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LAMPADEPHORIA†

WATER AND THE NATIONAL WELFARE—PROGRAMS IN SEARCH OF A POLICY

JAMES A. CRUTCHFIELD*

It is no secret to residents of the western states that water is a matter of primary public concern. Land and water policies are deeply imbedded in the region, and the imprint of federal water projects on the economic geography of the West is plain to see. It is increasingly clear, however, that no coherent national policy, past or present, has emerged from the massive federal effort in the field. There is no lack of interest, planning, and expenditure on the supply and quality of water, and much progress has been made in definition and measurement of the factors that determine an efficient water system. But sound principles are still honored as much in the breach as in the observance, and we still speak with a thousand voices on any water problem of real magnitude. The time is at hand when the plethora of overlapping and frequently quarrelsome federal agencies concerned with the development and allocation of water supplies and the protection of water quality must be subjected to the test of clearly formulated national objectives and of conceptually sound and consistent means of achieving them.

There is no need to elaborate the need for efficiency in the use of existing water supplies in the United States and in the development of new sources. Engineers and economists concerned with the national water situation are in general agreement that there is not a critical shortage in the supply of good quality water, but the necessary increases will be forthcoming only at steadily higher costs. The uneven rate of economic development in various regions of the United States and the unequal distribution of natural supplies of surface and ground-water accentuate the problem.

† This section of the *Review* is devoted to short, provocative pieces dealing with problems or opinions which do not readily lend themselves to traditional law review treatment.

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Water is a peculiar commodity in many respects, not the least of which is the fact that it can render multiple services, all of which involve some alteration in both the quality and quantity of water available for others. As a result, the "supply" of water is a slippery concept to define. On the broader national scene when we talk of adding to our water supplies, we have tended to think largely in terms of development of new sources—essentially improved usage of existing surface flows. Yet an increase of major proportions in the total net economic benefit from water can be obtained by reallocating existing supplies among present users and by taking full advantage of technical progress in reducing water losses. In addition, reclamation of brackish and waste waters and preventive measures to reduce pollution can be regarded as net additions to the supply of economically useful water.

Partly because the supply of water is flexible in these respects, there is no single answer to "the water problem." National water policy must deal with a complex bundle of regional problems, each with its characteristic local elements, but all linked in a national pattern by overlapping supply and demand interdependencies. There are no simple, final answers to the problems of water supply and quality in any one region. The problems of one region cannot be resolved in the long run except as part of a consistent national program designed to assure continued technological improvement in the use of current water supplies and proper scale, location, and timing of projects necessary to meet future needs.

Virtually every economist concerned with water has expressed unhappiness about the persistent tendency to price water below its full economic value. Quite apart from the random effects of this policy on income distribution, it inevitably results in reducing the net economic contribution of water in its many uses. As long as water is underpriced to the user, he will naturally tend to substitute it for other productive services wherever possible, whether the use in question involves irrigation, industrial cooling, waste disposal, or street washing. There will be little incentive to look actively for ways to reduce water inputs or to make use of water-saving techniques developed by others. And every step away from economy in water use is a step in the direction of more serious pollution. A new national policy with respect to the pricing of water from federal projects is long overdue.

Failure to price water on a sound economic basis has tended to create the illusion of shortage far in advance of actual need. The most

serious situation in this respect is the impact of a long-standing policy of subsidizing agricultural development by providing water at less than the actual cost of delivering it, and, in many cases, at far less than the price that other users would be willing to pay. In the western half of the United States, a major part of the consumptive use of water is for irrigation purposes. No one would contest the important part played by large-scale water projects in the development of commercial agriculture in the Western States. But the conditions that may have justified the extension of handsome subsidies to agriculture in the form of underpriced water no longer prevail. Even if the desirability of subsidizing agricultural output is accepted, there are far more efficient ways to do it than by inducing farmers to use more water than they should, to grow the wrong pattern of crops, and to force federal and state water agencies into premature and unbalanced projects for development and transfer of new water supplies.

The situation is compounded by the fact that more and more irrigation water has been drawn from underground sources, much of it on a "water-mining" basis. Since there are wide areas in which irrigation simply cannot continue at present levels because of declining water tables, the pressure for further water development projects to provide surface supplies for irrigation or to recharge groundwater sources is intensified. Even in the case of crops that are sold at market prices, the subsidy to irrigated agriculture involves a random transfer of income to farmers from other water users and the general public which serves no particular economic goal for the nation as a whole. In the case of crops whose prices are supported, the transfer effect is obviously magnified.

It should be stressed that a more realistic pricing of water for agriculture purposes will not turn the West into a desert. Many crops could well afford to pay prices reflecting the full cost of water delivery. American agriculture can and would seek out many ways of adjusting to higher water prices: by shifting crop patterns, by reducing water losses in irrigation processes, and by changing to production methods that require less water.

What of the argument that expansion of irrigated acreage in the United States is imperative to meet impending food shortages? In the opinion of most economists, this involves a mixture of unsupported assumptions and outright errors. It is by no means clear, for example, that the food and fiber requirements of a growing American economy

will require cultivation of larger total acreages, although the types of land used and the areas of cultivation may well change. The continuous agricultural surplus problem that has plagued the United States for decades is ample testimony to the incredibly rapid technological pace in agriculture and the consequent stabilization, or even reduction, of the total acreage and labor services required to meet expanding demands.

If we look instead at the world situation, and assume, for the moment, that the United States has undertaken a commitment to meet massive increases in world demands for food, it is still highly questionable that the most efficient way of achieving this objective is by expansion of irrigated acreage in the West, with the consequent heavy demands on already scarce water resources. One of the most efficient methods would involve expansion of output through American technical and capital assistance abroad, in countries closer to areas of the most insistent demand. Even in cases where American agriculture is to meet international demands, it is likely that supplemental irrigation and concentration on the more highly productive agricultural areas would produce larger amounts of food per dollar of input than would expansion of irrigated acreage in the West.

I have dealt with this subject of the supposed urgent need for more food at some length because it points to the pressing need for a major investigation of the role of water in American agriculture, national in scope, free of regional partisanship, and free of the biases inherent in the approach of the agencies whose missions are intimately bound up with present water pricing policies.

A review of agricultural water policy should automatically carry with it the presumption that a study be made of regional economic objectives, particularly as they relate to water usage. The issues involved are far too complex to be discussed in detail in this article, but one illustration might be offered. Present water policies in some of the water-deficient regions imply a commitment to provide water at constant prices to any number of people who choose to settle or establish any kind of business or farming operation wherever they choose. But clearly, this is directly contrary to the principle that the most efficient economic development of a region should be based on intensive use of the productive factors most abundant in the area. In practice, it means that regional economic development in the areas concerned can be sustained only by imposing increasingly severe costs on water users

in adjacent regions and on general taxpayers as the cost of interregional diversion projects mounts. It does not seem unreasonable to question whether the mountain must, in all cases, come to Mohammed.

Most of these problems crop up, with greater or lesser insistence, in the confused and confusing debate over possible diversion of Columbia River water to the Southwestern States.

If people and industry wish to go to the Southwest in spite of the high costs of providing additional water, they may of course do so. They will learn to economize on water use, and its value may rise to the point where interregional transfers on a large scale become economically feasible. But this is very different from the argument that the population of the Southwest should continue to grow *because* the water supply will be guaranteed, in unlimited quantities, at a price well below the full cost of providing it, with the burden of the widening gap between water cost and water prices borne by the rest of the country. There is an odd kind of schizophrenia in the Southwest which enables it to accept with equanimity the fact that population must move from some areas for economic and social reasons, but makes it impossible to accept the corollary that its own growth rate may have to slow down as one or more critical factors become scarce.

The general lack of knowledge about the relationship between water and regional economic growth, coupled with a shrewd eye for publicity effects, has enabled the Southwest to win general acceptance of the idea that water needs for people—household and industrial uses—will reach the crisis stage if major diversion projects are not undertaken in the near future. But any sensible economic analysis makes it clear that the marginal user of water throughout the Southwest is agriculture. The largest consumptive use of water lies in the expanding production of water-intensive crops, much of which would be economically unfeasible if irrigators had to pay the full cost of the water input. There is no dearth of water for the thirsty millions of Los Angeles that could not be relieved for long periods into the future by reducing irrigation utilization in the Los Angeles area itself, as well as in the valleys to the north and east.

The easy answer, that Congress has decreed subsidies to agriculture, including use of artificially low water prices, is evasive or dishonest depending on one's point of view. If all bad programs became self-justifying when passed by Congress, the economic well-being of the country would indeed be in dire peril.

It is unfortunate that so much of the argument about possible diversion of the Columbia has hinged on possible harmful effects on economic growth in the states of origin. Surely the more realistic question is whether the project could come within hailing distance of a benefit-cost ratio greater than unity if *all* costs were calculated accurately and borne by the receiving areas. It would appear that serious doubts as to the answer exist even in the minds of the Southwesterners; hence, their insistence—contrary to every principle of good administration—that the essential feasibility study be undertaken by the Bureau of Reclamation. The Bureau is the federal agency with the most to gain, in job security and prestige, from a “yes” answer (and, incidentally, one whose valuation practices are subject to widespread criticisms from impartial experts in the field of water economics).

The crux of the Columbia River question appears to be the ability to play the federal subsidy game for regional advantage. If this opportunity did not exist, it seems likely that regional economic development of Western water on a cooperative basis would be both possible and advantageous to the eleven states concerned. If it were no longer possible to shift a substantial part of the costs of major water development and transfer projects to the federal taxpayer, the common interests of the various Western States in unified regional development of water supplies could be translated into action. The scope of most of the major water projects in the Western region places them, inevitably, under federal jurisdiction; but the location, scale, and timing of the projects would certainly be significantly different if recipients of the benefits were made to bear most of the costs. It need hardly be pointed out that over the long run the economic welfare of each of the several states is better served by adherence to planning concepts aimed at maximization of the national welfare than by the pattern of second best (or worse) projects that inevitably emerges from log-rolling for short-run advantage.

The development of plans for larger, longer-lived, and more expensive water development and transfer projects raises some pressing economic problems to which an impartial national authority could well turn its hand. It must be remembered that capital-intensive, multiple purpose water projects effectively lock us into a system of water, power, irrigation, and flood-control over long periods of time, with only limited flexibility to meet the inevitable uncertainties of a dynamic, rapidly growing economy.

They frequently make it difficult, if not impossible, to take advantage of technological developments in alternative methods of providing many of these services. With respect to hydroelectric power, for example, calculation of economic benefits as the difference between the cost of producing hydroelectric power and that of the best alternative seriously overstates the benefits over long periods of time by ignoring the consistent record of technological improvement in thermal power. Similarly, steady progress in the field of nuclear power generation should make us wary of firm commitments to extremely large, multiple purpose water development projects in which power provides the major economic justification for the investment. As indicated below, the use of excessively low discount rates in the evaluation of water projects tends toward just this type of distortion and inflexibility in public investment.

In recent years, much progress has been made in defining the essential nature of the water quality management problem (a better term, incidentally, than pollution control). There is increasing recognition of the fact that many of the more serious cases of pollution arise from the fact that it is both possible and profitable to shift the cost of waste disposal from the municipality or business firm developing the waste to others who must either use water of degraded quality, incur heavy costs to rectify it, or simply forego valuable economic usages because the water quality cannot be made adequate at any cost. Similarly, it has become clear that the amount of water used, and therefore the amount of pollution generated, is by no means a fixed magnitude for any given household, industrial, or agricultural operation. If water charges and charges for the use of water courses as a vehicle for waste disposal are made sufficiently realistic, the amount of waste actually generated can be engineered to much lower levels. In effect, there is urgent need for region-wide analysis of our water supply systems, and for investigation of all alternative means of reducing the aggregate amount of waste to be handled.

Although recent federal legislation to establish water quality standards represents a giant stride forward, a tremendous amount of research and experimentation in system-wide water quality programs remains to be done before its full benefits can be realized. It is one thing to define analytically a cost-minimizing waste disposal system, fully integrated with its related water supply system, and quite another to develop data accurate and extensive enough to make it operational.

A national approach to water standards calls for an equally broad approach to their implementation.

All of these comments point up the economist's insistence on looking at alternatives wherever large scale public investment, in water or anything else, is concerned. Construction of a water project that does not cover its full costs, or the deliberate underpricing of water to an agricultural or industrial user, is undesirable not only from an equity standpoint, but because it ties up valuable resources, human as well as physical, that could make a larger contribution to the national welfare in other uses.

The authors of a national water policy should take a long, careful look at the way in which present values are related to future values. Virtually every economist concerned with public investment in water facilities agrees that the discount rates used by the water agencies do not reflect current professional opinion. While there is much disagreement as to the actual rate to be used, there is a general consensus that the rates now used by the federal agencies are so low as to result in serious errors in estimation of costs and benefits, with a consequent tendency to favor excessively large, and excessively long-lived projects at the expense of other approaches that are more flexible and more efficient.

The same kind of reasoning underlies the need for a systematic study of emergency procedures to deal with unexpected developments in water demand and supply. The recent water shortage in New England is simply a dramatic illustration of a general problem affecting water supplies and water quality throughout the nation. Variations in water flows around average figures are so great and may persist over such long periods of time that serious deficiencies in both quantity and quality of water can and will arise if we "sail too close to the wind." Nonetheless, a large amount of unnecessary economic waste can be inflicted on the public by insisting that all water projects should have an average capacity equal to peak requirements under the worst possible set of circumstances. Thus, if water structures are built to insure protection against the worst conceivable flood, or the most persistent possible drought, the cost in terms of under-utilized capacity over long periods of time may far exceed the costs of the rare contingencies they are designed to meet. More practical ways of meeting many of our emergency situations in water supply, flooding, and water pollution may be available if we consider alternative temporary mea-

tures to meet emergency conditions, with our major investment geared to meet only normal loads. Research along these lines is urgently needed since there is a strong suggestion of the need for a major revision of present concepts of structural control and water transfer used by federal agencies.

Economists share the concern of many other groups about the impact of economic growth and urbanization on the quality of our environment, both rural and urban. Water is at the very heart of the problem, since continued access to wildlife, outdoor recreation, scenic beauty, and wilderness areas—essential elements in the American heritage—involves competing uses of water. Unfortunately, there is no generally applicable method of putting dollar values on many of these non-marketed services; yet no one can deny that they play a vital role in the long-run welfare of the American people. The record of the past demonstrates that we have consistently under-invested in the quantity, quality, and diversity of outdoor recreation and the amenities of life. It is a matter of national concern that promising developments in the valuation of outdoor recreation be followed up with detailed studies of particular areas in which major decisions must be made as to competing water usage. This type of study is particularly pressing, since decisions adverse to recreational or scenic use of water are, for all practical purposes, irreversible. A national authority, drawing on the accumulated skills of economists, geographers, ecologists and other specialists could provide a much better balance for these types of uses in the overall scheme of water allocation and development than we have been able to achieve in the past.

The mere listing of these problem areas affecting the national water scene is testimony to the fact that agency procedures are less than adequate at the present time. This is not a matter of the integrity or competence of the personnel involved. The basic weakness lies in the fact that responsibility for management of the nation's water supplies is divided among federal, state, and local agencies which are subject to different legislative constraints, and charged with different objectives. Even at the national level, major decisions involving regional and interregional water projects are divided among several agencies which, despite both external and internal efforts, are anything but uniform in their handling of evaluation procedures required for efficient planning and development of water projects.

As an example, it might be noted that the Bureau of Reclamation

follows a number of policies that clearly violate sound economic practice in computing benefit-cost ratios for irrigation components of water projects. No interest is charged on capital costs assignable to irrigation; a substantial time lag is permitted between the first delivery of water and the first contractual payments from irrigators; revenues from other water uses are frequently used to reduce agricultural repayment obligations; and some secondary benefits are added to primary benefits in evaluating agricultural usage. Quite apart from their effects on proper planning and scale of projects, these dubious Bureau of Reclamation procedures differ from those used by the Corps of Engineers and some major state water agencies. Clearly, someone is wrong. The literature on water economics and proper methods of valuing benefits and costs has run so far ahead of the procedures of the federal water agencies that a major effort to bring the requirements of *Senate Document No. 97*¹ up to date is clearly necessary.

Economic evaluation of water projects inevitably involves the necessity of looking far into an uncertain future. At very best, the estimates for both benefits and costs are subject to wide margins of error. Nevertheless, there appears to be clear evidence that the federal agencies consistently err on the high side with respect to benefits, and on the low side with respect to costs. Again, there is no implication of dishonesty or incompetence on the part of the analysts, but the very fact that they are typically dedicated to the missions of their agencies tends to push in that direction. At present, there is no provision for a thorough, independent audit of planning activities in the water field. Such audits should not be limited to the adequacy of project evaluation with respect to accuracy of estimates and reliability of the data on which they are based. It is equally important to make sure that the size of the project is optimal, and that all alternative ways of satisfying water demands have received adequate consideration. Such an audit cannot be made effective if conducted by the planning group itself, nor would it realize its full potential if limited to an "after the fact" appraisal of completed project reports. Rather, such an audit must be undertaken as an integral part of the planning process itself.

The importance of these changes in procedure and techniques of water planning cannot be overemphasized, nor can it be stressed too

¹ *Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources*, S. Doc. No. 97, 87th Cong., 2d Sess. (1962).

strongly that they must be national in scope. The realities of economic and political life are such that federal water projects always involve the possibility of shifting substantially the allocation of benefits and costs among different geographic and political units and among different groups of individuals. The temptation to muster the full force of the local communities that would benefit from a project behind the efforts of the planning agency that wants to build it is apparent. The cost to the public, even if the pressure results in no more than a persistent tendency to go to the high side of the benefit estimates and the low side of the cost estimates, is not trivial. Moreover, the competitive nature of the relations among the various federal and state water agencies, each of which is sure of the virtues of pushing its particular program for the resource area in question, is not calculated to increase efficiency or accuracy in planning and executing projects.

Finally, a national review of water policy would permit us to investigate much more fully the complex nature of the overall decision-making processes involved. It must not be forgotten that water resources are used in an environment in which a multitude of decisions by state and local governments and by private enterprise must somehow be meshed with those of the federal agencies in assessing the full impact of alternative programs on regional and national economic welfare. Fractionalization of the process, by political unit or by agency at any level of government, is bound to result in failure to consider all alternatives and to evaluate them on as objective a basis as possible.

For these reasons I would strongly endorse the creation of a national water commission and the initiation of a broad-gauged analysis of all major aspects of the nation's water problems.

