

SOLUTIONS TO WATER PROBLEMS -- THE TIME IS NOW

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I want to discuss briefly with you solutions to water problems, but first I want to compliment you on the recognition of the importance of water by Governor King through his proclamation of "Water for New Mexico Week".

Water problems are "people" problems, for without the demands of people -- new demands and changing demands -- we would have no water problems. And people are dynamic and changing. Therefore, water demand is dynamic and changing. However, people don't change in predictable ways, so it is difficult to project such demands with the accuracy we thought we could, just a few years ago. Moreover, the general public must be brought into the decision-making process at levels heretofore unattained -- in the establishment of water policy and in the planning for water management. In all of these matters, we should have had the answers yesterday -- the time is not only short, the time is now.

We've had a tremendous program this morning and look at what's coming up this afternoon -- a series of student papers that should be equally stimulating. For openers, now let's talk about pollution.

Pollution

"Pollution Rated Top Problem by Public" -- so said the headline in the newsletters and newspapers about a month ago, giving the results of a poll of 3,000 people across the nation last November by Louis Harris and Associates. Other problems, rated in decreasing order of seriousness by these 3,000, were crime, drugs, schools, housing and transportation, employment and taxes, and youth.

There's no question but that pollution is a problem, and water pollution is just as bad as some of the other forms of pollution. However, this isn't our only water problem -- or is it? Perhaps it is all in the way we look at it. Or talk about it.

For example, is a water shortage a matter of water pollution? A drought can be thought of as a physical or hydrologic drought, a meteorological drought, or an economic drought. What if we were to re-use more of the water than we do now? And don't let us forget the sociological drought -- caused by our increasing personal or sociological desires, because we are caught up in the affluence of our present-day society.

Perhaps it is all in the way we look at it. Or talk about it. Consider if you will, two views of geology -- my field -- as given in the February Newsletter of the Council on Education in the Geological Sciences.

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One view is that of Charles Maher, a columnist for the Los Angeles Times. On December 16 he said, "That's the trouble with getting too scientific about anything. The average guy will be out driving somewhere and come upon a massive rock formation and say, 'Hey, that's beautiful.' but show the same formation to a geologist and he may get all hung up over whether the rock is igneous or metamorphic. So while the average guy would be admiring the rocks, the geologist would be studying them, perhaps oblivious to the fact that they were beautiful."

The other view, by Thomas Henry Huxley in 1850 (On the Education Value of Natural History Sciences), is neatly counter to Maher's. "To a person uninstructed in natural history, his country or seaside stroll is a walk through a gallery filled with wonderful works of art, nine-tenths of which have their faces turned to the wall." Think about that -- their faces turned to the wall.

These two views, of the same thing, remind us that different people or people with different backgrounds, view things differently. They also tell us that beauty (or comprehension, or understanding) is in the eyes of the beholder. But then that is another story -- a geologist's story -- and I shall not bore you with it, today.

Now, let's talk about resources, water, and the environment.

Resources, Water, Environment

"The adequacy of resources stands with peace and population control among the crucial problems of our time and the future." So said Dr. Frederick Seitz, President of the National Academy of Sciences in 1968, in the foreword to the book Resources and Man.

One of our resources, whose adequacy Dr. Seitz says is such a crucial problem, is water.

And who says it with greater focus on water than Dr. Seitz, with even greater thrust? None other than Senator Frank Moss from our neighboring State of Utah. Senator Moss, who, like New Mexico's Senator Clinton Anderson and Washington's Senator Henry Jackson, has been a stalwart in water legislation. In his book, The Water Crisis, Senator Moss said in 1967 (p. ix), "I believe it is not an exaggeration to say that water -- its competing uses and the conflicts that arise out of these uses -- may be the most critical national problem."

Now that we have focused our attention on water, let's expand it again, for just a minute. Why? Because water problems are environmental problems. Therefore some of the most critical water problems possess the same elements -- and the same possibilities for solution -- as environmental problems. And they are both tied up in policy.

Policy enables man to manage his resources, and to do this one must consider several aspects -- technological, economic, legal, and political -- and don't forget philosophical. In his recent book, Environment: A Challenge to Modern Society, Dr. Lynton Keith Caldwell of Indiana University discusses how the politics intensify as the demands of men intensify. He points out (p. xiii) that

"First, social conflict forces government to allocate or mediate the uses of the environment," and "Second, the cumulative stress upon the environment forces public intervention to protect the life-support capabilities of the environment from impairment or destruction." These two factors, as you know, are often in conflict.

If you wish to substitute the term "water" for "environment" in the above quotation, then you will be talking about the same thing as I am.

Let's now turn to water problems that are national in scope.

Water Problems -- National

Are we running out of water? "No," Arthur M. Piper answered in 1965 (United States Geological Survey Water Supply Paper 1797, p. 22). However, he added that time is getting short to develop the competence to manage our water supplies "boldly, imaginatively, and with utmost efficiency." His colleague, Raymond L. Nace, agreed a couple of years later (United States Geological Survey Circular 536, p. 1) that the time is getting short to stem the waste of water before irreparable harm is done, and he continued that water pollution is mainly a problem of economics.

What are the water problems of the United States? Of the West? Of the Southwest? How effective are some of our current water programs in the Nation? What about current legislation that is being considered? And how pressing are these water problems, anyway? Well, back in 1959 the Senate Select Committee on National Water Resources, of which your Senator Anderson was a member, recognized (Com. Print 3, January 1960) six major water problems: (1) distribution, (2) long-term supply, (3) natural chemical and sediment, (4) man's pollution, (5) floods, and (6) short-term variability of supply. But these were all physical problems. What about the social, the economic, the legal side of the fence?

The latest word from the Federal Government on water research priorities -- and therefore on water problems that need to be solved -- was contained in the report of the Federal Council on Science and Technology in December, 1969. This publication listed the following five as being the most urgent:

1. Managing metropolitan area water systems
2. Improving regional planning and management of water resources
3. Controlling pollution caused by heated-water discharges, oil, and sediment
4. Protecting the public health
5. Predicting ecologic change.

These five represent a considerable revision from the priorities established by the FCST five years earlier as part of a 10-year program of federal water research (February 1966). Item No. 4 wasn't even recognized as a major pro-

blem in 1965 -- that's protecting the public health. Items No. 2 and 5 were repeated from the earlier list, and Item No. 3 was considerably restricted in scope and Item No. 1 enlarged in scope from the earlier list. In addition, you will note that in 1965 we thought of several other areas as problems which by 1969 were no longer on the new "Hit Parade." Let's take a look at that earlier list:

1. Methods and criteria for water-resource planning
2. Benefits and alternatives -- cost allocation, cost sharing, pricing, and repayment
3. Improved methods of waste treatment
4. Conservation of water in industrial and municipal uses
5. Conservation of water in agricultural use
6. Ecologic impact of water development
7. Undesirable effects of nonwater activities on water -- especially urbanization
8. Evaluating climatic changes -- significance of fluctuations from flood to drought
9. Assessment of extent and character of water-oriented problems, especially:
 - a. Potential use of sea water and brackish water by desalting, or the
 - b. Potential for improved water yield through land management, or the
 - c. Potential for water conservation through better use of poor-quality water, or the
 - d. Sources, quantities, and characteristics of pollutants in water sources, or
 - e. Potential water recovery through waste-water purification, or the
 - f. Possible impact of precipitation modification.
10. Consolidation of Federal laboratories, and improvement of communication and coordination among researchers
11. Review of current Federal program of experimental watersheds, and finally,

12. Increasing the efficacy and reducing the huge and mounting cost of engineering works of unprecedented magnitude and complexity.

Well! That shopping list should include just about everything but the kitchen sink! But does it? And, noticing how the priorities were changed after the first five years of this ten-year look ahead, do you think that we have important problems today that were not stated in the "top five" of only a year ago? Or is our perception of these problems changing?

If we stop and think about it for a moment, we'll have to admit that the answer to those last two questions has to be "yes -- it is changing." Society is dynamic -- constantly changing -- not only because of people-problems, but also because of unanticipated side effects of technological solutions that are proposed to answer those problems. Even if ZPG (Zero Population Growth) is achieved, the increasing or the changing desires of those of us who are already users of this resource will demand increases in both the quantity and quality of that resource -- water.

The National Water Commission was created in 1968, to study the Nation's water needs and problems, and to recommend improved national policies so that future needs can be met. The Commission is to report in 1973, so its life is half over. What does the Commission see as the major problems? Well, it has selected (Interim Report No. 2, December 1970) some twenty areas for study, as follows:

1. Technological developments that might substantially modify future needs for water and water development
2. Effect of changes in life style of the public on future water development
3. Forecasting regional and National water needs
4. Values of using water for various purposes in different regions
5. Methods of increasing water supplies
6. Not identified yet
7. Use of water resources to promote regional economic development
8. Effect of water development on the environment
9. Influence of water development on the growth of existing population centers, and of new towns.
10. Federal water programs, an analysis of policies, procedures, and institutions
11. Combines with No. 14
12. Cost-sharing and pricing as incentives for water development

13. Metropolitan water problems
14. Institutional arrangements for water development
15. Methods used and constraints inhibiting water planning with emphasis on comprehensive river basin plans.
16. Criteria for evaluating interbasin transfers
17. Economic evaluation of proposed water projects
18. Practices and procedures of organizations that authorize, program, and finance water projects
19. Legal studies
20. How future water policies can affect the Nation's reserves of trained manpower
21. Review of the Nation's water-pollution control program, and
22. Public participation in the formulation of water policies and plans.

Thinking about that shopping list will help you focus on problems that you feel need tackling in the State of New Mexico. And who is going to tackle these problems? Why, your New Mexico Water Resources Research Institute, which has marshalled the many talented people in your three institutions of higher education and is reaching out to embrace experts in other schools in the State -- that's who.

Now let's turn to water problems at the State level.

Water Problems -- State

In order to manage its water resource, a State needs first of all a water policy. As a result of this policy, and as a necessary second step, a plan for the development and wise use of this resource must be developed. And you in New Mexico already have taken steps in this direction, for you will recall that at last year's Conference, the Fifteenth, you had a session dealing with "Overall State Water Planning."

You will remember the talks, by Mr. Carl Slingerland of the Interstate Stream Commission and by Professor George R. Dawson of New Mexico State University. Mr. Slingerland described how the State Planning Office had authorized the Offices of the State Engineer -- Steve Reynolds (remember Mr. Reynolds' paper at the 13th Conference in 1968?) -- and the Interstate Stream Commission to plan for the water and related land resources. Mr. Slingerland continued that in 1967 the U. S. Bureau of Reclamation was requested to re-orient its studies of the Rio Grande and Pecos River Basins in New Mexico toward a State-wide approach to water-resource development (Proceedings of the 15th Annual New Mexico Water Conference, 1970, p. 102). The Bureau's New Mexico Basins Project (State Water Plan) was visualized as including four steps:

1. Inventory the natural resources and determine the current state of their development and use. This had been completed for water, Mr. Slingerland reported, by the two State agencies.
2. Develop projections of population distribution and economic activities, at mileposts 1980, 2000, and 2020.
3. Determine ways in which projected water requirements can be met with supplies currently available under existing interstate agreements and court decrees.
4. Determine the prospects for (A) importation of water (B) weather modifications, and (C) desalting.

No. 1, Mr. Slingerland told you, the inventory, had already been completed by the time of last year's conference, and the rest were well along toward completion of the report, which is scheduled in Fiscal Year 1973.

The other talk by Professor Dawson, focused on the real problem of preparing a "plan". He stated (p. 107) that "Our basic conflict arises out of not being able to specify our common objectives in resource allocation" -- particularly the social and economic objectives of a State Water Plan, and how they should be determined. He sagely noted that our plans have been mainly short-run ones, heavily influenced by political factors such as a four-year term of office. Professor Dawson selected the issue of "mining" of underground water as illustrating short-term objectives that are out of tune with desired social and economic goals in the long run.

I would say that this is one of the most important problems facing the people of the State of New Mexico -- the development of a State water policy and a State water plan that will identify goals and objectives first, and then go into the elements of what is normally considered a State water plan -- planning the physical structures and processes that will make the water available where and when it is needed.

As an illustration of what I mean, let us take a look at my State, Washington. Last summer, the State of Washington Water Research Center prepared a report entitled "A Water Planning Concept for the State of Washington" (Report No. 6) at the request of the Washington Department of Ecology. We considered four categories of goals or objectives: (1) net State income, (2) Environmental, (3) Regional, and (4) General well being. In doing so, we examined desirable characteristics of water planning, organization and procedure, recommendations for immediate action in developing a State Water Plan, and implementation of water planning.

We noted that, in the past, much of the resource planning and development that affects the people and the environment within the State of Washington had been done without reference to State policy and goals. We pointed out that one cannot establish objectives clearly in advance without evaluating their consequences, and that one must lay out alternatives toward achieving an objective before we really understand what that objective means. We emphasized the fact that much resource planning has been based on the assumption that ultimate solutions to our problems are technological, whereas actually, more permanent solutions are in general socially oriented.

We identified one of our major needs as being that of including the public in the planning process at every turn, for without public support the plan will fail.

And, we questioned the validity of long-range forecasts and therefore of planning based on those forecasts. You will recall the newspaper headline last November 29, "Slower Rate of Growth Projected for California." Subsequent news items told us that California may not need new dams for 20 years, according to a revised assessment from the California Department of Water Resources, which is said to have reported that projects already authorized will provide enough water to meet the demand until 1990.

A few years ago the State of Washington Water Research Center prepared an inventory of the State's water resources and made projections of our water needs at mileposts 1980, 2020, and 2065. Our neighbor, Oregon, published last year its estimate of Oregon's water needs at milepost 2070, and Idaho is currently preparing estimates for 1980, 2000, 2020, and 2070. The first national assessment of the Federal Water Resources Council likewise made projections to 1980, 2000, and 2020. We in Washington recognized that our 2065 projection was less solid than ours for 2020, and that the 1980 projection was best of all. The California experience just cited shows that our concern is well justified.

We in the State of Washington have identified two categories of water-research studies that we feel should be undertaken -- broad-gage and specific. Some in the broad-gage categories that would apply equally to New Mexico, it seems to me, include:

1. Regional policy guidelines, an extension of State Water Policy
2. Changes in land-use patterns -- for example, urbanization
3. Relationship of attitudes of people to success in implementation of water-planning and water-management decisions
4. Public awareness and communication between conflicting users
5. Relations between the State's lead water agency and other State agencies having an interest in water
6. Impact of the Bureau of Reclamation's Westwide Water Study on the State
7. Interstate and International problems
8. Interbasin water transfers -- within the State as well as from the outside -- considering both economic efficiency as well as engineering aspects
9. Exchange of information between the Universities, the State agencies, the State legislators, and the people
10. Two-State studies of a shared water resource such as a groundwater basin.

Those were the broad-gage ones. Now for the specific ones. Specific problems are numerous. Some that occur to me (and you can think of many more) are:

1. Use and re-use of water of poorer quality
2. Recreation and aesthetics
3. Sociological concerns -- people decisions
4. Shorelines of streams and lakes
5. Water quality of lakes
6. Irrigation potential in relation to changing land use
7. Instream uses of water -- the waste-assimilation properties
8. Integrated ground-water and surface-water management

Now, you may not agree with me that all of these eight are actually problems in New Mexico. You may feel that they are no longer problems because studies have already been made. However, at the risk of subjecting myself to criticism because I am asking for more studies and re-studies, let me remind you once again that our water problems are dynamic ones, and are changing as our demands and technology change. So I think we had better take another look at these items.

Finally, let's take another tack, with a brief look at current legislation and its effect on solving some of these problems that we have been discussing.

Current Legislation

In looking back over last year, we saw that the major emphasis in Federal water legislation was in the water quality, or pollution field. With the large hue and cry these days about our despoiling the environment, I certainly do not see any change in this emphasis. As an aside, you will recall that the Water Pollution Control authorization expires next June 30, and that legislation renewing it did not get through the Congress last year. I would guess that the authorization will not only be extended beyond next June, but that it will provide for more rigorous enforcement of pollution standards.

We who are seeking answers to water problems -- and that includes all of us who are here today -- should be interested in the fact that legislation was introduced last year in both the House and the Senate, to expand the authorization of the Water Resources Research Act under Title I. Several bills were introduced in the House (H.R. 15957 by Robison of New York; H. R. 16274 by Morse of Massachusetts; H. R. 16279 by Burton of Utah and Saylor of Pennsylvania; H. R. 16285 by Johnson of California) and in the Senate S.3553 by Moss of Utah and S.3721 by Hansen of Wyoming), which would have increased the annual allotment to the 51 University Water Research Centers in each State and Puerto Rico, from \$100,000 to \$250,000. This increase in funds would have permitted additional worthwhile research to be conducted on critical water problems, and it would have

provided for a much better system of communicating these research results to the users -- governmental agencies, industry, and the public. Hearings were held in the Senate, and S.3553 (the Moss bill) was reported out with two major changes -- (1) the new allotment figure was lowered to \$200,000, which is still double the present \$100,000, and (2) a new section was incorporated in the bill (from Senator Bible's S.1051) to add the District of Columbia and the territories of the Virgin Islands and Guam to the 51 Centers already funded. The Senate passed the amended bill, but because the House Committee did not hold hearings on the legislation, it expired with the 91st Congress on January 2, 1971.

The legislation has been re-introduced in the new Congress by Congressman Johnson of California (H.R. 1400 on January 25), Senator Hansen of Wyoming (S.121 on January 26), Senators Moss of Utah and Hatfield of Oregon (S.219 on January 26), Congressman Morse of Massachusetts (H.R. 3835 on February 8), and Congressman Robison of New York (H.R. 5413 on March 2). We anticipate that hearings will be held in both houses of the Congress this time, and that a thorough review of the total program of the Water Resources Research Act of 1964 will be conducted. Such a review is welcome after six years of life of the program, with which New Mexico's Senator Anderson and Washington's Senator Jackson have been so thoroughly identified. Your State Water Resources Research Institute, under Ralph Stucky, is in the process of preparing material for the hearing.

The other area of legislation, besides water pollution control and water research, is land-use planning. Last year Senator Jackson proposed S. 3554, to establish a national policy regarding land-use planning and management; it was, he said, a "working draft," for comment, review, and analysis. This legislation would provide \$50 million annually to develop and implement Statewide land-use plans. In 1970 only Hawaii had such a plan, although Colorado was in the process of developing one at mid-year.

The legislation provided, within three years, for an inventory of land areas and the development of comprehensive land-use plans. A year later each State must have authorized a planning agency to implement such a plan; this authority would include the power to acquire land, to control the kind of development according to area specified, and to ensure full public participation by conducting public hearings. Each State would have to comply with certain minimum standards before it could qualify for the grant-in-aid. Failure of a State to adopt an acceptable plan within four years would result in a reduction of Federal assistance to that State by as much as 20 percent per year until it did comply.

The Act would create a Federal Land and Water Resources Planning Council headed by the Secretary of the Interior; it was drafted as an amendment to the Water Resources Planning Act of 1965, said Senator Jackson, because the Federal Water Resources Council already administers similar programs concerning the use of water and related land resources.

Jackson stated that one of the Federal Government's basic problems was lack of coordination among Federal agencies that pursue separate single-purpose missions such as highway building, dam construction, and urban renewal. Thus, confrontations have pitted proponents of highways against parks, dams against wild rivers, open beaches against development, industry against scenery, and commerce against wilderness.

This legislation was reported out by the Senate Committee but died with the 91st Congress; Senator Jackson has re-introduced it in the new Congress as S.632. Congressman Aspinall, Chairman of the House Committee, stated last June (Congressional Quarterly Weekly Report, June 5, 1970, p. 1502) that his panel would wait until the Public Land Law Review Commission Report was available before holding any hearings. The PLLRC Report was published in mid 1970, and Congressman Aspinall introduced his bill, H.R.4332, on February 17 of this year.

Also, last August President Nixon urged a National land-use policy in his State-of-the-Environment address, and the administration has just introduced a package of legislation that includes land-use planning and coastal management.

I don't have to tell you how important this matter of land-use planning is to water people. The problem of the interrelations between water development or preservation, and other natural resources is a most significant one, and we should consider it as one deserving of our utmost attention.

Conclusion

Well, what have we said during the past 25 minutes or so?

1. Pollution is an important water problem, but there are others.
2. Water problems are intertwined with problems of other natural resources.

We have many technological problems, but more severe is the problem of decision-making. Why? Because decisions are made by people, and people are notoriously mercurial. (That word, you know, has a double meaning these days -- as a pollutant or, as Webster says, having "rapid and unpredictable changeableness of mood.") Therefore one of our problems is the decision-making process -- and the legal, and the political, and the economic framework in which those decisions are reached.

In order to provide a framework for good decision-making we must establish a policy, and plan for the wise management of the resource. Only in this way can goals and objectives be examined and changed, because the planning process, you'll recall, is a dynamic, changing one. Re-evaluation of the management plan, with continual participation by the public, is a must.

We are beset by problems. But the situation is no different today than it has been for the past 15 years, as you have met in your annual New Mexico Water Conference and discussed water problems and their solutions.

Geologist A. C. Lane challenged us half a century ago with the statement, "The larger the area of our knowledge, the greater the circumference of our ignorance."

Think about that for a minute. The unknown just beyond the periphery of what is known, is exciting to contemplate.

And Alfred North Whitehead consoled us a little when he said, "It is the business of the future to be dangerous."

If you add those two remarks together, you can see that we have some challenging

times ahead of us, both in New Mexico and in the State of Washington. And there, Ladies and Gentlemen, is the challenge.

The Time Is Now!