WATER MARKETING— THE NEXT GENERATION

EDITED BY
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Water Marketing—
The Next Generation

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Introduction

Taking the Plunge

Terry L. Anderson and Peter J. Hill

Paul Ehrlich's gloom and doom predictions of global resource shortages have spilled over to water. According to Postel, Daily, and Ehrlich (1996, 785), water is unlike other resources such as oil, copper, or wheat because "fresh water has no substitutes for most of its uses." Based on this assumption, they estimate the Earth's fresh water supply accessible to humans (12,500 km^3/year), the current human demands (2,285 km^3/year or 18 percent of accessible runoff), and the increase in those demands by the year 2025 (9,830 km^3/year or 70 percent of accessible runoff). In keeping with Malthusian tradition, Postel, Daily, and Ehrlich (1996, 787) conclude from these estimates that "substantially higher levels of human appropriation of AR [accessible runoff] could result in a severe faltering of aquatic ecosystem services, including broad decimation of fish populations and the extinction of numerous beneficial species." Postel, Daily, and Ehrlich (1996, 787) do say that "greater efficiency of water use, changes in agricultural cropping patterns, and the removal of marginal lands from irrigation could help slow the growth of human appropriation of AR," but they have no place for markets and prices. Instead, water on the blue planet is assumed to be a necessity, and hence demands are unresponsive to market forces. Like a freight train speeding toward a landslide across the tracks, exponential growth and consumption inevitably must collide with fixed supplies.

These doomsayers notwithstanding, the efficacy of markets for averting resource shortages is no better demonstrated than with water. Water demands and supplies are far from unresponsive to price; on the contrary, both sides of the market exhibit surprising price responsiveness or elasticity. The actual responsiveness of

water consumption to price changes varies among regions, with the variations depending on such variables as income and precipitation. In their study of six subregions of the United States, Bruce Beattie and Henry Foster (1980) found that a 10 percent increase in the price of water would produce between a 3.75 and 12.63 percent decrease in water consumption. The northern California and Pacific Northwest region, with its abundant rainfall, was the most responsive, and the arid Southwest region was the least responsive. Similar data for agriculture show that demand responsiveness varies by crops but that aggregate estimates for California show a 10 percent increase in price bringing a 6.5 percent decrease in agricultural water consumption. The same price increase would cause an overall average consumption decrease of 3.7 percent for the seventeen western states. Estimates for homogeneous production areas in California show that starting from a price of $17 per acre-foot, a 10 percent increase in price would yield a 20 percent decrease in water use (Gardner 1983, 88).

In agriculture, the largest consumer of water throughout the world, a higher price would induce farmers to apply less water to crops by utilizing different irrigation technology or different cropping patterns. Research conducted at the University of California suggests that reduced water application would decrease most crop yields but that at higher water prices such reduction would be economical. Flood irrigation techniques conserve on labor but use large amounts of water. With high water prices, it makes sense to substitute labor and capital for water and to use drip irrigation or similar techniques. Trimble Hedges (1977) provided similar evidence in a simulation of a 640-acre farm in Yolo County, California. Hedges showed that the optimal cropping pattern at a zero water price would call for 150 acres each of tomatoes, sugar beets, and wheat; 47 acres of alfalfa; 65 acres of beans; and 38 acres of safflower. If the water price were increased to $13.50 per acre-foot, alfalfa acreage would drop out and safflower acreage, a crop that uses less water, would expand. The point is that the Postel, Daily, and Ehrlich assumption of "no substitutes" is absurd unless prices are not allowed to signal water scarcity.

The implications are significant. If water prices are kept low, as they are by water utilities subsidizing use, more demands will be placed on water resources. The additional water use will be subject to diminishing returns until the last units used generate much less value than the first. What is seen as waste or inefficient water use in rural and urban areas is simply the users' rational response to low water prices. When water for lawns is left to run into storm gutters or when irrigation water erodes the field without reaching the roots of the plants, it is easy to say that users are being wasteful. But users can only afford to be wasteful when water is cheap.

If farmers were motivated by higher prices to reduce consumption through improved irrigation techniques and modified cropping patterns, tremendous amounts of water would be available for human consumption and for instream flows. For example, transferring 5 percent of agricultural water to municipal uses would meet

estimated urban demands in the western United States for the next twenty-five years (Spencer 1992, 70). Higher water prices would also reduce the demand to build costly supply projects and delivery systems that dam and divert free-flowing streams. Higher prices would encourage private, profit-making firms to enter the water supply industry, taking the burden off the public treasury. If the price mechanism were allowed to operate, demand could be reduced, supply could be increased, water would be reallocated, and water crises could become obsolete.

Five years of drought moved Californians toward various pricing mechanisms to reduce demand for water and reallocate the scarce supplies. In 1991, when water supplies from the State Water Project and the federal Central Valley Project were cut, some cities, such as Santa Barbara, began using an escalating price scale for water to encourage conservation (Hayward 1991). Rather than regulating water consumption or using the state's regulatory power to shift water from one use to another, California Governor Pete Wilson opted to facilitate water marketing by creating the California Drought Emergency Water Bank (Krautkraemer and Willey 1991). Under the water banking system, the Department of Water Resources bought water for $125 per acre-foot from farmers who were paying less than $50 per acre-foot. Not surprisingly, water users jumped at the opportunity, and the water bank quickly bought 820,000 acre-feet of water, exceeding its target of 500,000 acre-feet (Hayward 1991, 47).

Whether markets can avert water crises is a function of the interface between property rights and politics. Economists understand that the precision with which water rights are defined and enforced will be a positive function of scarcity (Anderson and Hill 1975). Hence the arid West relies mainly on the prior appropriation doctrine while the humid East retains the riparian doctrine. As long as the demands for water are low relative to the cost of definition and enforcement, well-specified and transferable water rights are unlikely to evolve. Hence, until recent years when amenity values have risen, rights to instream flows were not recognized (see Anderson and Johnson 1986). Because in situ groundwater is more difficult to measure and allocate than surface water, it mostly has remained in the common pool. But because of overdraft, subsidence, and salt water intrusion, to mention a few, there is increasing pressure to change groundwater institutions. As singer Bob Dylan says, "The times, they are a-changing."

In many cases, these evolutionary forces do prompt improved allocation via markets. On America's western frontier, for example, miners and farmers arrived in advance of formal government and hammered out the prior appropriation doctrine that specified water rights and encouraged allocation to higher-valued uses. Even today, throughout the American West, water markets are moving the precious liquid from lower-valued agricultural use to higher-valued municipal uses. As described above and by Charles W. Howe (chapter 5), water banking allows transfers among agricultural, municipal, and industrial demand. A few western states encourage water conservation by establishing rights to salvaged water, thus eliminating the perversities of "use it or lose it."

Not only does political control of water preclude efficient pricing, it also exacerbates conflict and encourages waste in the decision-making process. Well-defined property rights encourage people to search out margins of agreement, such as the farmer who discovers he can economize on water and profit from transferring some of his rights to a municipality. However, in the absence of such a market, farmers will lobby the bureaucracy that controls the allocation, claiming that few trade-offs exist in production and that water is essential to their way of life. Likewise, the municipality will claim that more water is necessary for urban growth. Because neither party has any incentive to search out cooperative solutions, acrimony and exaggerated statements of need will dominate the debate. Depending on the value of water, competing parties invest large amounts of time and effort into influencing the political process.

However, since some people do benefit from bureaucratic allocation of water, there are pressures for government control. This control has stood in the way of the evolution of property rights to water. Even where well-defined and enforced rights exist, political forces often preclude their transfer to alternative uses. For example, most governments do not allow agricultural water rights to be freely marketed for instream uses.

This volume provides policy alternatives that go beyond simple transfers of water among traditional users and stimulates a rethinking of traditional political boundaries as they relate to water. Barton Thompson's (chapter 1) discussion of paradigms shifting from private to public rights begins tickling our gray matter by surveying obstacles to water marketing. James L. Huffman (chapter 2), David D. Haddock (chapter 3), and Henry N. Butler and Jonathan R. Macey (chapter 4) contend that it is political, not economic, barriers that constrain the potential for greater water use efficiency. They call for water federalism, meaning that water policy should be devolved to the lowest common political denominator that reduces transaction costs and encompasses relevant third-party effects. Generally, this means establishing water basin authorities that could be as small as a local creek or as large as the Ohio River Basin.

The remainder of the chapters delve into particular examples of how the next generation of water marketing could work. Charles W. Howe (chapter 5) describes water banking and the potential for even more sophisticated water markets, including futures markets. After enumerating the incredible inefficiencies in the Central Arizona Project, Jeffrey R. Fuller (chapter 6) argues that interstate water sales among Arizona, California, and Nevada could provide the necessary incentives to reduce these inefficiencies. Gary L. Sturgess (chapter 7) takes us "down under," where Australian states are opening their borders to water transfers between traditional (agricultural and municipal) and nontraditional (environmental) users. The potential for meeting environmental demands through river basin markets for water quality is described in detail by David W. Riggs and Bruce Yandle (chapter 8). Finally, environmentalists (and economists) Ben F. Vaughan and Peter M. Emerson (chapter 9) suggest how the definition and enforcement of groundwater

rights can encourage water use efficiency and environmental quality, especially as the latter relates to endangered species. Paying attention to the policy suggestions in these chapters can help us take the plunge into the next generation of water marketing.

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Water Markets and the Problem of Shifting Paradigms

Barton H. Thompson, Jr.

For over twenty years, national and state commissions have touted the potential economic and environmental benefits of water markets (National Water Commission 1973; California 1978). Rather than locking marginal water uses into place and requiring water-short regions to build expensive and environmentally damaging new water projects, markets would permit high-value, water-short uses to purchase water from lower-value uses. The opportunity to sell water for often considerable sums would encourage valuable conservation. Water markets would also reduce the cost of sudden reductions in water supply resulting from droughts or environmental regulation by permitting reallocation of the remaining water to its highest uses. These and other market advantages seem convincingly strong.

Yet active water markets remain a relatively local and often sporadic phenomenon. Portions of the West are doing better than others. Some areas of Colorado, New Mexico, and Utah enjoy extensive markets, although less dynamic than markets in property and many other resources (MacDonnell 1990a; MacDonnell et al. 1990b). A dozen or so western cities, in both these and other states, have relied on market transfers to meet a significant part of their growing populations' water needs (Chang and Griffin 1992; National Research Council 1992; Saliba and Bush 1987). State transfer statistics can also indicate a misleadingly low number of transfers because the statistics generally do not include transfers among users within water districts, mutual water companies, and other water organizations. Hence, states such as California that are dominated by large irrigation organizations

may have active intraorganizational markets (Thompson 1993a).

That said, there is still enormous potential for further expansion of water markets. California is a good example. Vaux (1986) and other economists have shown the considerable gains from trade that would flow from interregional transfers in California. Yet with the exception of a few important interregional transfers, such as the 1989 conservation agreement between the Metropolitan Water District of Southern California and the Imperial Irrigation District (Reisner and Bates 1990), water markets have largely been confined to drought water banks and intraorganizational transfers. Most other states also suffer from a dearth of transfers other than at an intraorganizational level (Sax, Abrams, and Thompson 1991).

This chapter surveys some of the obstacles that water markets face, focusing particular attention on the often neglected transitional problems of introducing markets into a field long dominated and still animated by two nonmarket paradigms.[1] One historical paradigm views water as a *public* resource to be equitably shared and closely regulated by society; the other sees water as a peculiarly *local* resource over which communities of origin have special claim. Both paradigms are inconsistent with dynamic water markets. And while water policy is replete with exceptions to these paradigms, the paradigms have influenced legal rules, ownership structures, and societal expectations in ways that impede the growth of water markets.

My emphasis on obstacles to water markets, however, should not be taken as pessimism about the future of water markets. Positive change has occurred and will continue. The change will not always be rapid; thus, important bills to promote water markets have been killed in both the California and Oregon legislatures over the past several years. And there will be backward slippage (at least from the standpoint of a market advocate), such as Arizona's decision to ban interregional groundwater transfers. Water transfers, however, will continue to increase. The important question is how to quicken the pace, and that requires an understanding of the institutional and psychological barriers to water markets, as well as an understanding of market advantages.

Traditional Water Paradigms

To understand many of the obstacles that active water markets face, it is imperative to understand the paradigms that have controlled water policy for most of this century. For a brief period in the mid-nineteenth century, water policy embraced markets. During the height of the gold rush, miners frequently engaged in water transfers; as a claim played out or failed, the claim's owner would move or sell his related water rights. California courts confirmed such transfers, emphasizing that an appropriative right was "substantive and valuable property," which could be sold or "transferred like other property,"[2] and the courts of other states agreed.

Over the next century, however, the market paradigm was eclipsed or replaced

by two conflicting paradigms. The first paradigm saw water as a public resource that should be allocated broadly among society and carefully regulated to promote reclamation and development in the West—the "public resource" paradigm. An ideological battle arose in the late nineteenth century between those who viewed water as simply another economic resource and those who favored the public resource paradigm. Aided by the scandals and excesses that flowed from the various schemes by which the federal government disposed of land and other resources in the late nineteenth century, the public resource paradigm ultimately won out, with adverse consequences to this day for water markets.

One of the leading proponents of the public resource paradigm was Elwood Mead, who, while Wyoming's state engineer, helped draft its water code. Mead argued that water transfers encouraged appropriators to speculate in water by claiming far more than needed and inevitably tended toward monopoly. The "growth and danger of monopolies in oil, copper, coal, and iron" warned against treating water as a propertied resource; water in a democracy "belong[s] to the people, and ought forever to be kept as public property for the benefit of all who use them, and for them alone, such use to be under public supervision and control" (Mead 1903, 365–66).

The public resource paradigm has strongly influenced the development of western water law. Indeed, a number of state constitutions expressly provide that water is "the property of the public" or "owned" by the public.[3] Copying the Wyoming water code that Mead drafted, moreover, ten states at one point banned water transfers. Today all ten states have either repealed these bans or riddled them with exceptions. The market skepticism embodied in the bans, however, remains prevalent in public and even some academic debate (Chang 1986).

Other institutional attributes flowing from the public resource paradigm remain significant today and continue to impede water markets. Absent a market system for encouraging the movement of water from low-value to higher-value uses, the law limits water users to the volume they can reasonably and beneficially use, and bans at least extreme forms of waste as nonbeneficial (Shupe 1982). Failure to use a water right for a set number of years can lead to the right's forfeiture or abandonment, making the water available for new appropriators (Novak 1983).

These components of appropriative water rights are often incompatible with and can deter market activities. As explained in a later section, water users often worry that voluntary water transfers will trigger an adverse legal or regulatory action. The very act of leasing or selling water, for example, might suggest that the user did not need, and thus was wasting, the transferred water. The institutional rules are also inconsistent with some specific market transactions. Proposals to hold water rights for future sale, without currently using the right for offstream purposes, for example, risk forfeiture or abandonment of the rights.

The public resource paradigm also encouraged active governmental involvement in the development, operation, and subsidization of water supply projects. At the national level, proponents of the public resource paradigm championed the