WEIGHTING OF CRITICAL SOCIO-ECONOMIC AND PHYSICAL FACTORS IN NATURAL RESOURCE MANAGEMENT

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In an experiment designed to measure the relative importance of various social and physical factors in natural resource management decisions, a selected group of Oklahoma State University students and a group of professional natural resource managers operating at a regional level were interviewed. These samples were then compared to the responses of resource managers operating at a national level. Preliminary results indicated that the factor rankings were quite similar for all three groups of respondents. However, the students appeared to be highly concerned with ecological considerations, while the regional decision makers emphasized current tourism and recreation demand.

In recent years, the populace of the United States has witnessed and participated in an "economic revolution." As per capita gross national product, disposable income, and other welfare indexes have climbed, while the length of the work week has declined, a new concern with environmental preservation and utilization of leisure time has developed. This fact is reflected increasingly in the policy considerations of public and quasi-public agencies.

As a result, the recreation resource manager is faced with a monumental task. He must not only make the "right" decision in terms of traditional politico-economic objectives, but his programs must also incorporate current ecological information and constraints. Furthermore, decisions made at present must include a means for furnishing future managers with sufficient latitude to respond successfully to changing public wants and needs.

The purposes of the present research are three-fold. First, possible future trends in resource management decision making are to be identified. In order to accomplish this objective, a selected group of Oklahoma State University students were asked to rank predetermined social and physical factors which are important in resource management decision making. These students have, by means of course selection, some familiarity with and an interest in the area of resource development.

Secondly, the study is designed to provide a fairly simple structure by which state resource and recreation managers can assess the relative priorities their counterparts place on the various factors which enter into planning and development decisions. To attain this goal, a group of Oklahomans who are presently in the position of making resource management decisions on the regional level were asked to rank the same factors which the students evaluated.

The present research utilizes the methodology employed in an unpublished study conducted by Elwood Shafer, George Moeller, Douglas A. Morrison, and Russell Getty, in which decision makers of four public agencies responsible for generating resource management decisions on a national scale also ranked these factors. The results of the national study were made available through private correspondence with Dr. Shafer. The third purpose follows as a direct result: to compare the relative factor rankings of the three groups of respondents when such comparisons are believed to be meaningful.

METHODS

Social scientists are continually faced with the problem of quantifying seemingly unquantifiable data. One method of coping with this problem was developed by the Military and Space Sciences Department of Honeywell, Inc. (1). This technique makes use of a requirements-oriented "relevance tree" to order critical factors which need to be considered in the decision making process. In this study, the relevance tree technique has been utilized to quantify the relative importance of various social and physical factors which influence a total recreation resource decision, specifically the

development of a typical 400-acre day use (recreation) and overnight use (camping) area, in a rural forested environment.

Social factors pertaining to overall recreation demand were represented by: (a) present recreation demand, (b) similar future demand, (c) changing demand pattern, and (d) technological advances related to demand. Factors representing the influence of tangible and intangible social values were: (a) money available, (b) political influences, (c) pressure groups, and (d) inter-agency coordination. A final factor for other social considerations was included.

Within the set of physical factors, resource accessibility was presented as: (a) ease of access and (b) distance from population centers. Characteristics of the physical resource were: (a) acreage to be developed, (b) buildings and other man-made structures, (c) water resource development opportunities, (d) topography, (e) natural vegetation, (f) fish and wildlife, and (g) uniqueness of the area. Finally, provision was made for consideration of other physical factors.

Interviews were conducted in two stages. In stage one, each respondent chose to consider either social factors or physical factors first. This choice reflected the relative importance attached to the two sets of factors. If physical factors were deemed more important, the respondent was given an interview form, or relevance tree, which listed the ten physical factors down the left-hand margin and the social factors along the top row. If social factors were selected as being more important, the two-dimensional matrix was arranged in the opposite manner. In the final step of stage one, the respondent assigned a weight between zero and one to each of the primary factors in the left-hand margin. A large weight indicated that the respondent attached a high degree of importance to the factor at hand. The sum of the entries in the left-hand margin was required to equal one.

In stage two of the interview, the respondent was asked to assign weights to the remaining factors within the context of each of the primary factors. The sum of these secondary weights in any given row was again required to equal one.

This concluded the active participation of the respondent. The summary calculations appearing in Table 1 were computed as follows: all secondary weights in the row adjacent to a given primary factor were multiplied by the weight assigned that primary factor in stage one. This procedure adjusted all secondary weights so that the grand total of the adjusted weights for all 120 cells equaled one. An average relevance tree for each group of respondents was then computed.

The value associated with any particular factor was determined by summing the elements of the average relevance tree across or down the corresponding row or column. As a result of this computation, the sum of the values of each set of factors, social or physical, equaled one, and a large value indicated a factor of relatively great importance. Finally, the coefficient for each subset of factors was defined as the sum of the values of the individual factors comprising that subset, *e.g.*, the "resource accessibility" coefficients are the sum of the values of the "Ease of access" and "Distance from population center" factors.

RESULTS AND DISCUSSION

The results of the present study are summarized in Table 1. Factors representing the accessibility of the resource were given uniformly high rankings by all groups. Water was considered by all to be the most important physical factor. The value placed on the social factor "Present demand" by the regional group of professional decision makers was markedly higher than that of the other groups. Conversely, the regional group assigned less importance to "Similar future demand," "Changing demand pattern," and "Related technological advances."

One possible interpretation of the regional respondents' evaluations is great concern with current needs for tourism and recreation facilities, and, therefore, less concern with future requirements. Due to a smaller than anticipated response rate, conclusions based on the regional group sample are advanced with some trepidation.

As a result of the manner in which the student interviews were conducted, their response rate was 100%. Therefore, the following conclusions are drawn with greater

TABLE 1. *Relative importance of social and physical factors in natural resource management decisions as evaluated by students and by professional resource managers.*[a]

	National professionals	Students	Regional professionals
SOCIAL FACTORS			
Overall recreation demand	.397	.417	.410
Present demand	.152	.161	.226
Similar future demand	.149	.151	.106
Changing demand pattern	.096	.105	.078
Tangible and intangible social values	.305	.314	.310
Related technological advances	.059	.052	.045
Compatibility with non-recreation uses	.088	.085	.101
Regional economies	.056	.064	.065
Amenities	.102	.113	.098
Internal and external agency pressures	.297	.258	.248
Money available	.106	.098	.102
Political influences	.055	.033	.046
Pressure groups	.051	.057	.038
Interagency coordination	.085	.070	.062
Other	.033	.019	.024
PHYSICAL FACTORS			
Resource accessibility	.239	.213	.298
Ease of access	.128	.093	.172
Distance from population centers	.111	.120	.126
Characteristics of the physical resource	.740	.782	.689
Acreage	.133	.090	.102
Existing man-made structures	.042	.066	.045
Water resources	.161	.170	.178
Topography	.130	.097	.093
Natural vegetation	.099	.112	.087
Fish and wildlife	.075	.140	.076
Uniqueness	.101	.107	.108
Other	.021	.015	.005

[a] Interpretation of "coefficient": the larger the figure, the greater the importance assigned to the factor.

confidence. From a sample of 67 student respondents, 40 chose to evaluate the physical factors first, while 27 selected the social factors as first choice. This selection is significant since the physical factors are more closely identified with current environmental concerns. Incidentally, the national decision makers responding to the original study split about 50-50 in their first choice of a form.

Their evalutions suggest that the students either under-estimate the complexities and pressures of the governmental process or simply do not think these considerations are important compared to the influence of the private sector on the decision-making process. This claim is based upon the relatively small coefficients that students assigned to factors related to the administrative process, *i.e.*, "Money available," "Political influences," and "Interagency coordination."

In contrast to the relative stability of the general response to the set of social factors, there was some variance among the groups as to the importance of the physical factors. When evaluations of these factors by students were ranked and compared with the results of the national study, major differences in evaluation affected the ranks of five of the ten physical factors. In the student response those of increased importance were "Fish and wildlife" and "Natural vegetation," whereas major losers were "Ease of access," "Topography," and "Acreage."

Two broad explanations seem possible. First, the students may be reflecting the Oklahoma experience with such developments and are constraining the decision to include a lake as the focal point. Alternatively, student opinion may be reflecting the new environmental awareness, *i.e.*, concern with ecology and external effects of resource management decisions. While the "experience" hypothesis is logically appealing, the students' environmental concern precludes the total acceptance of it. Further explanation is needed. This is provided by examination of factors which underwent large changes in either rank

order or percentage terms. Factors which the students deemed to be of greater relative importance are largely non-politico-economic, while those of lesser stature are, more generally, associated with existing features of the political (specifically, budgetary) process.

Some clear trends appear to be emerging with respect to environmental concerns, and factors which are now considered to be important may be expected to remain so in the near future. All groups of respondents were more interested in current demand considerations than in the likelihood of the emergence of new demand patterns through revised consumer preferences or revolutionary technological advances. One implication of this tendency to discount the possibility of shifts in demand is that hasty reaction may replace planned response as a resource management policy. Should this occur, efficiency in resource utilization is unlikely to be accomplished.

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REFERENCE

1. M. E. Esch, *Relevance Tree Methodology*, Honeywell, Inc., Boston, 1968.