Water Importation

AAAS Committee on Arid Lands

Large-scale importation of water into the arid regions of the United States has been proposed as a solution to water supply problems of those areas. Large-scale importation refers to water transfers of the magnitude of those proposed in the California Water Plan, the Texas Water Plan, the North American Water and Power Alliance proposal, the Central Arizona Project, and similar plans.

Reasons for Importation

Water importation is intended to provide water for areas of scarcity by transfer from areas of surplus. Scarcity and surplus refer to the present condition or to that expected to exist in the future, with the year 2000 frequently taken as the reference year. Water deficits are widespread in the arid western states. Water in excess of present or near-future regional requirements is available for exportation from the lower Mississippi River and other streams draining into the Gulf of Mexico, as well as from the Columbia River and rivers in Alaska, to say nothing of rivers in central and western Canada.

The present justification for large-scale water importation is primarily that of supporting or expanding irrigation agriculture. In the future, if cities in the arid regions increase in population, domestic and industrial needs may be expected to assume greater importance in the justification for importation. Few major cities except Los Angeles and Denver are now dependent upon imported water for municipal uses. However, cities along projected importation routes may expect to meet future water needs from that source.

Millions of acres of land in the Southwest, where the major water deficits are found, are suitable for irrigation agriculture, with only modest requirements for land preparation before cropping can begin. Practically all of the land has very low economic value, at present, in the absence of irrigation, although some of it may well have greater value in the future for social and esthetic purposes. If irrigation agriculture is to be expanded on a large scale, there are major advantages for it to be done in areas having long growing seasons and mild winters. These are, predominantly, in the Southwest. Such expansion will be impossible in the foreseeable future without importation.

The engineering capability for water importation, even over thousands of miles, is available. While the cost of large-scale importation will be high, ultimate benefits are said to be sufficient to offset them.

Criteria for Importation

Water importation for the purpose of continuing irrigation in areas having inadequate water supplies or expanding irrigation into presently nonirrigated areas should be decided by (i) the need for agricultural products that irrigation provides; (ii) national policies on the use of irrigation as a means of distributing economic benefits; (iii) the social and economic consequences of failing to provide imported water; (iv) the value of alternative uses of water for industry, recreation, or other sectors of the economy; (v) the impact of importation structures on the ecology of the areas involved; and (vi) the social and economic effects on the regions of water export.

There can be another reason for importation of water into particular areas: to meet the goals of a national policy of population dispersal. No such policy has been established, but proposals have been made to encourage dispersal by deliberate governmental action. Large-scale water transfers can be an important means of determining where people will live. They can do so by supplying water for municipalities, man-made recreational areas, and irrigated agriculture in the regions of import and by limiting water for these uses in the regions of export.

Domestic and industrial needs are not considered to be criteria for importation. Most, if not all, cities in the arid regions probably can obtain all the water they need for municipal uses, at least until the year 2000, by (i) tapping unappropriated surface or groundwater supplies, (ii) buying water rights, or (iii) reusing waste water. If adequate and reasonable notice and compensation are provided to water-right owners, the practice of buying water rights can be done with little adverse effects upon the families involved.

Evaluation of Criteria

In view of current acreage controls, limited markets for added agricultural output, and the low benefit-cost ratio of water used for irrigation, significant expansion of the present irrigated acreage does not appear to be essential to meet the food and fiber needs of the United States in the foreseeable future. There is no national policy on the distribution of irrigation benefits that makes acceptable a low benefit-cost ratio for irrigation projects. Industrial and domestic uses of water provide much higher benefit-cost ratios than does irrigation. Impacts of water transfers on the ecology of the affected areas frequently are difficult to assess, as is the effect on social and economic conditions in the area of export. This very difficulty makes it imperative that transfers be made only when there are compelling reasons for doing so.

The Committee on Arid Lands believes that if there is a compelling reason for large-scale water importation, it is to prevent the social and economic disruption resulting from failure to provide water to established irrigated areas where water supplies are inadequate to maintain the current level of irrigation. Two kinds of irrigated areas fit this need: (i) areas where the primary or sole source of irrigation water is groundwater, recharge is small, and water tables are dropping steadily and (ii) areas where the salinity of the irrigation water is causing an excessive increase in soil salinity, with a consequent reduction in crop yields.

When water supplies are inadequate to meet the current needs of irrigation, three recourses are open: bring in additional good quality water, reduce the irrigated acreage, or increase water-use efficiency. The latter two choices are

Members of the committee are H. E. Dregne, chairman; Carl N. Hodges, M. M. Kelso, Dean F. Peterson, Terah L. Smiley, and R. B. Woodbury. Background information for the report appears in the appendix.

not viable alternatives where a finite groundwater supply is being depleted or where irrigation-water quality is deteriorating.

If these critical areas contain large urban centers based upon nonagricultural industries, reduction in irrigation may cause a minimum of social upheaval as farmers find employment in the nearby cities. If, however, the economy of the region is almost wholly dependent upon irrigated agriculture, reductions will produce severe economic strains that, in turn, will lead to social upheaval as agriculture-based workers are unable to find other jobs within the region. Mass migration away from the region becomes necessary, and the towns become pockets of economic stagnation. The ramifications of mass migration away from the region are felt far beyond the borders of the region. Water importation thus becomes a rescue operation to avoid social and economic upheaval.

Conclusion

We conclude, then, that large-scale importation of irrigation water into water-deficient areas in the United States should not be undertaken simply because it is technically feasible, the water and land are available, and water deficits now or in the foreseeable future can be documented. Rather, we believe that if there is a compelling reason for large-scale water importation, it is to prevent massive social and economic disruption in an established irrigated area.

Appendix

Water importations (interbasin water transfers) for the purpose of irrigation were initiated thousands of years ago in the Middle East. Warnick (*1*, pp. 340–352) has traced the history of water transfers and has summarized the principal features of 20 proposed plans for interbasin transfers in the United States.

The uncertain ecological and social implications of interbasin water transfers were discussed in a AAAS Committee on Arid Lands Symposium in Dallas in 1968 (*2*). Howe, at that same symposium, concluded that the estimates of costs and benefits of large-scale water transfers indicate that such transfers are, at best, of marginal economic value, at present (*3*). He noted that established, highly specialized agricultural areas which face a permanent loss of water supplies are in a special category that warrants more careful study of benefit-cost ratios. Peterson emphasized the need for evaluating indirect and intangible benefits, such as the distribution of economic benefits nationwide, in arriving at a benefit-cost ratio for water importation (*4*). Import alternatives are available for nearly every water-short

area (*5*), by waste water recycling, desalting, weather modification, and water harvesting, to say nothing of more efficient use of water supplies in agriculture, industry, and the home. Wollman *et al.* have pointed out the greater economic benefits of using water for municipal and industrial purposes than for agriculture in areas experiencing industrial development (*6*).

Cropland acreage in the United States has been declining since 1950, at an annual rate of about 2.5 million acres per year (*7*). Productive capacity of the land exceeds current demands for food and fiber, resulting in government programs of acreage diversion of cropland to noncrop uses. Under these programs, 50 to 60 million acres of cropland are diverted temporarily to noncropland (*8*).

Needs of the potential water-importing regions is not the only consideration. Regions of potential water export are sensitive to the possible restrictions on their economic development that may result if part of their presently excess water supplies are permanently diverted to another region (*9*). That sensitivity has led to assurances, of doubtful legality, that the area of origin of transferred water would always be able to retain the water it would need for future development (*10*). Predicting those needs is extremely difficult.

References

1. C. C. Warnick, in *Arid Lands in Perspective*, W. G. McGinnies and B. J. Goldman, Eds. (Univ. of Arizona Press, Tucson, 1969), pp. 340–352.
2. P. H. McGauhey, *ibid.*, pp. 358–363; G. W. Thomas and T. W. Box, *ibid.*, pp. 363–374.
3. C. W. Howe, *ibid.*, pp. 374–382.
4. D. F. Peterson, *ibid.*, pp. 398–405.
5. G. Young, *ibid.*, pp. 382–397.
6. N. Wollman *et al.*, *The Value of Water in Alternate Uses* (Univ. of New Mexico Press, Albuquerque, 1962).
7. L. E. Partain, in *Contours of Change: The Yearbook of Agriculture 1970* (Government Printing Office, Washington, D.C., 1970), pp. 189–196.
8. R. F. Daly, *ibid.*, pp. 342–346.
9. E. R. Tinney and F. J. Quinn, in *Arid Lands in Perspective*, W. G. McGinnies and B. J. Goldman, Eds. (Univ. of Arizona Press, Tucson, 1969), pp. 411–415.
10. *The California Water Plan* (Bulletin No. 3, Department of Water Resources, State of California, Sacramento, 1957), pp. 217–218.

Forthcoming Events

March

7–9. **Vertebrate Pest** Conf., 5th, Fresno, Calif. (R. E. Marsh, Dept. of Animal Physiology, Univ. of California, Davis 95616)

7–10. **Computer Graphics in Medicine**, Assoc. for Computing Machinery, Pittsburgh, Pa. (Dept. of Computer Information Science, Point Park College, 201 Wood St., Pittsburgh, Pa. 15222)

10–12. National **Wildlife** Federation, Mexico City, Mexico. (T. L. Kimball, NWF, 1412 16th St., NW, Washington, D.C. 20036)

11–14. American Assoc. of **Pathologists and Bacteriologists**, 68th annual, Cincinnati, Ohio. (Miss J. Graves, Intersociety