Community DECISIONS: Ranking Stakeholders' Goals for Watersheds Using the Vector Analytical Hierarchy Process

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This integrated research, teaching, and extension project will develop and assess a complement of group facilitation and group decision support tools to facilitate stakeholder watershed planning. Our general hypothesis is that facilitated and computer-aided consideration of alternative strategies will reduce inter-personal and interest group conflicts in watershed planning, and permit consideration of acceptable compromise watershed strategies. Research conducted during the first project workshop tackled the questions: What are the personal objectives of watershed stakeholders? Does personal affiliation indicate watershed preferences? How can aggregation of personal preferences be conducted to assist in selection of watershed strategies? Can group preferences tied to a nutrient accounting system generate potentially acceptable watershed planning strategies?

Diverse stakeholders have diverse affiliations and preferences

- Farmers
- Nonfarm businesses
- Citizen groups
- Environmental groups
- Local government
- State and federal government
- Wastewater treatment plants
- Golf courses

Watershed objectives, preferences for strategies as brainstormed (no order)

- Maximize cost effectiveness
- Support a healthy watershed system
- Maintain active agriculture/forestry
- Develop community stewardship ethic
- Reduce hassle factor
- Promote appropriate development
- Support quality of life
- Maintain sustainable water supply
- Share costs equitably
- Embrace appropriate technology

Analytical Hierarchy Process (Saaty [1], Zahir [2])

- Long-standing method used in industry, natural resource management
- Not complex for participants
- Requires pairwise personal preferences of all alternatives
- Produces personal and aggregated ranking of watershed objectives

Example

Maximize cost effectiveness ——— Share costs equitably

9 7 5 3 **1** 3 5 7 9

(equally preferred)

Maintain active agriculture/forestry ——— Reduce costs of water quality protection

9 7 5 **3** 1 3 5 7 9

(slightly more preferred)

The Experiment

In a March 2008 workshop, ten watershed goals were elicited from 37 participating stakeholders, each of whom pairwise ranked importance of the goals. An overall ranking of watershed goals was obtained by grouping stakeholders into sub-groups, obtaining the goal rankings for each subgroup, and aggregating the sub-group rankings into an overall ranking. We explored two methods for grouping stakeholder preferences: 1) stated affiliations from the participant bio-sheet; and 2) *post hoc* clustering of individuals' goal rankings. Subgroups based on stated affiliations included 1) environmental, 2) agriculture/business, 3) local government/citizen groups, and 4) state government. The methods were compared based on ranking coherence, a measure of Preference clustering within a subgroup. Coherence was measured on a 0-1 scale, with higher values indicating less variation within subgroup.

[1] Saaty, T.L. 1990. How to make a decision: The Analytic Hierarchy Process. European Journal of Operational Research 48(1): 9-26.
[2] Zahir, Sajjad, 1999. Clusters in a group: Decision making in the vector space formulation of the analytic hierarchy process. European Journal of Operational Research 112(3): 620-634.

Goal	Entire Population	Stated Affiliations	4 clusters
		Rank	
Maximize cost effectiveness	5	5	5
Support healthy watershed	10	10	10
Maintain agriculture/forestry	9	9	9
Promote community stewardship	6	6	6
Reduce hassle factor	2	2	2
Promote appropriate development	7	7	7
Support quality of life	4	4	4
Maintain water supply	8	8	8
Share costs equitably	1	1	1
Embrace appropriate technology	3	3	3
Coherence	0.973	0.974	0.983

Results

- "Nuts and bolts" objectives such as "cost equity" and "reduce costs" are generally ranked higher than more abstract goals such as "maintain active agriculture/forestry"
- Ranking of objectives is unchanged regardless of procedure in this experiment
- Based on stated affiliations and occupations, there is more diversity of preferences among environmentalists than among farmers
- Based on clustering, lions lay down with lambs, i.e. members of preference clusters not always consistent with affiliations or occupations.

Implications

- AHP methods are practical techniques for aggregating group preferences
- Similarity of preferences is not easily predicted by affiliation or occupation, and ignores possible common interests or outlooks shared by individuals of apparently different groups.
- It may be beneficial to survey and analyze personal preferences at the beginning of a multi-session planning process to be able to group individuals with similar or dissimilar preferences or points of view.

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