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Will There be a Tomorrow?

Throughout our national history the people of the United States have recklessly exploited land and water resources as though there would never be a tomorrow. Of course there will always be a tomorrow for the planet Earth, but the future welfare of its inhabitants is by no means assured. All of us have seen with awe and wonder the view of the earth from space, recorded photographically from orbital vehicles. It is a beautiful planet, viewed from a distance of a few hundred or a few thousand miles. Even on much closer inspection, traveling around the world by airplane at an altitude of 30,000 to 40,000 feet, the spectacle, in general, is one of beauty and grandeur. Vast expanses of Canada, South America, Africa, and Siberia seem to be virtually unmarked by the hand of man. Only the great urban carcinomas mar the view, and at night even these are beautiful, like many-colored ornaments on continental Christmas trees.

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The closer we approach the surface, however, the less pretty becomes the spectacle. Factories pour rivers of smoke into the atmosphere; cities are sometimes obscured beneath their own smog; erosion scars the landscape; junk-heaps --wasted natural resources-- lie everywhere; rivers run turgid with sediment and waste products.

Traditionally, it has been a common assumption that human damage to the earth is only cosmetic and that only cosmetic treatment is necessary to repair the damage. However, ecologists have shown us that the trouble runs deep. All of us have heard or read about the ecological impacts of herbicides, pesticides, "hard" detergents, other chemicals, sewage and waste in general. Undoubtedly we will hear more about these from other speakers in this seminar. It is or should be obvious that we have more than a cosmetic problem, and it will need more than cosmetic treatment.

Where Do We Stand Today?

It is fashionable nowadays for planners and their advisors to try to foresee human situations and needs far in the future. For the Arkansas-White-Red River basins some projections extend as far ahead as 100 years. Projection is the proper word, because prediction is impossible. The planners assume that past and current phenomena such as growth in population and water demand will continue to accelerate, and they project these acceleration curves into the future. Planners themselves recognize the limitations in this procedure, but they have been unable to develop alternatives. During recent decades many projections for periods as short as 10 years have turned out to be significantly erroneous. This is a serious matter, because people in the future will have to cope with the unforeseeable conditions that actually arise, rather than with those anticipated.

The current concern with very long-range plans is, of course, a reaction to the harmful effects of short-sighted exploitation of resources in the past and lack of rational planning. We and the environment are now in part, at least, the victims of what has been called "the tyranny of small decisions" --small choices, taken independently of each other, which seemed insignificant by themselves but which, taken all together, created major problems. It is necessary, however, to avoid creating an opposite extreme-- a tyranny of large decisions. We have no right, it seems to me, to commit our descendants three generations hence to the kind of world we think they should live in. I believe in the opposite of the Golden Rule: Don't do unto others as you would have them do unto you; their tastes may be different. We have already proved that we are incapable of dealing effectively with the problems of today, let alone those of 50 to 100 years hence.

The meaning of "long-range planning" needs clarification. It is not, or should not be, a crystallized schedule of actions from here on out. Rather, it should consist of two parts, strategy and tactics. Strategy defines the long-range goal. Tactics are the means for achieving that goal. Tactics must be flexible so that they can change as situations change. Above and before strategy however, an overall policy and declaration of principle is necessary. The Nation has never had a generally understood or accepted national policy about water, land or the total environment. Encouraging progress toward these has occurred, however, in recent years, one of the more recent being the National Environmental Quality Act of 1969. This and much other recent legislation tacitly or openly acknowledge that many development activities have been misguided and harmful. The full extent and nature of the harm have never been assessed, but the legislation calls for prevention and elimination of damage. This means effective management. Management requires, among other things:

1. Broad knowledge of the physical and biological aspects of the environment;

2. Clear understanding of the interrelations among these aspects;

3. Planning to achieve short-term needs without foreclosing opportunities for alternative actions that may become desirable in the future -- that is, to retain flexibility for future action and decision;

4. Definitive action toward chosen ends;

5. Operation;

6. Continual environmental monitoring to evaluate the impact of actions and operations;

7. Assimilation of monitoring information as an aid to continued planning to meet changing situations and resource demands.

In other words planning should be a continuous process and management should be responsive to it.

Land and water are two basic elements of the landscape. Nearly everyone recognizes that we have already done considerable damage to the landscape. Some of the more obvious damages can be related directly to obvious causes. Highway and urban construction, for example, accelerate erosion and sediment transport. Concerning the landscape and the environment as a whole, however, we have no systematic information, either qualitative of quantitative, on what it is like, in what ways it is changing, and at what rates. Most environmental monitoring programs now extant --Federal, State and local-- relate to special purposes but not to each other, and they leave many gaps. Few comparative studies have been made, and no overall evaluation of the environment exists or is in progress. Land and water cannot be effectively managed without knowledge of what they were like originally, what they are like now, and what they can or may be like in the future.

Water Supply and Use

The water budget for the Nation consists of income (precipitation) minus expenditures (evaporation and runoff). Income, based on an estimated average precipitation rate of 30 inches over the 48 conterminous states, is 1,430 mi^3 (cubic miles) of water. Evaporation, averaged as 21 inches, is 1,020 mi^3. Runoff, according to a recent estimate, is about 410 mi^3, including a small amount of submarine discharge of ground water directly into the sea.

Continental runoff to the sea is a residual -- unconsumed water. We must keep clear the distinction between water used and water consumed. A consuming use of water is one that turns it to vapor or incorporates it in a product, so that it is not available for reuse. Total water use includes all water diverted from streams or pumped from underground, including that not consumed. This is commonly called withdrawal use of water. In the conterminous United States in 1965, the latest year for which national data are available (Murray, 1965), total withdrawal use of water was somewhat more than 100 mi^3, or about 25 percent of the theoretically available supply. However, only about 25 mi^3 was consumed -- about a fourth of the amount withdrawn and only about 6 percent of the available supply.

These data, simple though they may be, are important. (a) In some areas of scarce water or intensive use, water is reused several to many times. (b) In areas of abundant supply or less intensive use, most of the available water is not used at all, except for the non-consuming and non-deteriorating purposes of recreation, power generation and navigation. (c) Nearly all runoff water that reaches the sea is polluted to some degree. Thus the chief current function of more than 90 percent of our water is to carry waste off the continent and into the sea. We are still following the primitive notions that a river is a free natural sewer, and that the world ocean is a limitless sink.

In view of the facts, it is not credible that water itself is a problem, or that water itself can solve any important problem. In many areas, including the relatively well-watered Arkansas-White-Red River basin, the so-called water problems are actually problems of water management. Fundamentally, therefore, they are economic and social problems: availability of funds and effort, and a willingness to apply them in this area.

Land Supply and Use

The total area of the 48 conterminous States is about 2,971,500 mi^2 (square miles). According to data published last year (Stamp, 1969, p. 10), about 156,000 mi^2 of land in the 48 States that were formerly cultivated have been taken out of cultivation because of severe erosion; another 440,625 mi^2 of crop and grazing land have been seriously affected by erosion; and about 1,210,937 mi^2 have been moderately eroded. Thus, nearly 1,808,000 mi^2, or about 60 percent of the land area is more or less seriously affected by erosion. The total land area in farms is about 1,750,000 mi^2, so obviously much farm land is the culprit in erosion.

Turning specifically to the basins we are considering here -- the Arkansas-White-Red -- the situation is worse than in the nation as a whole. Reportedly, by bank erosion the Red River below Denison Dam removes about 3,000 acres per year of some of the best farm lands in the basin. The Red River at its mouth near Simmesport, Louisiana, annually discharges about 40 million tons of suspended solids, equivalent to about 33,300,000 yds^3 (cubic yards) of sediment. About 88 percent of the basin (16,559,800 acres) has problems of erosion, shallow or poor soil, or waterlogging. Among these, erosion is the principal problem.

Land problems in the White River basin seem to be less acute. The basin includes about 27,765 mi^2, of which about 5,360 mi^2 (19 percent) is too wet for good farm land. Less than 20 mi^2 are critical producers of sediment, but about 5,300 mi^2 of cropland need soil treatment and improved management and 6,300 mi^2 of rangeland need treatment and improved management. About 230 mi of roadside need treatment to reduce erosion. In short, about 11,500 mi^2 of land, or about 41 percent of the basin is in unsatisfactory condition.

I have not attempted to compile similar data for the whole AWR basin, which includes about 282,000 mi^2. On a comparative basis it seems likely that 75 percent of the area has problems of waterlogging, erosion, ineffective land management, or deteriorated soil. The term, problem, is here used rather loosely. Waterlogging, for example, is a problem to those who want to drain and farm the land. However, drainage and farming would be a problem to those who want to preserve the wetlands for wild-fowl habitat.

Underdeveloped Resources

Development of resources, as traditionally practiced in the United States, has been largely a process of exploitation rather than of rational management. The unsatisfactory nature of our approach to resource development has long been recognized at Federal and State levels, but it has not been widely publicized until recent years.

Based on the land and water data presented above, and on the emerging modern concepts of management, land and water are our most widely exploited but least developed natural resources. In the AWR basins, where average annual rainfall is far above the national average, the supplies of land and water are tremendous and many other resources are abundant. The area is suitable for a diversified economy based on agriculture, mining and industry.

Technology and the Future

The long-distance canal or aqueduct, the high dam and the huge reservoir have become status symbols in all countries today. They are tangible symbols of technology, and the misconception is widespread that technological manipulation of the environment can solve all problems. Deleterious effects arise from some projects but, rather than foreseeing them we traditionally have waited till after the effects have occurred, feeling secure in the faith that technology will remedy any unfavorable situation that arises. Commonly the remedies entail vast expense which, if foreseen and evaluated, might have given a project an unfavorable benefit/cost ratio.

Following construction, marked downstream channel changes occurred below Hoover Dam on the Colorado River, Fort Peck Dam on the Missouri, Denison Dam on the Red River (Leopold and Maddock, 1954, p. 148), and many others. Unfavorable downstream effects have been recognized for many years as a probable result of construction. But so little scientific study of case histories has been made that the magnitude and importance of downstream changes has seldom been foreseen. Therefore, measures to prevent or reduce damages are not included in most project plans. In many cases, corrective measures have been very expensive.

Large reservoirs commonly trap 95 to 99 percent of the sediment that previously passed through the reach impounded by the dam. Release of clear water from the dam and change of the flow regimen leads to downstream erosion and other effects. During 1942-48, for example, the Red River below Denison Dam lowered its bed an average of 1.63 feet. Sixteen years after closure of the dam, about 35,000 acre-feet of sediment had been removed from a 100-mile reach of the river below the dam (Leopold, Wolman, and Miller, 1964, p. 454-455). In general, the amount of sand deposited behind a reservoir is about equal to the amount eroded from the channel below the dam.

It is not implied that the structures mentioned should not have been built. It is an inescapable fact, however, that any modification of streamflow or of a river channel has far reaching consequence -- physical, ecological, social, and economic. These should be foreseen, evaluated and provided for.

Conclusions

Planning reports by various agencies for the AWR basins include a bewildering array of facts, inferences, conclusions, and proposals. No single individual could hope to evaluate these studies, but one can evaluate the approach taken by the Committees for the more recent comprehensive basin reports. In most respects the reports are traditional: they propose to use traditional types of data as a basis for doing more of the same sorts of things we have always done, but on a larger or more comprehensive scale.

Nothing is either good or bad merely because it is traditional, but the current condition of the environment is ample evidence that some innovations are needed. It is encouraging to note that the comprehensive studies of the AWR basins recognize the need for flexibility in planning so that plans can be altered when necessary or desirable.

The reports were prepared too early to be impregnated with the currently fashionable word, environment. Concern with the total environment is, of course, appropriate and long overdue. It is important, however, not merely to jump on the catch-phrase bandwagon, but to develop a program that actually deals with the total environment. The AWR basins area holds some golden opportunities to do this. Agencies at all levels of government --Federal, State, and local-- have learned to work together and with private interests here better than in most parts of the Nation.

Seminars such as this one are a means for accomplishing a second necessity, which is to involve the individual citizen and citizen-action groups. In the final analysis, what is done with and to the environment depends largely on how people think of themselves in relation to things around them. All citizens should become involved in the thinking. It is not sufficient to leave the citizen-action to organized conservation groups, because some of these are as badly biased in one direction as the indiscriminate developers are in the other. Eventually a sane compromise must be reached. All resources are subject to conservation. But resource conservation goes far beyond creation of national monuments and parks, wilderness areas and so-called wild rivers. Natural resources are the base for economic development and they will be used. Therefore, conservation should be concerned with the protection of resources during the process of their use.

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