Rational Use of Water

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Water is a unique natural resource because it is essential for every human activity, thus heavily influencing societies by its geographic distribution in terms of both quantity and quality. Water can be transported from one location to another, can be stored for future use, and can be modified in quality. For these reasons, the development, management, and conservation of water is a principal concern of the process of social decision-making, and the rational use of water is an objective sought by every society.

The forces of a free economy have generally not been allowed to function in the area of development and allocation of water resources. The political history of most parts of the world has been interwoven with the development of water supplies for domestic use in cities and towns, and for irrigation uses in rural areas. The majority of water supply projects have historically been major public endeavors undertaken as matters of public policy, rather than as the result of free economic entrepreneural endeavors. The elements of long-range public planning have often been intuitive and political rather than analytically rational.

The development of the modern industrial society, based on a complex system of agriculture, urban centers, and industry, has compounded the complexity of the problem. Modern interests in establishing recreational facilities involving natural or artificial water bodies has interposed an additional system element in the historically traditional situation. When agriculture was the predominant user of water in all communties, the competition for water resources existed between social groups, such as cities and countries. In our modern society, we now have competition between various forms of activities such as agriculture, industry, recreation, domestic use, as well as between subcategories of these activities. In the absence of the free play of a national economy in the water resource area, the wise planning and allocation of water as a resource requires an in-depth assessment broad in nature and scope.

Because modern transportation of agricultural products—food and fiber—may often be undertaken more easily and at less cost than the transportation of water, one of the traditional constraints in the allocation of water resources is minimized. In the absence of artificial trade barriers, as within the United States, the problem of allocation of water can be examined on a very large regional basis, and the effect of modern commodity transportation can play a significant role.

The interaction between agricultural use and urban use of water represents a principal issue in allocation policy. A key question is the amount of agricultural use necessary to sustain an urban economy. Although this varies in different areas of the world, the water required to maintain an urban population and its industry is roughly 5 to 10 percent of that required for the agriculture supporting the same urban population. Thus agricultural use tends to predominate in all water planning programs.

Although agriculture is by far the most expensive application of water in relation to the output of economic value, it does have a special role in allocation planning. It has the stimulating characteristic of providing a large-scale operation which can utilize the maximum water supply available at any time. Agricultural irrigation systems provide a continuous summer load as contrasted with the peaking characteristics of urban use; large-scale agricultural irrigation, therefore, rarely requires expensive regulatory storage facilities. Also, distribution conduits are far less costly. From the point of view of investment economics, agricultural water can be put to use almost immediately and thus begins to pay off the capital investment in water supply quite rapidly.

Because of these features of agricultural use, as well as the importance of its product, agriculture has historically been the initial and pioneering venture in developing any area. This factor raises the basic question of whether, in fact, all urban developments require an agricultural precursor as an initial phase of opening new areas. Very approximately, urban and industrial developments require an amount of water equal to or less than the agricultural areas they displace. Thus, if a water supply is developed initially for agricultural use, it is generally adequate for urban use. As previously mentioned, agricultural applications can be undertaken rapidly, once water becomes available. Urban growth, in particular urban industries, may take decades to develop. Thus the economic rationale for initially developing water supplies primarily for urban use may hinder the appropriate large-scale installations which are necessary for good economic development.

These and their related factors must be considered in any long-range plan for the rational use of water. Unfortunately, at the local community level, the complex interrelation with the regional and national economy are obscured. Local decision-making therefore tends to suboptimize the allocation problem with unfortunate repercussions on the large-scale planning of resource allocation. This has been particularly evident in the recent concern with environmental issues relating to water quality and water utilization for recreational purposes. A recognition of the importance of a large regional and national overview of this problem has yet to be developed publicly. In addition, the criteria and analysis necessary for good national decision-making are not as yet fully available.

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Speakers and Topics

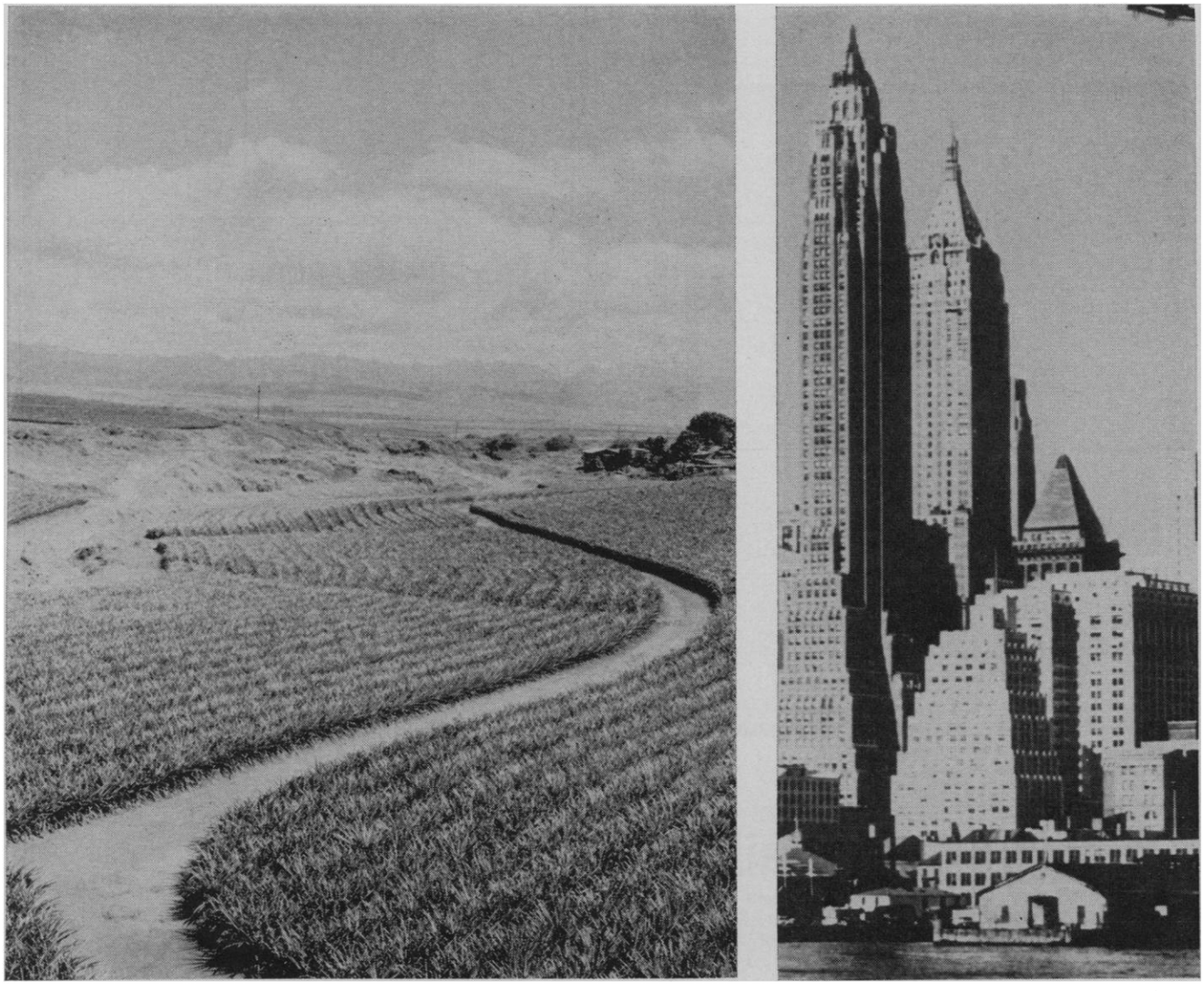
Chairman: Chauncey Starr (University of California, Los Angeles).

Michael F. Brewer (Resources for the Future, Inc.)—*Managing Water for the Enhancement of Environmental Quality: Challenges to Public Policy.*

Everard M. Lofting (University of California, Los Angeles)—*Alternatives in the Allocation and Use of Water as a Scarce Natural Resource.*

Lloyd E. Myers (United States Department of Agriculture, U.S. Water Conservation Laboratory, Phoenix, Arizona)—*Alternative Water Sources and Costs.*

Dean F. Peterson (College of Engineering, Utah State University of Agriculture and Applied Science, Logan)—*John Wesley Powell Revisited.*



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Program information and registration forms for the meeting, hotels, and tours appear in the 10 October issue of Science. *Reports about symposia appear in the following issues: 19 Sept., "Tektite: A Study of Human Behavior in a Hostile Environment"; 26 Sept., "Expanding Horizons in Medical Education"; 3 Oct., "Education of the Infant and Young Child"; 10 Oct., "Is There An Optimum Level of Population?," "Approaches to Policy Sciences," and "Sea-Level Panama Canal"; and 17 Oct., "Quantitative Studies of Urban Populations" and "Our Food Supply."*