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A SOCIAL ASSESSMENT OF ALTERNATIVE WATER MANAGEMENT POLICIES IN SOUTHWESTERN KANSAS*

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ABSTRACT

Results of a social assessment of three alternative water management policies proposed as possible solutions to the groundwater depletion problem in southwestern Kansas are presented. The following three alternatives were assessed in terms of their estimated impact on conflict polarization in the area: (1) continue existing water management practices, (2) water demand control through incentives, and (3) water demand control through regulation. A panel of knowledgeable informants made estimates according to a modified Delphi procedure. Results indicate that increased regulation of water demand is the best policy because it reduces conflict polarization more than other alternatives.

The Ogallala aquifer is tapped extensively by farmers in southwestern Kansas for purposes of irrigation [1-4]. Extensive use of the aquifer, coupled with a low level of natural recharge, has led to reduced groundwater levels in the region [4-6]. It has been reported, for instance, that observation wells in several areas of the region have dropped by as much as six feet or more in one year [6; 7, p. 107; 8, p. 273]. Depletion of groundwater levels has led to increased costs for pumping water and to serious reductions in groundwater supplies in some areas of the region [7, 8].

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Since the economy of southwestern Kansas is highly dependent on irrigated agriculture [1; 9, pp. 134, 159], the continued availability of adequate water supplies is important to the economic, social, and political viability of the region. It is also possible that conflicts among diverse water users will arise as groundwater supplies continue to decline over time. In effect, the continued depletion of groundwater supplies in southwestern Kansas has long-term and irreversible consequences for the region as well as the state of Kansas.

Various water management strategies have been proposed as possible solutions to the water depletion problem [7, 8, 10]. In turn, a number of studies have been undertaken to assess the likely impacts associated with various management alternatives (e.g., [11-14]). Little, however, is known about the non-market social impacts of these and related alternatives.

We address this problem by presenting results of an assessment of the likely non-market social impacts associated with three alternative water management strategies that have been discussed as possible ways of dealing with the groundwater depletion problem in southwestern Kansas. A social impact assessment technique developed by Freeman and Frey [15] was used to assess the three water management alternatives.[1] The technique consists of a value based definition of social impacts, and a modified Delphi procedure for estimating social impacts associated with alternative management strategies.

DEFINING SOCIAL IMPACTS

The assessment of alternative water management strategies requires one to determine what is desirable. In other words, one must specify a defensible value criterion for use in the identification and assessment of the likely social impacts associated with alternative policies. Such a criterion provides the basis for distinguishing between desirable and undesirable policies. Unless such a distinction can be made, there is little policy relevance in undertaking an assessment of alternative management strategies.[2]

Freeman and Frey have introduced the idea of "context of choice" to deal with this problem [15]. This notion refers to the choices or activities that are available in a given context. Policies that expand choices are more desirable than policies that reduce choices. The rationale for this criterion is quite simple: the well-being of individuals is enhanced when they have the opportunity to pursue their own preferences.

As Freeman and Frey [15] and others [27] have noted, more choice is not necessarily better. It is, however, reasonable to argue that policies that affect choices in certain ways are more desirable than others. Various criteria can be

[1] For reviews of the state of social impact assessment practice in the United States, see [16-22].

[2] Useful discussions of the value problem are presented in references [23-26].

used to gauge what would happen to the choice context if a management alternative were to be implemented. One such criterion is the structure of social conflict. The key issue is not whether a policy creates conflict, but rather the kind of conflict that is created. Social conflict can be viewed as ranging along a continuum from polarized to cross-cutting. Polarized conflict exists when groups are in disagreement on all important issues. Cross-cutting conflict exists when groups are in disagreement on some issues but in agreement on other issues. Polarized conflict divides groups while cross-cutting conflict knits groups together.

Water management alternatives were assessed in terms of their estimated impact on the structure of social conflict among major activity groups in the region. The more a water management alternative increases polarized conflict between groups the more the context of choice is reduced. Desirable policies are those that are estimated to reduce conflict polarization.

PROCEDURE

Management Alternatives

The three water management alternatives examined are summarized below.

- *Alternative A–Continue Existing Management Practices:* Emphasis on long-term continuation of current practices. Continue existing policies regarding water rights, the spacing of wells, metered wells, the monitoring of water waste, and the establishment of Intensive Groundwater Use Control Areas.
- *Alternative B–Water Demand through Incentives:* This alternative consists of federal as well as state and local initiatives. Federal initiatives include increased subsidies for conversion to low water use crops not considered to be in surplus, and conversion of irrigated farms to dryland. State and local initiatives include public information programs on efficient water use, research on efficient water use and development of crop varieties requiring less water, purchase and retirement of water rights, and the elimination of the "use it, or lose it" concept in water rights administration.
- *Alternative C–Water Demand through Regulation:* This alternative consists of federal as well as state and local initiatives. Federal initiatives include the reduction of subsidies for crops considered to be in surplus. State and local initiatives would include measures such as the requirement that all water users develop and implement water conservation plans using best management concepts, the requirement that all nondomestic wells be equipped with a totalizing water meter, no water use beyond stated quantity in water right, the reduction of water rights within control areas and monitoring by spot checking meters, increased effort to control waste of water, and loss of water right for continued nonreporting of water use.

Study Area

The study area is Southwest Groundwater Management District Number 3. This district consists of parts of thirteen counties in southwestern Kansas. This particular district was chosen because 51 percent of the irrigated land in Kansas is located in this district, the majority of groundwater withdrawn for irrigation in Kansas is used in this district, and it has been an area of previous research [7, 8].

Significant Activities

Significant activities of the Groundwater Management District are presented in Table 1. This list of ten activities was constructed to reflect important economic activities in the area. Identification of these activities was made in consultation with knowledgable informants in the district.

Source of Data

Estimation of conflict patterns associated with the three management alternatives was based on the use of six knowledgeable informants. A modified version of the Delphi technique was used to structure the estimation process [28, 29]. Informants were assembled in a face-to-face setting in a large community of the district, briefed, and asked to estimate the likely impacts of the three policies. After making estimates in an anonymous fashion each participant returned estimates to the coordinator who pooled responses. Pooled estimates were returned to the group members who then compared their responses to those of other participants and adjusted their estimates accordingly. Estimates were again returned to the coordinators for collation and an additional round.

The actual process of estimating the conflict patterns associated with the three policies consisted of three steps. First, a list of six conflict issues or

Table 1. List of Significant Activities

1.	Dryland agriculture
2.	Irrigated agriculture
3.	Industrial water use
4.	Municipal water use
5.	Cattle feeding
6	Meat packing
7.	Retail sales
8.	Motels/Restaurants
9.	Construction
10.	Energy development

conflict cleavages that divide the groups engaged in the ten activities in the district was prepared in consultation with knowledgeable informants in the district. These were as follows:

1. for or against agricultural irrigation;
2. for or against the use of river water for irrigation;
3. for or against increased taxes for education;
4. for or against the use of agricultural chemicals;
5. for or against more state control of water; and
6. for or against the use of meters to control agricultural groundwater use.

Second, following the modified Delphi procedure outlined above, participants estimated the position that would be taken on these issues by groups engaged in the major activities of the area. Third, participants concluded by making iterative estimates of the likely responses of each activity group to the policies being considered.

RESULTS

Results are reported in Tables 2 and 3. Estimates of the existing patterns of conflict over issues in the district are presented in Table 2. Estimates regarding the impact of each management alternative on existing conflict patterns are presented in Table 3. Analysis of data proceeded according to six steps outlined by Freeman and Frey [15].

Table 2. Conflict Patterns Associated with Six Base Issues

	Column A			*Column B*		*Column C*
	Observed Position			*Ideally Expected Position*		*Deviations from Ideally Expected Position*
	For	*Against*	*Neutral*	*For*	*Against*	
1. Irrigated agriculture (base group)	6		0			
2. Dryland agriculture	1	4	1	2.5	2.5	−1.5/1.5
3. Industrial water	2	4	0	3	3	−1/1
4. Municipal water	3	3	0	3	3	0/0
5. Cattle feeding	4	2	0	3	3	1/−1
6. Meat packing	3	2	1	2.5	2.5	.5/−.5
7. Retail sales	4	2	0	3	3	1/1
8. Motels/restaurants	1	1	4	1	1	0/0
9. Construction	1	1	4	1	1	0/0
10. Energy development	1	2	3	1.5	1.5	−.5/.5
			Sum = 11			

Table 3. Comparison of Estimated Positions on Management Alternatives to Existing Conflict Patterns

	Column D Alternative A				*Column E Alternative B*				*Column F Alternative C*			
	For	*Against*	*Neutral*	*D*	*For*	*Against*	*Neutral*	*D*	*For*	*Against*	*Neutral*	*D*
1. Irrigated agriculture (base group)	–	–	–	–	–	–	–	–	–	–	–	–
2. Dryland agriculture	X			−1	X			−1	X			−1
3. Industrial water	X			−1			X	0	X			−1
4. Municipal water	X			+1	X			+1	X			+1
5. Cattle feeding	X			+1		X		−1		X		−1
6. Meat packing	X			+1		X		−1		X		−1
7. Retail sales	X			+1		X		−1		X		−1
8. Motels/restaurants	X			+1			X	0			X	0
9. Construction	X			+1			X	0			X	0
10. Energy development			X	0			X	0			X	0
Total				4				−3				−4

The first step consisted of selecting a base activity group from the ten groups. The group having the fewest neutral positions on the six conflict issues was chosen as the base activity group. Irrigated agriculture was selected as the base group. It is positioned at the top of Tables 2 and 3. Other groups were viewed as aligning themselves with, taking a neutral position toward, or opposing the irrigated agriculture activity group.

The second step consisted of recording the estimated positions of groups in relation to the position of the irrigated agriculture group on the six issues. Data are recorded in Column A of Table 2. They refer to the number of times that a group was estimated to be allied with, opposed to, or neutral to the irrigated agriculture group's position. For instance, a two for irrigated agriculture and a four for against irrigated agriculture suggest that the group (industrial water use) supports the position of the base group two out of six times.

The third step consisted of computing the expected pattern of support or the pattern that would occur if a perfect pattern of cross-cutting conflict existed. Data are reported in Column B of Table 2. Under a condition of perfect cross-cutting conflict, each activity group would be aligned with the position of the base activity group half of the time; and half of the time, it would be opposed to the base group position. Given six issues on which an activity group is estimated to have a non-neutral position, the expected pattern would be 3/3 in a situation of perfect cross-cutting conflict. Where activity groups are estimated to have neutral positions, the expected pattern was computed only for non-neutral positions. Since the dryland agriculture group is estimated to have non-neutral positions on five issues, the expected pattern for this group is 2.5/2.5.

The fourth step consisted of comparing the observed pattern of support and opposition (Column A of Table 2) with the expected pattern (Column B of Table 2) to determine the deviation between the observed and the ideal cross-cutting patterns (Column C of Table 2). Deviation scores were computed by determining (a) the difference between the number of times a group supported the irrigated agriculture group's position and the expected value, and (b) the difference between the number of times a group was against the irrigated agriculture group's position and the expected value. Since the number of deviation units is of central importance, signs were ignored and deviation scores were summed across groups. Results reported in Table 2 indicate that there are eleven units of deviation from a pattern of pure cross-cutting conflict.

The fifth step consisted of determining the extent to which an alternative would either increase or decrease cross-cutting conflict. Each alternative was compared to the existing base conflict pattern reported in Column A of Table 2. Estimated positions are presented in Columns D, E, and F of Table 3. They refer to the conflict patterns associated with each alternative. A positive value indicates that an activity group's position would increase the deviation from the ideally expected split; a negative value indicates that an activity group's

position would decrease the deviation; and a zero indicates that an activity group's position is neutral.

The sixth and final step consisted of computing a conflict polarization score for each alternative. This was done by algebraically summing deviation scores across the activity groups for each alternative. Conflict polarization scores are reported at the bottom of Table 3. These scores suggest the following ranking of alternatives: Alternative C (-4), Alternative B (-3), and Alternative A (4). Alternative A is the most polarizing alternative, while Alternative C reduces conflict polarization the most. Alternative C is therefore the mose desirable alternative.

SUMMARY AND CONCLUSIONS

Results of the assessment of the social impacts associated with three water management strategies proposed as possible solutions to the groundwater depletion problem in southwestern Kansas suggest that increased regulation of water demand is the best policy. This policy is estimated to reduce conflict polarization in the area. Since none of the three proposed management alternatives is estimated to increase conflict polarization substantially, any one of the alternatives is a viable candidate for implementation. Other criteria such as economic efficiency and technical feasibility should be used in the selection of one of the alternatives for implementation.

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