MYTHS: CORNERSTONES FOR COUNTERPOSITIONS

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The history of development, management and use of water resources in the United States is a fantastic success story. The development of large quantities of water suppliers has played an important role in the economic development of the United States. Irrigation development has transformed areas of low productivity into some of the most productive lands in the United States. While millions of people throughout the world have gone hungry, the United States has had an abundance of high-quality, low-cost food. Exports of agricultural products have an important effect on our balance of payments. Water developments also provide power, recreation and flood protection. Many viable, productive communities exist because of water development.

But, in spite of all that has been accomplished, nagging questions and controversies keep arising. Counterposition views seem to be increasing in numbers and gaining greater strength. The wisdom of simultaneously carrying out public programs for resource development and for cropland retirement has been questioned many times. Acts of development alledged to be in the public interest are viewed by others as atrocious crimes against nature. Some groups prefer zoning people out of the flood plains rather than building expensive flood control structures. Projects have been stopped or delayed, and studies terminated.

In view of the rapidly changing environment facing water planners, perhaps this is the time to critically appraise how we plan the development, management and use of our natural resources.

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This article discusses water myths of false images that influence public attitudes about water, examines some of the constraints on water planning, discusses the impact of uncertainty in planning, and outlines an approach to planning that would lead to better planning decisions.

Myths and False Images

Water is unique in several ways. Because it flows, quantity and quality changes resulting from its use at one place and time may affect other uses at other places and times. These *externalities* are an important characteristic of water resources. Water also has a *cyclic* peculiarity. Its supply is generally replenished continuously through the hydrologic cycle. It generally is not consumed in use. Rational planning requires that these objective traits of water be considered in establishing policies and programs for water use.

But the *water-is-different* images often ascribe to water peculiarities that go far beyond its objective characteristics. They appear again and again in our water planning reports, issue papers, and everyday conversations. As planners for public agencies, it is in our own self-interest to recognize these false images and become more realistic about water and its role in society.

Scarcity

The most realistic concept of scarcity is the use made of the term by economists. Scarcity is the relationship between the supply and demand of a good or service as reflected by its price. If the demand is large relative to supply, the price is high and the good or service is considered very scarce (diamonds, Picasso paintings, or vintage wines). When the supply is large relative to demand, the produce is less scarce and the price is cheap.

The term "scarce" is probably used more often to describe water than any other commodity in the United States. Almost every water study begins with the premise of scarcity. Is this premise fact or myth?

As measured by its price *water is the cheapest of all commodities* marketed in the United States. It is the least scarce of all the things we buy. There is nothing in the market cheaper or less scarce than water. We have all heard the expression "dirt cheap." The price of dirt in the Denver area is about $1.50 per ton. Delivered, it runs around $2.00 per ton. Water is delivered to Denver homes on demand, 24 hours a day, 365 days a

year for about 14 cents per ton (56 cents per 1,000 gallons). In Central Arizona, where the water scarcity is often labeled "critical," water is delivered to Salt River Project farmers for about $.0015 per ton ($.000006 per gallon).

There is little basis for special selection of water as a scarce commodity when it sells for 165 gallons for one penny--delivered! It does nothing for objective water planning to single out the least scarce of all commodities and tag it with the scarcity label.

Free Good

In direct conflict with the scarcity image is the "free good" image. It holds that water is a "free gift of nature" so should cost its user no more than the net cost of its production and delivery. This implies an unlimited supply, free at its source, a complete absence of scarcity. Many people apparently hold the scarcity and free good image at the same time.

Survival

Water is necessary to life and essential for sanitation. It is a survival absolute. Without it, we die. Man must have a couple of quarts of water per day to survive. It is not necessary for survival, however, that every person have 200 gallons per day or that another irrigation project be developed.

A major public official speaking in support of a large irrigation project states: "Water is life. We must have water to survive. The question is, how do we get it?" This kind of attitude is not unusual, even among planners, and presents a major obstacle to rational water planning.

Priceless Resource

Closely related to the scarcity myth and the survival image is the priceless resource image. Because water is necessary for survival and people would pay almost any price rather than go without, development of water is often viewed as providing this priceless resource to consumers. Yet, not a single planning decision we make today is relevant to survival or to providing "priceless" water. Most of our decisions are relevant to providing water at a cost of under 15 cents per ton, as discussed earlier.

Irrigation Fundamentalism

Based on the concept that agriculture is the cornerstone of any viable society and that, in an arid environment, irrigation is either required or or is highly beneficial for crop production, this image holds that in much

of the West, irrigation is a requirement for a viable society. While it is true that, in the past, many communities developed around an irrigation economy, only a fraction of future Western economic growth is expected to be associated with irrigation development. This is not to say that the growth of certain local communities will not be tied closely to irrigation development; only that irrigation is not a necessary condition for viable growth in the West.

Environmental Quality

The newest, but fastest growing, of the absolute images of water is in the environmental quality-recreation areas. The idyllic idols of open and green spaces, parks, playgrounds, greenbelts, recreation, camping, and wild rivers are lining up along with other water uses in establishing water *requirements* for these purposes and demanding their share of water resources.

Implications

These myths and false images interact with each other and with the realistic images and reflect the public policies and institutions that guide the control, development, and allocation of water resources. As a result, each user of water views his desires for water as *water requirements*. But, except for a couple of quarts per day, they are *not* requirements. They are *preferences* and should be viewed as such. We do not have irrigation requirements, instream requirements, or municipal and industrial requirements. We do have preferences or demands for these uses of water.

The almost total insulation of water from the market mechanism tends to reinforce the image that man's desires for water are absolute water requirements, rather than demands that are relative values. The absence of price signals tends to reinforce the "free good" image and leads to the development and allocation of water as if it were free at its source. Administrative rules and regulations are used in lieu of prices. Rigid, unresponsive administrative practices lead to inflexibilities in water allocations. This leads to an overemphasis on security of water rights and rigidity and inflexibility in the allocation of water among users. Water-users emphasize security at the cost of flexibility, and thus policies and institutions emphasize tenure and rigidity rather than the flexibility required to achieve equity and efficiency in water allocation.

The inevitable outcome is that we have much economic inefficiency in water allocation over space and time--inefficiency in the allocation of

water in the short run between uses and between users, and inefficiency in the commitment of development capital to long-run water uses and allocations. Historical patterns of water allocation and past relative preferences among water uses get locked into distribution patterns of water because of resistance to transfer and the lethargic character of the institutions by which such transfers are possible. Although initial water allocations may have been efficient at the time they were made, they have steadily diverged from efficiency goals as demand and technology have changed at ever increasing speed.

In the West, where most water development is tied to irrigation, the inflexibility of water transfer has hastened the development of remaining unused supplies, even to the extent of importing water at high costs to satisfy growing demands. At the same time, little effort is made to divert irrigation water supplies to other uses in spite of the general abundance of agricultural production. The result is an ever increasing cost of water development and transport, insulated against lower cost competition from local water transfers between uses, users, and locations.

In areas where surface supplies have been fully developed, development has often turned to groundwater as the cheapest available additional water supply. This results in the depletion of a stock resource that in most cases is irreplaceable. Depletion of a stock resource is not bad in itself. The tragedy is that we are depleting it now instead of saving it for efficient use later. At the same time we are using our surface (flow) resources inefficiently because of false images and the resulting inflexible institutions and policies.

As long as society perceives the false images of water described in this article, there is little that we as water planners can do to improve the situation. Society's "unseen hand" prescribes the policies and institutions--defines the rules--of the water game. Rational action calls for playing the game according to the rules established by society.

But, we *are* in a period of change. Water attitudes and values of society are changing. As new supplies of water become increasingly scarce, conflicts increase and society reassesses its attitudes. New rules are being examined, demands are being evaluated, and traditional planning approaches are being challenged. If we want to continue in water planning, we need to continue to develop rules for planning that reflect society's changing attitudes and values.

Uncertainty

As if the problems of working in an area filled with myths, false images, and widespread inefficiency were not enough, planners also must contend with uncertainty. It is highly unlikely that the conditions on which water requirements for the year 2000 would be based will be reasonably close to actual conditions. In fact, the statistical probability of this situation approaches zero. Said another way, when we make economic projections and establish water requirements to meet these projections, we are almost certainly planning for the development of the wrong quantity of water.

For example, in establishing irrigation water requirements, if there were three equally likely but singificantly different population growth rates, three levels of exports, three consumption patterns, three patterns of regional development, three levels of yield growth and three levels of water use per acre, there would be 729 equally possible future situations. The same kind of situation exists for the many other uses of water. Taken all together, the water requirements approach to planning will likely result in planning for a situation that will not occur. A different approach to planning is needed. The new approach must go beyond simply developing a new set of terms for the same old practices.

Better Decisions

The intent of this essay is not simply to criticize past mistakes but rather to establish the background for proposed changes in water planning that can lead to greater efficiency in planning for the development, management, and use of our natural resources. Two major changes are proposed: (1) stop planning to meet water requirements and start planning to meet the demands of alternative futures, and (2) stop developing a long-range plan and begin developing a planning process that continuously provides current, reliable intelligence to decision makers. Specific recommendations follow:

> Planners should utilize every opportunity to *broaden the scope* of planning to include total resource planning. The ties between land, water, and environmental resources are so strong that planning for a single resource often results in serious negative external impacts on other resources or institutions.
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> It is not enough to simply identify these impacts. Rather, the objectives of land, water, and environmental planning must all be integrated into the planning process, and significant trade-offs must be identified for the relevant range of alternatives.

Much more effort must be expended in measuring the demand schedules for the products that use water as a major input against the corresponding derived demand schedule for water.

In other words, we must measure the *preferences of society* for varying quantities of water for major uses by estimating the price society would be willing to pay rather than go without. It is especially important that these preferences (prices) are identified over the relevant range of possible quantities of water available. This is required in order to analyze the marginal impact of varying quantities of resource use. Major errors in estimating the effect of alternative courses of action are made by estimating average rather than marginal values.

Planners must begin to utilize *economic projections* as a tool for evaluating alternative futures by (1) providing insights into the nature and level of future economic activity; (2) identifying potential problems or inadequacies in resource supplies; and (3) providing a baseline, or measure, against which alternative plans can be tested. The distinction between the above and the traditional approach is more than semantics.

The recommended approach is to stop viewing regional market shares and associated water requirements as an indication of needs that must be met--stop viewing economic projections as providing a goal or target--and begin to utilize projections as a tool in an analytical framework designed to measure impacts of alternative plans. There is no single fixed quantity of water supply to plan for. Rather, there is a range of resource development management and use alternatives, each with a different set of economic, environmental, and social consequences. Planners should be concerned with reliable measurement of these consequences.

Total resource planning is an extremely complex business. The only way to adequately consider all of the relevant relationships is to make a major commitment to the development and use of *systems analysis* as an important tool in planning. The system should be structured so that independent component models can be added to or taken from the system without disturbing the operation of the system. The system should be designed to simulate alternative futures, to measure economic and social consequences of each alternative, and to display these consequences in the multi-objective accounts.

Uncertainties should be explicitly recognized and efforts taken to reduce them. This can be done by statistical analysis, testing of model--both physical and economic--and, in some cases by developing and evaluation of prototypes.

While much can be done to reduce uncertainties, they cannot be totally eliminated. In order to avoid costly errors that may be caused by uncertainties, the planning process must be designed to provide maximum flexibility. This requires that alternative futures and alternative solutions be continually evaluated.

The planning process should employ a sequential decision-making approach. This approach identifies the critical point in time when decisions must be made, and directs the planning process to provide the information needed to make those decisions.

Planners must recognize that the end result of planning is not another project but rather an improved society. There are many ways we can develop, manage, and use our resources to achieve this goal, including changes in policies or institutions, increased efficiency, and better conservation and preservation of resources. We need to broaden our method of analysis to include these future alternatives on a par with engineering solutions.

Proper planning demands equal attention to both.