

## SOCIOLOGICAL ASPECTS OF WATER DEVELOPMENT<sup>1</sup>

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**ABSTRACT.** Decisions to develop water resources systems so far have been primarily taken on the basis of engineering and economic feasibilities. Very rarely, if ever, sociological feasibility has been considered, except in a very broad sense. Planning is for the people, and it should improve the quality of life. Hence, it is argued that water resources decisions ought to be primarily social ones, and that the success or failure of any resource development should not only be judged by its techno-economic excellence but also by its impact on people.

Water resources planning process is discussed, and the difficulties associated with the evaluation of sociological feasibility of projects are enumerated. The social consequences of water development projects are traced through planning, construction, operation and management impacts. Finally, it is suggested that the foremost factor in the success of any water management program is the public understanding and acceptance of that program.

(KEY WORDS: social aspects of water planning and management; planning process; public involvement)

### INTRODUCTION

Appreciation of the importance of the sociological consequences of water resources planning and management is of comparatively recent origin. This is not surprising as, in the past, the decisions to develop water resource systems were primarily based on economic and technologic feasibilities. However, during the past decade or so, it has become increasingly obvious to water resources planners that this simplistic procedure is no longer adequate. Rising public concern clearly indicates the need for in-depth studies to evaluate the sociological consequences of proposed water development projects. This, however, is just. After all, planning is for people and it should improve the quality of life. Thus, it can be logically argued that water resources decisions ought to be primarily social ones, and that the success or failure of any resource development should not only be judged by its techno-economic excellence but also by its impact on the people since it is the people who use and misuse the water and who, as consumers and taxpayers, pay for the development and conservation costs [Biswas and Reynolds, 1970]. Thus, planners should ask more searching questions about the developments, not only in terms of the usual benefit-cost ratios but also in terms of how the lives and attitudes of people may be affected.

Unfortunately, research on the evaluation and the assessment of the sociological consequences of planning, development and management of water resources (or any other natural resource for that matter) has long been sadly neglected. For example, in 1966, the Battelle Memorial Institute of Columbus, Ohio, prepared a comprehensive bibliography on the *Socio-Economic Aspects of Water Resource* [Hamilton *et al.*, 1966] at the request of the U.S.

<sup>1</sup>Paper No. 71100 of the *Water Resources Bulletin* (Journal of the American Water Resources Association). Discussions are open until June 1, 1972.

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Department of the Interior. The bibliography covered the period 1955 to 1965, and had some 700 entries. However, under the classification of *social aspects*, it had exactly 18 entries, i.e., only 2 per cent of the total. When a comprehensive bibliography, prepared specifically on the social and economic aspects contains only 2 per cent of its total entries on social aspects, it does indicate a rather sad state of affairs. In a recent paper, Biswas and Chatterjee [1971] have discussed in considerable detail the reasons for this neglect, and have put forward some suggestions to overcome this shortcoming.

### THE PLANNING PROCESS

The fundamental goal for planning of water resource developments, in common with other natural resources developments, should be the enhancement of the general welfare of the nation's people. Achievement of this objective would necessitate the determination of the goals of a nation as a whole, as well as their relative priorities [Hufschmidt, 1968]. One would then have to further decide how water resource development and management can best help achieve these goals, what should be water resource development objectives, and what policies should be formulated in attempting to achieve these objectives.

Broadly speaking, the national objectives can be divided into what might be described as traditional economic and social-political categories. These two categories, however, are closely interrelated. The economic objectives, in general, would provide criteria for resource allocation and investment planning whereas social-political objectives provide the environment within which planning has to proceed. The national economic objectives would include economic growth (increase in Gross National Product, increase in per capita income, favorable balance of trade and foreign exchange position), proper income redistribution (among various social groups or among different sectors of the economy), and full employment. The social-political objectives could be the greatest possible personal freedom, equality of opportunity, reduction of human strife, justice and improvement of the environment we live in.

These goals, however, are not specific enough to be of great use to the water resources planners, and as such the use of fundamental objectives, against which major policy questions of water resource development and management can be tested, may lead to an intangible wilderness. Thus, currently, the planners translate the goals into a set of specific economic criteria which gives rise to a multi-part objective function which is then maximized for economic efficiency. The use of economic criteria is a matter of expediency, as they are tangible and quantifiable, in contradistinction to social-political elements which are, in general, intangible and nonquantifiable. Generally, the objective function is multi-dimensional, and the goals are not mutually exclusive—in fact, often conflicting. Thus, it is not possible to have the best of all the goals; priorities would have to be assigned.

The next more important question is that of decision-making. The roots of the current approach to public decision-making are micro-economics, welfare economics, and quantitative decision theory, and the methods available are cost-effectiveness analysis, operations research and systems analysis and program budgeting. The planners do not make the final decision, nor do they pass legislative actions. In fact, water resources planning, project authorization, and its funding are all essentially political processes. The planners do, however, point out the cost-effectiveness of the various alternative courses of action as well as their social and technical feasibilities, and this information helps the policy-makers to arrive at responsible decisions. Decision-making, to a great extent, is much of an economic process where every decision may be considered as an allocation of resource between alternatives [Biswas and Reynolds, 1969; Biswas, 1971]. Oftentimes, the planners are rather handicapped by the absence of clearcut

directives from policy-makers about objectives and planning criteria, and the process is further complicated by the consideration of intangible and indirect values in which society is interested, but which have never been adequately defined.

Thus, even though benefit-cost analyses have become an integral part of resource planning for a considerable period of time, social and environmental assessments have played a secondary role so far in the formal planning process. The reasons for this are many. At the present state-of-the-art, there is a lack of general methodology to identify and evaluate the potential social and environmental consequences of water developments, and also there is no common unit of measurements as in economics (i.e., dollars). Data are lacking, and whatever available are often rough estimates. Hence, social and environmental changes of water developments tend to be qualitative rather than quantitative in nature. Besides, the existing machinery for making socio-environmental decisions is rather inadequate, and few explicit criteria are available by which the decisions made can be judged or evaluated. Hines [1967] suggests another reason:

... agencies planning highways or dams are compelled to adopt a single-purpose approach, generally ignoring other considerations except when they are forced upon them by an aroused public. For the agency to do otherwise—for example, to admit the economic and aesthetic loss that results from the destruction of wilderness—is to weaken the case for the agency's projects, to reduce the number of projects that can be undertaken by the agency.

In spite of these difficulties, it is possible for the planner to minimize the possible adverse effects, even though the adverse consequences can be forecasted only in general terms.

It is suggested that the techno-economic analyses are not enough for proper decision-making. Most technological designs are based on the explicit or implicit assumption that they are closed systems which can be "fully described by the technological inner constraints and marked by clear boundaries decoupling the systems from other parts of the environment" [Hertz, 1970]. On the other hand, dollar values frequently tend to unfairly dominate the economic analyses [Hutchison, 1969]. Rickover [1967] suggests that:

Cost effectiveness suffers from a philosophical weakness. It holds that one factor—the economic—is fundamental, and that all other factors—the social, cultural and political—are derivative. This is a fallacy known to students of philosophy as the fallacy of reductionism; it reduces the complexity of reality to one of its elements, and offers that one is sufficient reason for the whole.

Since society and culture are considerably influenced by the physical environmental conditions, social analyses and forecasting should play a major role in any water resources development decision-making process.

## SOCIAL CONSEQUENCES

Although water resources development programs are generally planned carefully and extensively, this planning proceeds from the perspective of the planners in which individual social consequences are not anticipated. Thus, the aggregate of the many individual and unanticipated effects may often lead to results that are completely unexpected by the planners.

Generally, the socio-cultural complex of the project area changes along with the various stages of resource development—planning, implementation and operation and management. It is possible that some projects may seem to escape the socio-cultural effects at the initial stages, but it is bound to be affected in the long run. For example, Zimmerman and Russel [1967], in their study on the Missouri River, suggested that the unanticipated social consequences will probably have more of an impact on the local culture than the consequences that can be

identified at present. He further suggested that similar unanticipated developments probably occurred at TVA, and are underway due to the construction of the Aswan Dam on the River Nile. In the case of the Aswan, it is now obvious that the dam, built primarily to generate hydro power, has also reduced the fish population in the Mediterranean Sea. This is because the aquatic food chain in the eastern Mediterranean has been abruptly broken. Planktons and organic carbons have been reduced by about two-thirds because of lack of the Nile sediments. It has, in turn, substantially reduced sardine, scombroid and crustacean population of the area. Erosion has become a major problem, and the fertility of the Nile Valley has been lowered because of the lack of sediments. Already some of Egypt's six million cultivated acres need artificial fertilizer, and it is anticipated that the rest will need it in the near future. Salinity in the Middle and Upper Egypt is increasing rapidly, and some agronomists have predicted that it would take over a billion dollars to rectify the situation. Moreover, the population of aquatic snails that carry bilharzia parasites have increased enormously. One recent report states that "one out of two Egyptians now has it; one out of every 10 deaths in the country is caused by it; and where the canals have just come, the snails are quick to follow, the infection rate of bilharziasis has shot up from 0 to 80%" [Sterling, 1971]. Thus, the unanticipated social costs of the Aswan Dam have been considerable. Many similar cases in Asia, Africa and South America can be cited where dams constructed for irrigation, had to pay heavy prices in terms of the overall health of the region (schistosomiasis) that was supposed to benefit from them. In all fairness, however, it should be pointed out that the planners have been fairly successful in predicting several possible social costs, if not all, and have often taken necessary countermeasures.

*Planning impacts.* Even during the early phases of planning of water resources development projects, considerable social forces are put into motion. Public announcement of possible planning, feasibility studies or public hearing, immediately initiates formation or further intensification of interest groups and acceleration of political activities—not only in the designated or expected development areas but also in areas which may be marginally affected or implicated. Possible relocation of the people that may be affected becomes a sensitive issue, and often the land speculators tend to move in for a quick killing. Increasing land prices and the resultant land transactions often force some people, generally the disadvantaged—the poor and the elderly—out of the project area. Lack of precise information as to the location and timing of the development further complicates the problem.

*Construction impacts.* Once a development project has been officially authorized, the construction phase begins. Since water resources developments frequently require heavy construction for dams, spillways, diversion works, etc., it creates new employment opportunities in varying numbers. New workers of different categories move into the area in increasing numbers, and it creates more social problems for the host community. Rents and house prices start escalating, and often affect the lives of the local people, especially those who are in the lower socio-economic strata who find it increasingly difficult to obtain suitable accommodation. The immigrant workers, in these days of excellent transport facilities and mobile-home trailers, tend to bring in their families with them, expecting "all the comforts of home"—i.e., schools for their children, adequate community services and facilities, water and sewer services, etc. It strains the available facilities and resources of the area to the limit, and often creates friction between the natives and the transient workers. It can be said that the effect of the influx of the transient workers on the area will be dependent on the size of the host community. A large city can reasonably accommodate a substantial number of migrant workers without any apparent strain whereas a small town will be in considerable difficulties. However, since most of the heavy constructions involved with water developments are generally in

remote areas having small towns and communities, the social problems tend to be accentuated by the sudden arrival of the transient workers.

A typical example will be the case of Duchesne, Utah, which is about three miles from the Starvation Dam. With the heavy influx of construction workers into the town, the school system became overtaxed and inadequate. Special bond issues had to be passed to enlarge the existing water supply and sewage facilities. Several similar experiences can be cited for the development areas for many dams in North America.

The example of Page, Arizona, is somewhat different. It was a new town that was built for the construction and operation of the Glen Canyon Dam. The Navajo Indians used to live all over the project area. The new town was built in one of the most remote parts of the Indian Reservation. Advent of the construction workers, and development of modern facilities like schools, hospital, supermarkets and theater within short driving distances changed the whole way of life of the Indians.

Planning and construction impacts also affect the cultural aspects of the locality. In remote areas, farmers, loggers or trappers want to preserve their traditional way of life. The sleepy town which they dearly love, and where they grew up and where they would like to have their children grow up, almost disappears overnight. They feel threatened by this externally imposed force, and justifiably so. With the decline of the influence of the traditional culture and increasing evidence of the power of the almighty dollar, new social stresses and strains become evident.

*Operation and management impacts.* Toward the end of the construction phase, most of the activities in connection with the development work rapidly come to a conclusion. The transient workers begin to leave, and unemployment often becomes a serious problem. During this process of upheaval and realignment, the community generally loses some of its native younger work force. Often the city fathers are in a bind because of over-planning and over-designing. However, when the construction of the dam is over, the lake upstream begins to fill, and new sets of social forces are put into motion. Since water is a major focal point for recreation and the average North American family is more mobile than ever, the communities prepare for the arrival of the tourists. The recreational activities of our affluent society stimulate the economic potential of tourist areas. New hotels, motels, restaurants, service stations and marina spring up near the lake. However, during the early years of operation, the recreational benefits tend to be lower than anticipated, and it leads on to some repercussions on the blue-collar workers.

As the tourists start using the lake for recreation in increasingly large numbers, the socio-cultural complex of communities all around the newly created lake changes substantially. This is in contrast to the construction phase, when social changes tend to be concentrated near the construction site. A typical example is the case of Manila, Utah, on the shore of the Flaming Gorge Lake. This one time isolated mountain town now swarms with tourists in the summer, along with their boats and camping trailers. Since the tourists are there to stay, the old timers were forced to change their way of social life, and whether they preferred the change or not, became a moot question.

The long-term social effects of water resources development can be included in this phase. Oftentimes, as briefly discussed earlier, the social consequences can be quite aggravating. An example could be the deterioration of the life-style in the Peace-Athabasca Delta due to the construction of the Bennett Dam in Canada. It has been claimed that consistent low lake levels have a high probability of adversely and permanently affecting all kinds of fish populations in the area. The spawning areas of walleye and pickerel in the eastern Athabasca basin have now been affected. Consequently, the growing commercial fishing industry on the Lake Athabasca,

currently estimated at \$100,000 per year with potential in Alberta for about \$1.5 million, is now in trouble. With the loss of sport fishing, the recreational potential of the area is obviously diminished. The muskrat population is disappearing, and it has substantially reduced the income of the local inhabitants, in some cases even to zero. Loss of marshy habitat and an increase of willow habitat will reduce the long-range water fowl production. The moose population will probably decrease in the long run as their food sources gradually disappear. All these unfortunate side effects have already seriously affected the people who live in that area—primarily Treaty Indians and Metis. The social as well as the economic dislocation is now considerable, and review of individual cases suggests that severe hardships are now being experienced by many. Admittedly, it is not possible to put a dollar value on the social costs involved, but it needs to be emphasized that the development has caused the local inhabitants to be deprived of their existing livelihood.

### PUBLIC INVOLVEMENT

Most studies indicate that the disregard of people's desires and wishes have generally resulted in the failure of water resource projects in achieving their desired objectives. Hence, it may be said that the evaluation of public attitudes and perceptions is an important part of any planning. It may be one way of humanizing planning. Another way probably is the participatory planning, wherein direct citizen participation in planning and policy making is emphasized. In all these cases, however, a suitable institutional arrangement would have to be developed.

Zeidler [1964] suggests that the critical nature of the present water resources problems can be explained by considering the past neglect and present reluctance of local and state authorities to enforce water pollution control measures. Thus, a panacea to the existing ailment could be an aroused public, with strong motivation "to do something about the problem." He further suggests that a favorable public perception of problems and a desirable attitude toward proposed solutions would depend upon:

- (i) voluntary organization support,
- (ii) political leadership in public opinion education,
- (iii) participation by technical and organizational personnel in properly focussing public attention on relevant issues,
- (iv) interference by the legislature.

Eventually, successful assertion of public opinion would probably be dependent on the degree of public and private involvement in the development of a satisfactory water resources plan that is compatible with the national environmental objectives [Fox, 1969].

A word of caution, however, may be appropriate here. In the context of the fluoridation of water controversy, it may appear that the direct citizen involvement in policy-planning may not be quite appropriate [York, 1969]. Some of the past experiences may suggest that the actual citizen involvement in policy-making may result in an improper and unsatisfactory plan. However, this may not be a correct conclusion. It can be argued that the administrative agencies and the legislatures have better expertise available to assess several alternatives and then select an optimal plan. But, unfortunately, neither the administrative agencies nor the legislatures often represent the local public attitudes and desires. Thus, it is possible that a large section of the public may be left disenchanting by an inconsistent policy. Besides, it may also seriously damage the policy by alienating people's sympathies and support, and could also shatter their confidence in the policy itself.

It may be suggested that the public do participate, perhaps somewhat indirectly, in our

decision-making process. The alternative policies are developed within the bureaucracy, but the final decision is that of the politicians, who are after all the representatives of the people. If the public do not like the decisions, they can always replace their representatives at the next election. Thus, it may be said that the planners are circumventing the established democratic procedures by going directly to the people during the early planning phase. This, however, is not correct. We are suggesting that by involving the people at the initial stages of planning, the planners can come out with more meaningful and relevant alternatives. The final decision-making will still be carried out by the elected representatives within the established democratic framework. During such a process, the probability of a plan being accepted by the people increases greatly. Also, such interactions between the planners and the people will make both better informed, and thus put both sides in better positions to make informed decisions.

In a later paper we will discuss the various methods available to involve and inform the public, and also the procedures to evaluate their attitudes and perceptions.

### CONCLUSION

Since planning is for the people, planners should give more emphasis on the social consequences of water resources development and management. Physical and economic feasibility studies are needed, but equally needed are social and environmental feasibility studies. Finally, the tremendous importance in water resources management of having an informed public supporting a plan must be realized. With increase in population and the resultant further utilization of our natural resources, this importance will become even greater. It should be noted that the foremost factor in the success of a water resources management program is the public understanding and acceptance of that program.

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NOTE: The opinions expressed are those of the authors and not necessarily that of the Department.