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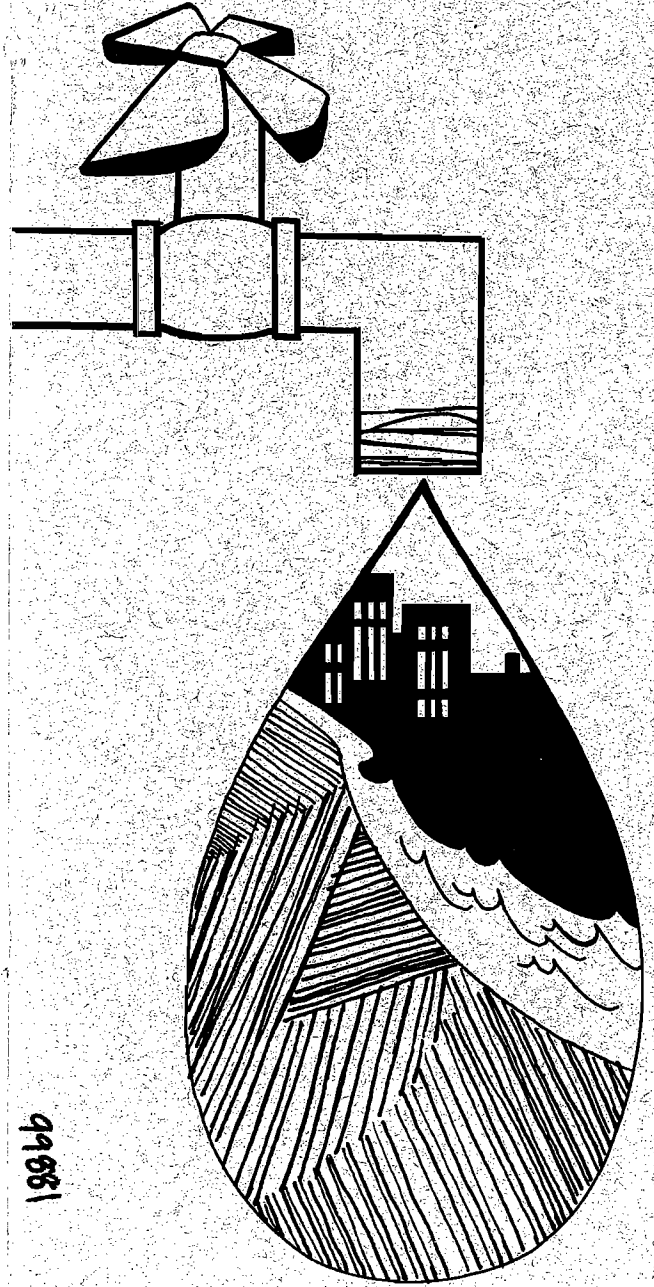




Logan, Utah 84321

*Water Resources Research -  
A Challenge to the Social Scientists*

Utah Water Research Laboratory / College of Engineering



49581

**WATER RESOURCES RESEARCH--  
A CHALLENGE TO THE  
SOCIAL SCIENTISTS**

**by  
Dean F. Peterson**

Address delivered to Workshop for Sociological Aspects of Water Resources Research, April 18, 1968, Utah State University, Logan, Utah.

Utah Water Research Laboratory  
College of Engineering  
Utah State University  
Logan, Utah

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**Dean F. Peterson**

Dr. Dean F. Peterson is Dean of the College of Engineering at Utah State University. He is currently on leave from the University to serve as Director of the Office of Water for Peace in Washington, D.C.

Dr. Peterson is a recognized expert in the water resources field. He has recently served in the Office of Science and Technology within the Executive Office of the President as an expert of water resources.

Dr. Peterson was born in Delta, Utah. He received his bachelor's degree from Utah State University, and his doctorate in civil engineering at Rensselaer Polytechnic Institute. He has had extensive experience as a civil and hydraulic engineer with both government and private industry. After World War II he was associated with Colorado State University as head of Civil Engineering. Since 1957 he has been Dean of the College of Engineering at USU.

In addition to his academic responsibilities, Dr. Peterson has served in recent years with the Agency for International Development (AID) and the Department of State as an irrigation and water resources consultant, and also served as Chairman of the U.S. National Committee charged with coordination of work to carry out United States participation in the International Hydrological Decade sponsored by the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

## **WATER RESOURCES RESEARCH-- A CHALLENGE TO THE SOCIAL SCIENTISTS**

**By Dean F. Peterson**

Development of water resources for useful purposes was one of the earliest activities of man. This was done primarily to provide irrigation, but for other purposes also. The Bible speaks of ancient wells, which undoubtedly involved human effort in their construction, and ancient aqueducts for domestic use in cities such as in Rome are well known.

Undoubtedly there were social interactions with water resources objectives in those days as in these. Certainly there was some competition for the water from the same source and, where large public works were required, society had to be organized for these to be constructed, operated, and maintained. The consequences of water resource developments had far-reaching effects on everyday customs and practices. It is not by chance that the Egyptians oriented their temples toward the rising sun at the Summer Solstice; whereas the Chaldeans oriented theirs toward the East, the direction of the rising sun at the equinox. The Nile begins its rise nearly on the first day of summer; the Tigris on approximately the first day of spring.

But the influence of water on man's culture is not restricted to the primitive societies of the past. There are few great cities, in the U.S. and elsewhere, that are not located on principal rivers. Boston - the Charles; New

York - the Hudson; Philadelphia - the Delaware  
Washington - the Potomac; Norfolk - the James,  
and so on. Cairo on the Nile, Bagdad on the  
Tigris, and Calcutta on the Ganges are exam-  
ples elsewhere. (For Los Angeles, the Colorado  
was moved into the Los Angeles Basin.)

In the past, water resource development decisions have been made primarily on the basis of economic and technological opportunities. If there existed a predictable economic need; if there were opportunities where-by water resources were available and the technical skills needed for their development, then these usually were initiated if capital financing could be found. This procedure is relatively simple and straight forward, but engineers have felt for a long time that something was lacking in the system. During the past decade they have been made increasingly aware that this simplistic procedure is not fully adequate by the clamor and virulence of the critics who range from economists to conservationists. Actually engineers do not really make the decisions about water resource investments. They do not control the purse strings nor vote the legislative actions. I understand the highest placed engineer in the entire Executive Branch of the Federal Government is a mere Deputy Assistant Secretary. Engineers do, nevertheless, describe the opportunities. Society usually responds without thought to the alternatives or to the consequences to other interests who may not be represented by those who make the decision. Granted, the engineer should see that all costs and alternatives are considered, but no one has agreed to pay for the additional investigations nor have the intangible and indirect

values in which society is interested been adequately defined.

By now it seems fairly clear, even to engineers, that water resource decisions are and ought to be social, not technological, decisions. But there are few standards by which these decisions may be judged and the machinery for making them is notably creaky and inadequate. Obviously, if these are indeed social decisions, then social scientists ought to have something to contribute to the art of democratic decision-making in the water resources area.

Having made the decision, then the process of implementation needs to occur. In complex systems a large mix of institutions must be articulated. Some of these carry out the technology; others are concerned with pricing, financing, and apportioning the benefits. These impinge on a wide array of existing and developing institutions having general or other special purposes ranging from the League of Women Voters (who incidentally has done a yeoman job in elucidating water resources problems to the general public), the complex structures of modern city and town governments, the labor unions, to the universities. Water resource decisions are not static; population and demands are never as predicted. Ecological or aesthetic consequences are often not anticipated and technology is continually changing. Thus complete separation of the process of decision-making and that of implementation in a dynamic world is not possible.

The scale of water resource development has greatly increased in the last few years. The federal government is heavily involved for a great many reasons; large investments are required; river basins may extend over several states; diversions from one river basin to another are possible, and environmental deterioration has reached a point where federal concern is necessary. The question of scale is not only in relation to physical size, but to the scale of institutional involvement as well. A water system for a small village quite likely will involve some federal agencies. Its sewage system is certainly a matter of federal concern these days. Water resource investment by the federal government has become a significant way of reallocating national income, not only regionally, but in some measure also among segments of society as well. The pervasive impact of water development is documented by the fact that there are thirty-eight federal agencies who have on-going programs in water development or research.

Clearly the questions need answers from all kinds of scientists; and since society is so heavily involved it seems obvious that the social sciences should help answer them. The social scientists themselves should frame the questions; however, since they are relatively newcomers to the water resources field, perhaps it might be useful for an engineer to comment on some of the questions as he sees them. First of all, I am greatly disturbed by the common replies I get from the social scientists. They usually take the vein--"What is it you want society to do? Tell us and maybe we can find a way to persuade society to do it." I

think the large question is "What should an affluent, democratic society which is America in the mid-twentieth century do; what are its objectives, and how can water resources development help achieve these objectives? What ought to be our water resource objectives and what shall be our policies in trying to achieve these objectives?" I do not believe these can be enacted into an eternal law. What I want to see is a continuing public discussion on an intellectual level such that it will influence the decisions which relate to water resources at every level and in all branches of government. This discussion must take place freely; it must use widely understood language, not technical jargon. Against such a background, we could then turn our attention to the question of how to accomplish the task.

From what discussions I have had, development of fundamental goals against which the large questions can be answered leads into a pretty intangible wilderness. Basic ethical considerations, which apparently are highly subjective judgments, seem to be involved. It occurs to me that there are some things however, that nearly everyone would agree are either pretty good or pretty bad. I would argue, for example, that such things as improved health, increased opportunity for the underprivileged classes of society, greatest possible personal freedom, a better understanding of the world around us, reduction of human strife, preservation of animal species, and the spiritual uplift of an aesthetic environment are good things. Perhaps you may think such things are remotely removed from the mundane technological exercise of building

dams and laying pipelines. I do not. I think the relationship may be much closer than we realize.

We must also place some relative values on our goals. We probably cannot have the very best of all of them. They are not mutually exclusive but are often in conflict.

Against such a background, the next most important question is that of decision-making. Here we have the eternal conflict which arises because planning is highly specialized art and *good* planning is likely to be done only by people who specialize in planning. But these planners must make plans for large sectors of society. Society does not want to have plans about which it has nothing to say imposed upon it from above, so the question is how to involve the participants? In trying to do this there is a real and acute danger that extremely pressing needs of minorities may be wiped out in the process of reaching a consensus of the majority. This overriding sacrifice of minority needs to majority consensus is, in my opinion, a major threat to orderly society.

In the simplistic view of the decision-making process the planners develop the alternatives, these are explained publicly, and the public makes its comments. After this is done, the *decision maker* decides among the alternatives. There are several problems with this view. First, decision-making where complex plans are involved is largely an accretion process of small decisions which accumulate to a large one so the pertinent decisions are still largely made by the professional planners.

The alternative to this would be to have an infinite set of alternative plans. A second problem is that communication with the public where complex technical problems are involved is extremely difficult; the public discussion will very likely become emotional, especially where vested interests are involved. A legislator may prefer not to have to deal with alternatives which may require decisions which apportion benefits to his constituency in different ways.

The third task is to identify and help develop the needed institutional structure which can deal with the complex technological and economic systems required for modern water resources development, and at the same time, provide *all* of the public benefits in the freest possible way.

It seems to me that man sets his values and develops his institutions in a pragmatic way in a real world in which development of natural resources for his material benefit is a primary activity. Surely institutions and values must arise in response to this basic need. But this world is not complete without attention to ethical and aesthetic values; and at what point does multiplying demands due to population expansion and materialistic goals need to give way to other environmental values? Water is a major resource with which man is concerned, and its development, therefore, must have some significant relationship to human institutions and values. I think also that meaningful results cannot be obtained in a modern world without giving full attention

to technological and economic factors. Therefore, I believe that some team approach in which there is a much greater interaction between technologists and social scientists will be necessary. I should think this real world would provide some wonderful excitement for social scientists and I challenge some of you to leave your ivory towers and enter it.