree of beneficial competition anticipated as the Employment Act has directed "public and private policymakers cooperate in achieving objectives within the context of a free competitive enterprise system" that is capable of generating "prices that encourage and discipline business firms to allocate relatively scarce resources in the most efficient manner ..."[57, p. 27]

their interinstitutional relationships are such that local bias is prevented; bias such that an inequitable distribution to the advantage of any local area is made possible when conflicting interests in all areas are not fully represented in arriving at the solution.

In the total institutional structure for water development there is a complex set of calculations and balances, with each participating individual coming to his own decision for a multitude of possible reasons. The final weight of all decisions will either approve or disprove the Plan. Approval by the majority will be no assurance of unanimity of support for the variety of institutions necessary to the operation of the whole System. Many groups and individuals will still have their own goals and objectives which may be at odds with the System itself.

Institutions structured along functional lines would indicate the need for specific institutions for each of three broad, separate functions: (1) creation of the System -- negotiating and bargaining, planning, and feasibility analyses; (2) construction of the System -- engineering and related activities; and (3) operation and management of the System -- to program the System for the fulfillment of all its operational, water distribution, and fiscal obligations.

At the local level there are important problems of institutional arrangements able to provide for the contractual purchase of System water, its distribution and use. Prospective users of imported water have been forewarned of the need for local institutions -- master districts or other authority -- with the power to execute contracts between them and the state and federal governments, to tax beneficiaries and charge water users in

various ways,[1] to acquire land and other facilities for distribution systems, and to sell water as retailers of that resource.[52, p. V - 3]

In arranging for these institutional needs, choices will be of an "either-or" nature, with the final proposal being placed before the state's electorate asking them to approve a specific arrangement. This means that the agencies and organizations involved in assembling the Texas Water System package must consider the numerous alternatives and, in each case, selecting the preferred organization on a multi-criteria basis of political and social acceptability and eonomic efficiency.

Planners for the development of the System must, of necessity, develop a model against which all problems and their solutions may be measured. Without attempting to demonstrate specifically how the entire System should be structured, an overall institutional model can be indicated (as shown on page 61) with a basic pattern which follows the divisional separation as described in the Texas Water Plan.

Such a structuring, with institutions as required at each level of service, can provide for the power of control beginning either with the local institutions, or reaching from the top and down, as the voters decide.

Many water users will hesitate to give a master district the power it will need to exercise the required control within its jurisdiction of the Texas Water System. To give important rights such as eminent domain and the taxing power to another governmental entity will be difficult for some,

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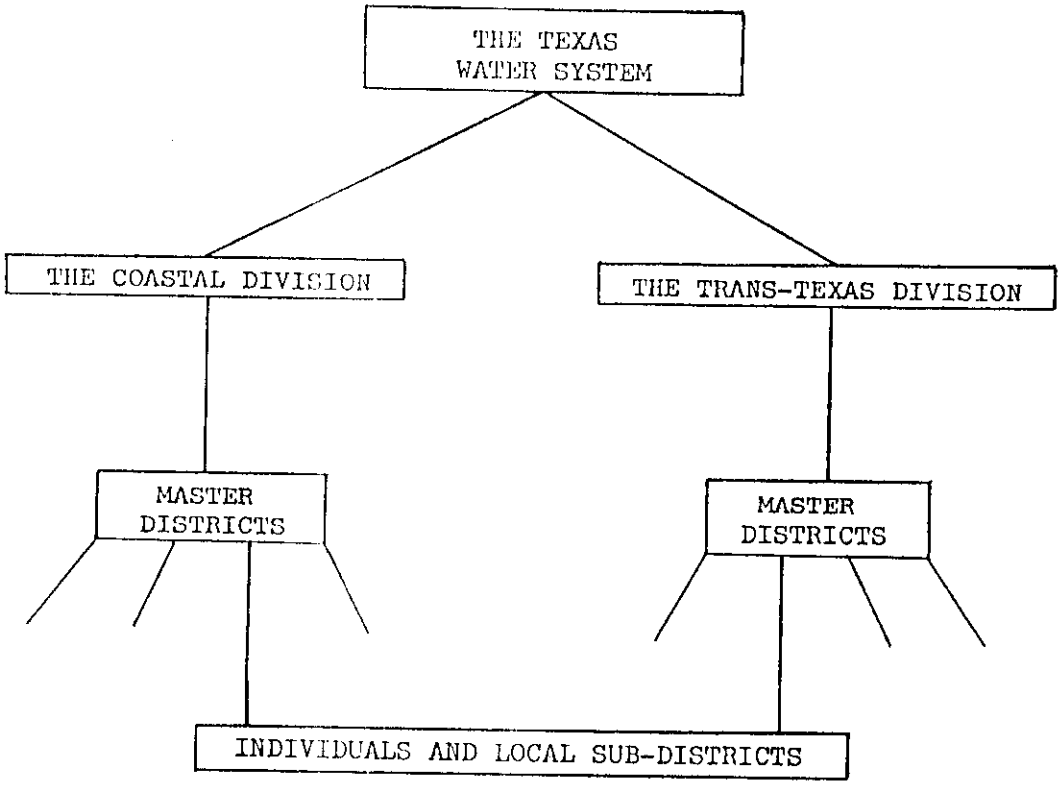
[1] A Solicitor's Opinion has ruled that irrigation districts without the power of taxation are not acceptable as "contractor" to repay construction costs.[59, pp. 244, 319] Other project functions of the Texas Water System will likely face the same edict regarding local institutional powers.



yet existing institutions might find serious conflicts with their own objectives if System responsibilities are added to their present duties.

Organizing master (or other) districts will be difficult in those areas where a wide variety of districts or authorities are already in existence, including water and power authorities, irrigation districts, drainage districts, fresh water supply districts, navigation districts, underground water conservation districts, etc. Each has its own special authority and responsibilities, and a large degree of autonomy. Most will tend to guard their special interests jealously. Each is an economically oriented institution with assets and liabilities which were accumulated by and for that institution, and its first responsibility is toward its "own" economic

structure and clientele. Adding further and possibly conflicting responsibilities to existing institutions may appear to be the easiest and most convenient method of getting the necessary local participation, but this expedient would be of doubtful success, threatening rather to bring only discord because of conflicting objectives and purposes.

SUMMARY AND CONCLUSIONS

We have not dealt in this report with the specific types of institutions necessary to bring additional water to the state of Texas. Pumping water from the lower Mississippi River seems to be the preferred and least costly of several possible water sources. The Texas Water Plan, however, is sufficiently flexible as to the source of water for import that little of consequence could be done here other than to proceed as though all of the necessary institutional arrangements with other states and the federal government were an accomplished fact.

Throughout this study we have resisted the temptation to discuss and evaluate methods of cost-benefit analysis, input-output models and other procedures for quantifying the effects of changes in water supply, allocation and use occasioned by the Texas Water System. The scope of this study has thus been limited to those in-state problems resulting from developing the Texas Water System which may be categorized as institutional.

The state of Texas has recognized the critical and limiting nature of water as a resource contributing to a wide spectrum of economic activities. There appear to be few things that this state could do which would have a greater long-term impact on its future growth and development. The adequate development and proper management of the state's water resources holds promise of yielding benefits of great and lasting importance to all its citizens.

Obtaining the necessary financial commitments to permit construction of the Texas Water System will bring many other problems. These problems must be solved before the necessary and desired System efficiency can be attained, among the more critical being the new institutions that must be

created to provide for the new service requirements caused by developing the System.

The Texas Water Plan is but one step among many that will be required to bring to fruition proposals that have covered decades for more fully developing and utilizing the state's water resources. There can be little doubt as to the importance of just how the many problems are solved. As a final estimate, the benefit-cost ratio of the proposed System strongly indicates the need for an efficient system in total, including an efficient institutional structure in its support and guidance.

An inefficient institutional structure results in two types of costs, both of which are hidden, yet both being costs in the truest sense. One type of cost results when resources are directed, by extra-market regulations and restrictions, into the wrong uses or rates of use. A higher valued output has thus been forfeited. The other type of cost is the excessive institutional cost overhead resulting when there has not been sufficient institutional restructuring or even the elimination of some institutions in favor of those which would be more effective in meeting System objectives. This type of cost will be covered by increased tax and other charges to the private sector in support of that institutional waste, removing resources from more productive uses elsewhere. Given the capability of institutions to so curtail benefits and inflate costs, particular care must be exercised in their selection in view of the low benefit-cost ratio estimated for the Texas Water System.

In questions of resource use, rates of use, and the mix of products to produce, economic theory recognizes the functional relationships and

the changing rates of interaction as the proportions of resources and products are changed. Economic optima are determinable with a consequent maximization of net output specified, given factor-product relationships, and the prices of resources and products.

In considering institutional patterns such clarity of what constitutes an optimum does not presently exist. It would appear fortunate that, given an objective in resource development and administration, a large number of alternative social organizations is possible, each of which could perform the required functions. But our inability to quantify differences in the efficiency with which these functions are performed does not mean there are no differences, we just aren't able to see them. Relative efficiencies of social organizations are not inherently different than for physical resources. In the latter case they can be identified and verified empirically; in the former, no such data are readily available.

No handy reference book or catalog exists from which to select that institutional arrangement which would best serve the needs of the Texas Water System. The structure of institutions finally established will be the result of give and take in the political arena, influenced by the final weight of the needs and desires of all involved, as they cast ballots that express their individual preferences and choices.

Problems of concern at all institutional levels, but probably of greater importance at the state and local levels, involve the question of equity in obtaining support for the System through the tax structure, as well as a need for the equitable pricing of water, and in how the water is distributed among the users. These problems must be solved to the satisfaction of the

citizenry no matter which alternative may be proposed, with the choices ranging from centralized administration to a decentralized System.

There is an inconsistency in how we view the two sides -- resources used and services provided -- of a publicly sponsored enterprise. Required resources (men and machines, cement and steel, etc.) are taken from the private sector in competition with all others who would use those resources, on the basis of price competition in the market. At this point only the "how" is important: We will not trust ourselves to assemble the necessary resources by any other means. No other alternatives will be considered. Each need for resources is met by calling for competitive bids and, given technical specifications, being required to accept the lowest bid. This is viewed as the operation of the competitive system at its best. Legal or other restrictions are applied not to the market system itself, but to the freedom of administrators in awarding contracts. Such an approach is utilized as a highly desired institution for the protection of society.

Now if our collective administrative judgment cannot improve on the efficiency of the free market in providing for the <u>resource needs</u> side of the Texas Water System, why should we even consider any alternative to the free market on the <u>product</u> side of the System? Logical consistency would dictate that we do everything possible to free the market from restrictions of all kinds that hinder or prevent the free exchange of water, and concentrate on devising institutions that will correct malfunctions of the free market without reducing desired market efficiencies.

It is here assumed that a system of institutions yielding a high level of efficiency in water allocation and use consistent with the attitudes of

the citizenry is an overriding requirement. Given the numerous authoritative discussions of institutional arrangements in the management and control of public enterprises, the possibility of an all-powerful control from the top is here considered as being too contrary to our basic philosophy of government; that decentralized control is both desired and possible.

This does not suggest abandoning all the institutions resulting from past efforts that have aimed, basically, at solving the problems of market externalities, or spillovers. A wish to free the market would direct the emphasis toward corrective action at the level where such externalities occur. It would mean either establishing institutions with jurisdictions over the same area as the externalities with which they must deal, or to legalize cooperative efforts by the institutions whose boundaries those problems cross.

Compacts to solve interdistrict problems need be no less effective than they are with interstate problems. With local control (for taxation, water pricing and allocation decisions) vested in master districts, problems of externalities reaching across two or more district areas can be solved through contractual arrangements, with supervision from division, System, or state levels to make certain of adequate representation of all parties and equitable solutions of their problems.

If the Texas Water Plan ever becomes a reality, it is not likely to fail -- not in the usual sense of the word "failure." But it could fail to perform efficiently because of unnecessarily high institutional overhead costs, leading to wasted manpower, inadequate services, excessively high taxes and tolls, disputes over the use of water and over institutional

responsibilities, poor repayment experiences, and an overall rate of output below the System's potential. This kind of failure can be avoided by using special care in designing institutions that are capable of implementing the Texas Water Plan.

An efficient System can be realized only after all factors involved are so organized that each functions better than any alternative organization could, with no more institutions than necessary to fulfill all the needs of the Texas Water Plan. There is evidence that the Plan meets the tests of engineering possibility and of economic feasibility; it remains to be seen whether the System will be so institutionally designed as to be socially and politically acceptable, and capable of accomplishing the purposes set for it.

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