

# The Water Resource Problem

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It is most appropriate that the first paper on this session concerned with water problems and policies in the United States should be entitled "The Water Resource Problem." There is a multiplicity of water problems and related policies of critical importance in all parts of our nation. The title assigned to this paper indicates, however, that your program committee feels as I do regarding the water resource problem; i.e., the many water problems, large and small, add up to a national problem of major proportions and pressing significance. This fact is receiving increasing recognition. For example, Peter F. Drucker authored a series of four articles in *Harper's* magazine earlier this year under the over-all title of "America's Next Twenty Years." At the conclusion of the final article in the series, Mr. Drucker listed the eleven most important policy issues facing the United States in the next twenty years. First on the list was the matter of public policy relating to the water resource problem.

## THE GROWING DEMAND FOR WATER

The total demand for water in the United States is increasing rapidly as a result of two factors, population growth and increase in per capita consumption.

The United States is experiencing one of the most rapid periods of population growth in its history. Each year for the past several years it has appeared that we have reached a new peak in birth rate and in the net yearly population increase and that we must be approaching a time when both the birth rate and the rate of increase will decline. The rate of increase continues at a high level, however, and set a new record in 1954. There were 4,073,000 births in 1954, which was the first time in the history of the nation that the birth rate exceeded the 4,000,000 mark in any one year. This birth rate resulted in a net population gain of 2,823,000, which was also a new record.

When the increasing per capita consumption of water is applied to the growing population, the effect on the aggregate demand for water becomes apparent. Per capita consumption of water is increasing in all uses — domestic, industrial, agricultural, and recreational.

At present the per capita requirements of water are approximately 200 gallons per day. In addition, our growing industrial economy requires a constantly larger amount of water. For example, 18 barrels of

water are required to refine a barrel of oil. About 320,000 gallons of water are required to produce a ton of aluminum. More than 65,000 gallons of water are required to make a ton of steel. In agricultural use about 805,000 gallons are required to grow a bale of cotton. It is certainly appropriate that this nation become more concerned about its water resource problem.

Concern regarding the water resource problem has been greatest in those locations where water obviously is a limiting factor in economic growth. California and some other states are particularly concerned with this phase of the problem. Civilizations have flourished through the development and use of their water resources. The remains of great water facility structures scattered over the face of the earth indicate that water resources have been basic to the growth of many of the great civilizations of the past. We do not know why many of these nations vanished from the scene, but there is evidence that at least some of them collapsed because their water resources failed. In some instances, it appears that the civilizations broke down because of a failure to recognize the basic interrelationship of land and water.

Failure to recognize the critical importance of water as a basic resource is not a state of mind which man has outgrown. The development of an adequate appreciation of the problem has been a long and difficult process in this country, and the battle is not yet won. Many people still seem to ignore the facts of life and feel that water should be a free good, or at least, nearly so. This lack of understanding of the scarcity of water relative to current demands is the key to much of our problem in securing an adequate recognition of the water resource problem.

Almost without exception, we have concerned ourselves with the possibilities of increasing the availability of water to meet the growing demand. Little attention has been given to the possibilities of reducing the amount of water required for certain purposes. This approach to the water resource problem will undoubtedly receive increasing attention in many situations. Much can be done to increase the re-use of water in industry. In western irrigation farming, more attention should (and no doubt will) be given to the beneficial use aspect of the appropriation doctrine of water rights in order to minimize wasteful use. The West has been so concerned with the priority aspect of the appropriation doctrine that it has given only limited attention to the beneficial use aspect.

The pressing nature of the water supply problem suggests the need for more objective consideration of the alternative uses for a

given supply of water. It has become increasingly obvious to me that, in the western states, we need to consider the merits of using a limited supply of water for other purposes than irrigated agriculture. However, an analysis of alternative uses will almost certainly show additional irrigation development to be justified in specific situations.

The question of the best use of a limited water supply should be the subject of comprehensive and objective research to provide the basis for decision-making. Not only may it benefit the nation but, selfishly, I hope it may be in the interest of localized areas of the West. An expanded resource base should mean a broadened tax base and the possibility of removing from agriculture some of the burden of financing public services. Changes in the tax structure may be necessary in some states in the semi-arid West in order to relate properly the financing of public services to the various income-producing segments of the economy.

In addition to concerning ourselves about the availability of water for consumption, full consideration of the water resource problem involves situations where too much water has a destructive effect upon other resources. Erosion, flooding, sedimentation, and other damaging actions of water are a part of the water resource problem which must be given major attention. Fortunately, the same land treatment practices and engineering structures which serve to control water and reduce its destructive effects also are important in increasing the usable supply of water.

#### **THE CRITERIA FOR PUBLIC ACTION**

I propose to consider this aspect of the total problem from standpoints of: (1) public action in relation to private enterprise and (2) public action at the different levels of government.

In my mind, the major goal of resource development is to increase the capacity of the resource base to support private enterprise. It cannot be otherwise in a capitalistic economy. The attainment of this goal may involve at least three aspects: (1) improvement of the physical and economic availability of resources, (2) application of technology to resource development, and (3) adjustment of institutional arrangements where necessary.

This concept is not new or revolutionary. Throughout the history of the nation, the federal government has sponsored programs and policies designed to improve the usability of the natural resources of the nation for private enterprise. Public programs to develop hydroelectric power and irrigation and drainage facilities are not too far removed from our historical experience of the federal

government subsidizing canals and wagon roads, making land grants to the railroads, and providing free public land to private enterprisers of all kinds.

In discussing criteria for public action, it seems to me that one point needs to be brought clearly into focus. There is a tendency to carry the private-profit motive over into public resource development. Obviously, if the resource project will produce profits comparable to the profits necessary to attract private capital, private enterprise should undertake the project.

Other factors, however, justify public action in many cases. The risk element may be too great for private enterprise to undertake the project. The size of the project may be beyond any feasible combination of private effort. The public may find it desirable to develop resources ahead of the current level of demand, something that may be impossible for private enterprise to do. Hydroelectric power development in the Columbia Basin is the outstanding example of such a situation. At the time Grand Coulee Dam was authorized, some experts claimed the power would never be used in the lifetime of persons then living!

In connection with the emphasis on the private-profit motive with respect to the water resource problem, we might ask ourselves if the following can be consistent as goals in resource development: (1) achieving the greatest return per dollar of public money expended and (2) achieving maximum benefits from a particular resource situation. In many instances the greatest return per public dollar spent may be secured by developing only a single resource use. But we must ask ourselves how long we can afford to bring our resources into only partial use.

Also, in the case of irrigation development, the greatest return for the public dollar spent might be achieved if the irrigated lands were settled in large operating units. But what is the relationship of such a program of development to our traditional emphasis on maintaining the family farm? This and other such questions involve social goals regarding which there is much disagreement.

Finally, in considering the criteria for public action in connection with the resource problem, I am somewhat concerned lest the concept of decreased federal participation in resource development should mean that the federal government is not assuming the obligation I think it has in this important policy field. I believe that the federal government has a responsibility in the resource field akin to its responsibility for national defense. A nation which loses or outruns its resource base is doomed to extinction or a permanently low

level of living. I believe that many aspects of the water resource problem can be handled only by the federal government if the long-run public interest is to be fully protected. It should not be assumed, however, that I discount what can be accomplished through state and local effort. The State Water Conservation Board in Montana has made notable progress in the development of water resources.

#### THE SCOPE OF ANALYSIS

The economic and social principles of water use must be concerned at all times with the goal of obtaining the maximum in economic returns and human satisfactions. Anything less than this goal will only serve to aggravate the problems associated with the scarcity of water. The concept of multiple purpose development of water resources has grown out of the emphasis on obtaining the maximum in benefits from the water available.

Many early water projects presented opportunities for use other than the one purpose recognized in the original plans and construction. As these multiple purpose potentialities became evident to more and more people, increased emphasis has been given to the evaluation of all possible uses in planning for resources development. Water projects offer such multiple use possibilities as irrigation, hydroelectric power, flood control, municipal water and sanitation, recreation, wildlife, and navigation. These uses, in their relationship to each other, range all the way from being complementary to being competitive.

The nature of some of the water uses indicates that consideration of benefits must be carried beyond monetary evaluation. Our private enterprise, dollar-conscious economy emphasizes monetary evaluation, and our administrative and legislative procedures require a monetary accounting in cases of public participation in water resources development. At the same time, the nation's growing population calls for increasing concern with recreational values and other non-monetary considerations. These nonmonetary values are often largely public in nature and impossible to identify with individuals or specific groups.

Emphasis on the monetary values of water resources development assumes that the measure of preferable public action is to be found entirely in a comparison of the dollar benefits and dollar costs that may arise. The benefits-costs type of analysis seems exact but is often incomplete to the point that it bears little relation to reality. The incompleteness of benefits-costs analysis is associated with the importance or lack of importance attributed to the nonmonetary values of resource development.

It should be noted that nonmonetary *costs* may be as important as nonmonetary *benefits* in determining the value of certain water resources projects. In some instances nonmonetary benefits and/or costs may be the deciding factor in the decision-making process and the calculable monetary values may be of secondary importance. It is difficult, however, to obtain appropriate consideration of these nonmonetary values when courses of action are being determined. As a result, we witness many attempts to place a monetary value on benefits and costs that are not priced by the existing market mechanism. We are constantly trying to place a monetary value on some things that probably are not subject to monetary evaluation. Second, we are then saying that monetary evaluation is a measure of how much these things are worth.

All this does not mean that the economist should abandon the problem of evaluation in resource development. I suggest a two-stage approach to the problem. First, economists should make every effort to establish justifiable monetary measures for what now appear to be nonmonetary values. The danger here is in applying monetary measures where they are not justified. Once the dollar value has been placed and included in the benefits-costs ratio, it has the same appearance of exactness and the same influence in decision making as other benefits and costs where the monetary values may be easily computed. Second, those benefits and costs on which monetary values cannot be placed, should enter the decision-making process through a uniform system of qualitative description.

Because most extra-market values, those not priced in the market place, cannot be given a monetary value it is important that they be described adequately and that the governmental mechanism be such as to give objective consideration to nonmonetary values whether they be the recreational values of a storage reservoir or the intangible losses suffered by individuals and/or local units of government flooded out or otherwise inspired by that reservoir.

In applying economic analysis to the water resource problem, public agencies and public action should be recognized as important factors in determining the value of water. Water is scarce and has economic value but that value is not determined by free movement and trading in the market place as is the case with most economic goods. The value of water and its uses is largely the result of administrative actions by governmental agencies—federal, state, and local. The problem of allocating the available supply of water is certain to become more pressing.

Even more troublesome will be the problem of achieving shifts in the use of water in accordance with changes in demand in the

future. In considering the fact that some goods are allocated by legislative and administrative fiat rather than price, John R. Commons left us a pair of concepts that are most useful in dealing with the problem at hand. He referred to the conventional interplay of market forces as bargaining transactions and the legislative and administrative determinations as rationing transactions.

In those instances where resources are allocated by rationing transactions, shifts in use in response to changes in demand are often extremely difficult to make. Legislative and administrative decisions tend to be more inflexible than prices resulting from transactions in the market place. The stabilizing effect of rationing transactions results in a situation sufficiently fixed that the certainty of expectations takes on the nature of property rights and is capitalized into property values. This is true even in the case of rationing transactions where there was no intention of guaranteeing anything as permanent as property rights. It has been evident in the case of acreage allotments for cotton, tobacco, and wheat as well as some less important crops.

The purpose of rationing transactions with respect to water has been not only the allocation of the resource, but also the assurance of control. Technically, a water right does not involve ownership of the water, except in the case of stored water, but rather a right to the use of water. This distinction does not alter the fact, however, that a water right is a property right and that the pattern of water rights tends to freeze an existing pattern of water use.

Property rights in water are, if possible, more jealously guarded than property rights in land. The competition for water in many areas has resulted in an emotionalism about rights to water that complicates the problem of obtaining objective consideration of the merits of alternative uses of water.

Shifting the use of water becomes, then, largely a matter of outbidding another use for the property rights involved rather than a result of changes in the market price of water and its value in alternative uses. Obviously, the value of the property rights of water will reflect the value of water for various uses, but the use of water is much more difficult to shift than it would be if water were a commodity traded freely in the market place. The growing problem of water rights under the riparian doctrine in the eastern portion of the United States is a case in point.

It should be noted also that the users of water, particularly for agricultural purposes, more often than not are involved in some sort

of a group dependency for their supply of water. Shifting the use of water seldom involves the action of only one individual user.

### **THE IMPLEMENTING FRAMEWORK**

Let us consider next some of the implications of an analysis which includes nonmonetary values as well as monetary values and which must recognize at all times the importance of a system of rationing transactions. The nature of the economic and social forces affecting water serves to emphasize the importance of improving the institutional arrangements involved.

The public has a major interest in the way in which water resources are developed, controlled, and used. People, through their governments, have been creating institutional arrangements to protect both the private user and the public interest throughout the history of water resource utilization. Some of our earliest civilizations evolved most advanced legal institutions in relation to the use of water. The great Babylonian Empire developed one of the most advanced codes of law known anywhere. A major feature of the code of Hammurabi, famous ruler of the Babylonians, was the section which dealt with water control and use.

This matter of providing ourselves with institutional arrangements to fit the situation at hand has two aspects. First, the institutional arrangement should be permanent enough and should be well enough accepted as to provide stability and assurance to the people who carry on economic activity within the framework of those institutions. Second, they should be sufficiently flexible to permit the economy to meet the demand of changing conditions.

One of the major problems of the recent past has been the designing of institutional arrangements that will preserve those things from our present institutions which are necessary to our long-run stability, security, and progress and at the same time provide the flexibility of action necessary to meet the goals of the future. An important feature of this problem is the reconciliation of the public and private interests involved in the problem of water resource development, control, and use. We are still searching for the institutional arrangements which will assure the best possible job for the people involved.

We have seen the rise and fall of interest in valley authorities as an institutional device. We have observed the use of voluntary interagency committees as a coordinating mechanism. The search for a more adequate institutional device is now evidenced by the tremendous interest in the interstate compact approach as an institutional arrangement governing water resources development.



Interstate compacts have been widely used throughout the nation in a variety of situations. As with any institutional device, a great many things can be said both for and against the interstate compact arrangement. Without going into detail, it can be said that the interstate compact is best suited to static situations and has serious shortcomings when applied to dynamic situations. The interstate compact may establish an institutional framework around the development, control, and use of water resources which prevents adjustment to meet the changing conditions of the future. Here is the conflict between the desire for assurance and stability and the need for a reasonable amount of flexibility.

Many aspects of water resources development make necessary continued federal participation. Multiple purpose projects include benefits that accrue to the general public and are not limited by state or local boundaries. The Central Valley Project in California is the only major water resource development project entirely within the confines of one state. As noted previously, many water projects are too large to be undertaken through private effort or by state and local units of government. Some water projects may have long-run benefits that only the federal government can afford to finance.

On the other hand, state and local units of government might well play a more important role in many aspects of water resources development in view of the fact that the benefits, both private and public, are primarily state and local in character. One of the best ways to discourage the promotional aspects of water resources development would probably be to increase the degree of state and local financial responsibility. This means more active participation on the part of state governments and the inclusion of other beneficiaries in the repayment responsibility in addition to such direct users of water as irrigation farmers and hydroelectric power facilities.

This complex interrelationship of interest and action in all levels of governmental organization further emphasizes the importance of the institutional arrangements that surround water resources development. Many individuals and groups have made the problem of institutional organization so controversial that it has received little objective study. The need for coordination of effort has too often been obscured by dispute over the kind of organization to be established. It is immaterial to me what name is given to the water resources agency. I think we have been misled too long by the idea that our choice must be between two types or organizations that represent some sort of extremes. Actually, there are a great many alternatives for coordination of effort in water resources development.

The development of an implementing framework to handle successfully the water resource problem of the nation may mean consideration of a board of review at the national level of government, a river basin organization at the regional level, a new agency at the state level, and/or a conservancy district or something similar at the local level. An important factor in such institutional arrangements at all levels of government is providing a system of uniform value judgments for benefits and costs described in qualitative terms. In solving this problem, we should not be concerned with institutional changes that might facilitate resource development for the sake of resource development. The end objective should be to achieve the optimum kind of a working balance among all resources, both natural and human. By so doing, we should achieve the maximum in economic returns and human satisfactions.