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Constructing Preferences in Structured Group Deliberative Processes

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Introduction

Conflict around the valuation of environmental goods and services in environmental policy debates and the increasing participation of public stakeholders in these debates has lent focus to the power and function of stakeholder groups in initiating policy change. This chapter examines the efficacy of group processes in changing the individually held values of group members for environmental goods and services. It examines how structuring the group process can promote a more effective and efficient process, an informed group with a strong understanding of the issues, greater stakeholder participation in the process, and increased stakeholder satisfaction and buy-in with the end result.

An empirical study involving river management alternatives in the State of Vermont in the northeastern US is used to examine the effect of structured group deliberative processes on individual stakeholder preferences for environmental amenities. Conjoint analysis or choice modeling, a widely-used marketing research tool, was used to measure stakeholder preferences for project costs and non-market environmental goods and services and to capture changes in these preferences that may occur as a result of group deliberative processes. The preferences for river characteristics were quantified for a small stakeholder group to aid in their deliberations over river management alternatives in the White River watershed of central Vermont (Hermans et al., in press). Initial preferences were measured and then re-evaluated after a structured discussion about preference similarities and differences between group members. The measurement of preferences using conjoint analysis

took place within a multicriteria decision analysis framework that was used to structure the decision-making process.

In this chapter we begin by surveying current findings in group psychology and organizational behaviour and how structuring group processes can increase the effectiveness of the process. We examine how structured group processes aid in the formation and modification of individual stakeholder preferences. Next, we outline evidence that preferences, especially for complex, unfamiliar goods, are constructed by individuals as they participate in group processes and are endogenous to the process itself. We test conjoint analysis as an effective means to measure these preferences. Finally, we explore the implications of this research: (1) for developing effective group methodologies to manage public participation and collaborative planning processes; and (2) as a method of valuating of non-market environmental goods and services. The purpose of this research is to present initial evidence that quantifying preferences can aid in the group processes. This research is a combination of epistemological traditions, combining quantitative methods with qualitative approaches, attempting to best address practical problems in group deliberative processes.

Deliberative Group Processes

Collaborative public participation is increasingly the norm in environmental decision-making and management in the United States (Sagoff 2004). However, simply involving the public as stakeholders in environmental management does not ensure a successful outcome. The *process* by which multiple stakeholders are involved, more than any other aspect of the project or decision activity, can dictate the success of (make or break) the endeavour. If handled incorrectly, the stakeholder process can result in failed, unsatisfactory and/or unsustainable results.

In light of these challenges to public participation in environmental decision-making, this chapter explores recent findings in the areas of organizational behaviour and group decision processes. Findings are extended in support of structured public participation processes, as opposed to discursive, open discussion processes. Here, *structured group processes* refer to group deliberations facilitated by a neutral third party that follow formal steps and involve the quantification and analysis of group participants' preferences. We also refer to the structured group process as *analytical deliberation*. In contrast,

although discursive processes may also use a trained facilitator, a structured, analytical framework is not used and group members' preferences are not quantified. Analytical deliberation does not exclude open discussion, but strives to make discussions more efficient by imposing a framework to guide them.

To begin, Rhoades (2000) argues that unstructured group processes do not allow members to engage in group deliberations effectively. He states:

'[W]e have lulled ourselves into believing that all we need to do is get people around a debate table and discuss problems, resolve our differences, and come to some kind of a consensus plan for action. The notion is that by bringing together diverse people from different walks of life, advised by scientists and planners, and arguing out consequences and trade-offs, we can achieve a common understanding of the problem and the required solutions. This is fine in theory but all too often in such 'participatory' community meetings there is little that people can really grab onto that allows them a clear image or vision of the future they may want to create…people have a hard time thinking beyond vague generalities guided by their own ill-informed biases. In such participatory encounters, no matter how well intended, there is precious little empirical reality around which precise boundaries can be drawn so as to keep the community-expert dialogue on target. Feel-good consensus building exercises do not yield understandable, empirical or visual information capable of dealing with the future or the consequences of different decisions. As a result, the consensus building process tends to break down since it is not easy to understand the consequences of different decisions' (p. 37).

In contrast, analytical deliberation gives participants a structure around which to arrange their discussions. Structuring group deliberations can help participants share information in an atmosphere of open dialogue and equitable participation. This is especially important for groups considering complex information around public goods. In a review of recent research on group performance and decision-making, Kerr and Tindale (2004) identify a number of key issues relevant to information sharing in groups. We summarize their main points in Table 1.

Table 2.1 Information Sharing in Groups (Summarized from Kerr and Tindale 2004)

1. *Strength of* a priori *preferences.*
   Brodbeck et al. (2002) found that individuals do not like to modify their *a priori* preferences. New information, which is inconsistent with initial preferences, can be misinterpreted as it is filtered through existing preferences.

2. *Preference for shared information and dismissal of unique information.*
   Stasser and Titus (1985) have found that groups focus on information that is shared by all members, and that new information that is presented by individual members is not considered. The fact that allowing participants ample time to synthesize new information can ensure new and previously unshared information, is considered.
   Wittenbaum et al. (1999) found that individuals providing unique information to the group discussion are devalued by other group members and the information is not regarded as important (known as 'decreased social validation'). Information that is shared by all members is considered more than information unique to one individual, even if it is central to the process.
3. *Dissecting the information process*.
   Research indicates that splitting the group decision process into two parts, 'information search' followed by 'integration and decision,' will help ensure that relevant information is brought to the group and used in the decision process (Kerr and Tindale 2004).
4. *Degree of preference alignment.*
   If all group participants share the same preferences, a premature consensus can be reached before all applicable information is addressed (Karau and Kelly 1992).
5. *Group divisiveness*.
   Beersma and De Dreu (2002) found that small group negotiations can lead to the formation of coalitions of group members with similar preferences. Structuring the process can keep these coalitions and power plays in check.

Webler *et al.* (2001) have identified five common perspectives of what constitutes a good public participation process as defined by participants involved in forest management issues in New England. These process types are listed with the defining characteristic of those people most associated with the perspective in Table 2.2 and illustrate the wide range of opinion of what constitutes 'good' process.

Table 2.2 Five Characterizations of Good Public Participation Processes (Summarized from Webler et al. 2001)

Process	*Characteristics*
Process should be legitimate (Advocated by those concerned with legitimacy issues)	Consensual decision-making Open, transparent process Focus on evidence/information People must be able to use information No arbitrary ending date of process

Process	*Characteristics*
Process should promote a search for common values (Advocated by those identified as environmentalists)	Value-based deliberation Ending date needed Education should inform common values Post-deliberation implementation is important Adversaries need to communicate Relationships are important
Process should realize democratic principles of fairness and equality (Advocated by public participation professionals)	Fair and unbiased process Concern with design and operation of process Productive interaction between participants Participants need to be heard and be able to speak Defined ending date combined with consensus decision making (informed consent) Process driven by evidence, not political power
Process should promote equal power among all participants and viewpoints (Advocated by those with strong ties to local community)	Concern with leveling the 'playing field' Management of power issues Keep decision-making power in local communities Open process driven by evidence Inclusion of community members Protection of disenfranchised groups Consensus is important
Process should foster responsible leadership (Advocated by those who believe consensus may be unlikely)	Emphasis on leadership Responsibility for making decision is with leadership Public participation is crucial early in process

Similar to the issue of *a priori* preferences, Moon et al. (2003) have found that the outcome of a group decision-making process is influenced by whether individual group participants considered the decision problem *prior* to meeting as a group. Groups where participants consider the problem prior to meeting together are less likely to come to agreement due to differences in pre-formed preferences. Additionally, if a decision is made, they will be less confident of the decision. In

our research, we are interested in seeing how these 'prior opinions' are affected by the subsequent group process.

In most group decision-making processes, group members have prior knowledge and preferences about the problem. The greater the preference differences within a group (termed value diversity), the greater the potential for group conflict (Moon et al. 2003). However, Brodbeck et al. (2002) show that increasing value diversity can improve 'information sharing and decision quality'. The issue is how to manage this value diversity productively; how to structure the process in such a way as to ensure that group members feel comfortable expressing different points of view and protected from criticism of their preferences. Structuring the process can also insure that relevant information is disseminated to the group, as prior preferences are often not based on accurate information. In particular, for non-market environmental goods and amenities, such as the value of healthy rivers or forest ecosystems, public stakeholders often form preferences without understanding the ecological and social complexities involved.

Preference Construction and Elicitation

As is well-known from behavioural decision research and behavioural economics, individual behaviour often deviates somewhat from the simplifying assumptions posited in economic models (Rabin 2002; Grether and Plott 1979; Damasio 1994; Fishburn 1991; Faber et al. 1992). People often do not know or cannot articulate their preferences. Preferences they do have are often not consistent over time and experience. In groups the uncertainty and pliability of preferences is magnified. Participants often come to group processes with incomplete knowledge of the issues and ill-defined preferences, and discussion can provide an opportunity for significant changes.

A key point stressed above is that through structured group deliberations information is synthesized and preferences can be constructed and fully developed (Howarth and Wilson 2006). A central focus of this study is the elicitation and subsequent group discussions of these preferences. In instances of unfamiliar and complex environmental goods and services, preferences are not 'revealed' as much as they are 'constructed' during elicitation, and constructed preferences are particularly 'context dependent' (Slovic 1995; Tversky and Thaler 1990). As preferences are elicited through

any of a variety of methods, this context needs to be carefully managed for framing effects and other biases (Payne et al. 1999; Norton *et al.* 1998; Gregory et al. 1993).

There are a variety of methods used to elicit preferences for non-market characteristics of environmental goods and services, including contingent valuation (CV), hedonic pricing, travel-cost studies (cost-benefit analysis methods), and conjoint analysis (Hanley and Spash 1993; Department of Environment and Heritage 1995; Dennis 1998; Farber and Griner 2000). Here we compare two stated preference methods: contingent valuation, a method that has achieved a high degree of popularity and wide application in the field of environmental economics; and conjoint analysis, the preference elicitation method used in this study to address some of the limits in traditional CV.

Contingent Valuation

Contingent valuation is a widely used method of non-market valuation where monetary values are estimated by providing respondents with hypothetical markets (Carson et al. 2001; Carson 2000; Mitchell and Carson 1989; Arrow et al. 1993). It has been used extensively to estimate monetary values for environmental goods and services; for recent literature in environmental contingent valuation, see NOAA's website for an extensive bibliography (NOAA Fisheries 2005). Briefly, the general approach of contingent valuation is to present a respondent, via a survey, with questions about their valuation for a certain good or service. From the answers, the respondent's willingness-to-pay (WTP) for the value or service, or willingness-to-accept (WTA) its loss, is estimated. This monetary value is meant to capture the passive (non-market) use value of the good or service. There are many different ways to conduct a contingent valuation survey. For an overview of the different CV survey methods, see Boardman et al. (2001).

Contingent valuation is subject to well-documented biases. Included among these are information bias, response bias (including scoping bias, non-commitment bias, budget constraint bias, and compliance bias), market bias, and strategic bias (Kemp 1993; Mitchell and Carson 1989). The degree and kind of information available about an environmental service affects respondents' willingness-to-pay (WTP) values for the service (Mead 1993; Cummings et al. 1986). There are limits to the amount of information respondents can internalize in a given period of time and they may have difficulty fully understanding this 'extra' information and integrating it into their WTP values

(Arrow et al. 1993). Hoevenagel and van der Linden (1993) found that WTP values were not consistent but varied depending on the descriptive information given to respondents.

Bias resulting from issues of scope, namely the lack of sensitivity of WTP values to scope, is one of the most damaging criticisms of contingent valuation (Hanley and Spash 1993; Mitchell and Carson 1989). Grouped under scope issues are variations on the same theme, such as embedding bias and part-whole bias. Embedding bias occurs when WTP is the same regardless of the magnitude of the environmental good. Part-whole, or mental account, bias occurs when WTP values reflect a good that is different from the one specified in the questions because respondents are 'visualizing something more or less inclusive than the commodity described' (Hanley and Spash 1993). Budget-constraint bias occurs when the respondent does not take into account his actual budget when stating a WTP value and values, therefore, are not realistic. For a detailed discussion of bias in CV, see Hausman (1993).

Conjoint Analysis

Conjoint analysis is a well-known preference elicitation technique that has found widespread application in marketing, transportation, and increasingly environmental policy and management (Dennis 1998; Farber and Griner 2000; Haefele et al. 2001; Harrison et al.1998). An overview of this method is provided in the Appendix; see Kuhfeld (2005) and Green and Srinivasan (1990) for more detailed treatments. Conjoint analysis constructs a choice set consisting of several alternatives that vary along a number of criteria. Participants rank or rate the alternatives according to their preferred levels of each criterion. The criteria can be qualitative or quantitative and can be in different metrics. A conjoint exercise can be constructed to closely reflect how people actually make decisions, avoiding the creation of hypothetical and, at times, unrealistic markets.

Conjoint analysis shares some of the weaknesses of contingent valuation; two of the most important issues are information bias and framing effects. It can be very difficult for individuals to assimilate all the information contained in a conjoint survey. The difficulty of the exercise can cause individuals to refuse to complete it or to use simplifying heuristics. Also, survey design can affect the outcome; accordingly, the design needs to be carefully thought out and pre-tested.

Conjoint analysis addresses some of the disadvantages of contingent valuation. Information that is not easily integrated into WTP can be accommodated in conjoint analysis, which does not necessitate the translation of information into monetary value. Thinking through a conjoint exercise requires the respondent to make tradeoffs between a set of different criteria (or goods/services), thereby reducing the tendency to focus on only one criterion. The fact that this process does not require the translation of different criteria into one common metric is a key benefit. It is not until the criteria are weighted relative to the others by the conjoint analysis that a common metric (relative preference weights) is used.

In cases where unfamiliar information is synthesized during the group process, conjoint analysis offers a more viable and realistic way for preferences to be constructed. In many, though not necessarily every instance, discussions around the qualitative and quantitative conjoint variables will be more productive than discussions centered on monetary willingness-to-pay figures. In the case study discussed below, it would not have been feasible or realistic for group members to discuss river characteristics in terms of contingent valuation-derived monetary values. It should be noted, however, that contingent valuation, along with other cost-benefit analysis methods, can serve well as components of a conjoint analysis study in structuring group discussions. The point here is not to dismiss contingent valuation as a useful tool, but to demonstrate that when discussing individual preferences in a group setting, conjoint analysis can address scientific complexities in a way that is more conducive to group discussion.

Case study: Evaluation of Management Alternatives for the White River

The White River in rural east-central Vermont in the northeastern US has been channelized over the last 100 years to accommodate agriculture, human settlements, transportation, infrastructure, etc. resulting in severe erosion and gravel deposition, increased frequency and severity of flood events, and compromised aquatic and riparian habitat quality. These impacts damage private and public property located in the river's historic flood plain. Channelized rivers are expensive to manage and intervention measures include gravel removal, channel armoring, realignment and post-flood remediation projects (Kline and Cahoon 2003).

River management and continued channelization costs have been mostly carried by the State of Vermont, but it is expected that local municipalities' financial responsibility for flood damages will increase in the future (Kline and Cahoon 2003). In order to address these issues, the Vermont Department of Environmental Conservation (DEC) has identified four river management strategies. These include continued channelization with the establishment of wider buffers, active geomorphic management, passive geomorphic management, and the combination of these alternatives (described in more detail in Table 2.3).

Table 2.3 River Management Alternatives for the Upper White River, Vermont (Reproduced from Kline and Cahoon 2003)

Channelization: Maintain rivers in a channelized state through dredging and bank armoring applications. Active re-vegetation and long-term protection of a wooded riparian buffer is important to this alternative.
Active Geomorphic: Restore or manage rivers to a state of dynamic equilibrium by designing and constructing a stable planform in a relatively short period of time. This may include human-constructed meanders, floodplains, and bank stabilization techniques. Active riparian buffer revegetation and long-term protection of a river corridor is essential to this alternative.
Passive Geomorphic: Allow rivers to return to a state of dynamic equilibrium through a passive approach that involves the removal of constraints from a river corridor thereby allowing the river, utilizing its own energy and watershed inputs to re-establish its meanders, floodplains, and self maintaining, sustainable equilibrium condition over an extended time period. Active riparian buffer re-vegetation and long-term protection of a river corridor is essential to this alternative.
Combinations of the Above Alternatives: Use a combination of alternative approaches to accommodate the varying constraints that typically occur along a project reach.

A structured deliberative group process was used to help local community members evaluate the river management alternatives for the upper portion of the White River. This process consisted of 11 monthly meetings and involved a high degree of new and

complex information for the group to synthesize into their individual preferences and group discussions. The community group consisted of 20 core members who knew each other, had been working together as a group for some time, and were knowledgeable about river issues. The group had been meeting informally prior to the onset of this project to conduct river restoration projects. Between 12 and 20 members attended the monthly meetings (Hermans et al. 2006).

River system dynamics is a complex science and education of the group was vital. The decision process was structured in a way to allow the group to synthesize a great deal of unfamiliar, complex scientific information. The process was also designed for the group to better understand and develop their individual preferences for river characteristics. The group members used the objective scientific information to inform their subjective preferences in deliberating and deciding on a plan for managing specific reaches of the Upper White.

Process Structure

In this study, conjoint analysis, in combination with a multicriteria decision analysis (MCDA) tool, structured the group process. The MCDA component of this process is covered in Hermans et al. (in press) and will not be addressed here. The stages and steps of the group process were defined and structured around criteria selection and definition, and measurement of group preferences for the criteria. The scenarios introduced by the conjoint survey served as a basis for the information synthesis and preferences discussion stage of the process. The group process was designed to help participants incorporate new information into their preferences about river systems so they could have informed deliberations instead of positional discussions. The process was also designed to quantify participants' preferences for river attributes so they would be more informed about their *own* and their fellow group members' preferences.

A professional facilitator was used in each meeting to ensure that the proceedings conformed to norms of openness and inclusiveness and that the stages of the process were completed. Also present at each meeting was a process analyst responsible for process structure, administering the conjoint survey, and reporting the results. Figure 2.1 shows the three process stages and corresponding steps and Table 2.4 summarizes the process steps. The process structure addresses many of the biases groups can exhibit. Several sessions were devoted

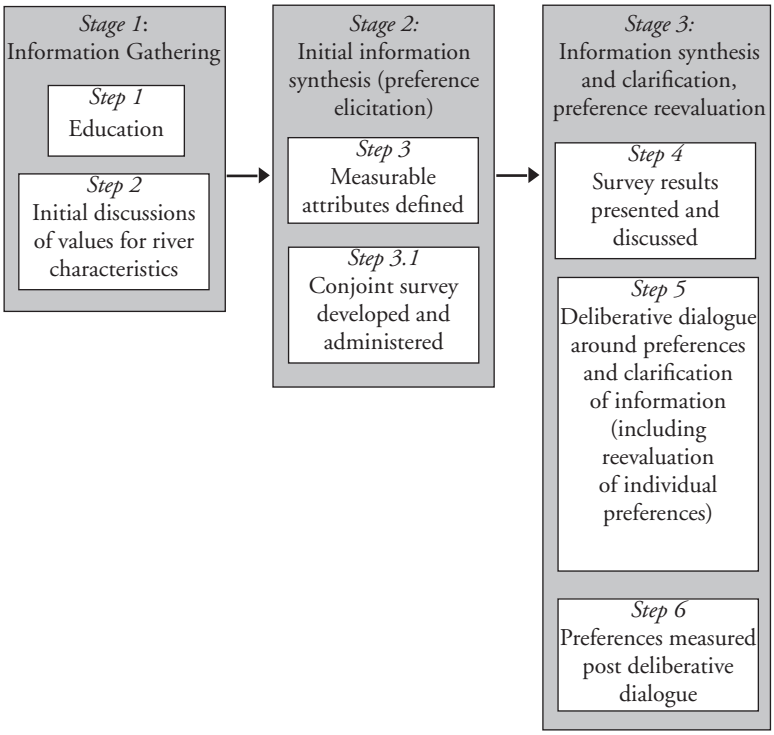

Figure 2.1: Process Stages

to education on river systems. This information was new to the group and sufficient time was given to ensure that new information was understood and synthesized, and not misinterpreted. This education gave all members equal access to scientific information, addressing the potential for decreased social validation (Stasser and Titus 1985; Wittenbaum et al. 1999). The purpose of these meetings was not to have members share the same preferences or to achieve group consensus about what river attributes were the most important, but to help the group gain an understanding of its preference agreements and differences. However, as new information was learned, synthesized and discussed, opinions and preferences changed as the group became better informed and some individual preferences converged. The use of a neutral, third party professional facilitator ensured that coalitions were not formed within the group (Beersma and De Dreu 2002).

Table 2.4 Summary of Process Steps

Step 1	Education of group on river dynamics and ecology and river management alternatives by Department of Environmental Conservation scientists.
Step 2	Creation of vision for Upper White and formulation of values important to group.
Step 3	Development of measurable criteria capturing relevant group values for evaluation of river management alternatives. • Criteria adapted for use in conjoint survey tool designed to quantify individual's preferences. For a definition of the criteria used in the conjoint survey, see Table 2.5. • Administration of conjoint survey to the group as part of a larger survey.
Step 4	Conjoint results presented to the group, focusing on individual's criteria preferences and highlighting preference agreements and conflicts between group members. Quantification of members' preferences allowed them to see where conflicts in preferences exist and where there is common agreement.
Step 5	Subsequent group discussions are structured around differences in individual members' preferences for the attributes, and the implications of these various preferences on their willingness to ascribe to a particular management alternative are discussed.
Step 6	Re-administration of conjoint survey to the group to measure preference changes that took place during the structured deliberation phase.

Table 2.5 Criteria definitions presented to stakeholder group for analysis

Amount of land taken out of agriculture or development over a 30-year period
Different management strategies for the river will result in different amounts of land taken out of agriculture or development, providing room for the river to meander and to have access to the floodplain. This will reduce flood damage and erosion, and will improve the habitat of the river. This land is measured in acres.

Cost borne by local taxpayers to manage one mile of the river
Different management strategies for the river will have different costs of implementation and maintenance. These costs can include average maintenance and land acquisition costs, as well as one time construction costs, depending on the management strategy employed. They do not include flood damage costs. Long and short term river management costs are taken together here over a 30-year period. These costs are paid with taxpayer dollars. In the future, these costs may likely be incurred locally.

(These do not include the costs that might be added or avoided from management decisions made upstream and downstream.)

Number of high quality pools
High quality pools provide deep water for recreational opportunities and fish habitat. These pools are typically formed along the outside of a stream's meander bend. Under various management scenarios, the number of pools will increase or stay the same over time.

Percentage of the river section that minimizes flood damage through meandering and river access to floodplain
A meandering river, with access to the floodplain, is more stable, resulting in less erosion and reduced flood impacts. Public and private investment is minimized in the river corridor and the floodplain.

Percent of river section with more than 35 feet of vegetative buffer
All river management alternatives result in at least a 35 feet buffer. The wider the buffer the more benefits you get from the buffer. Buffers are an important feature of a healthy river. They stabilize the river bank and protect against erosion. They offer quality wildlife habitat, provide shade to keep water temperature down, and are an indication of high animal and plant diversity.

Figure 2.2 illustrates the structured group process. Preferences can be modified during the process and if the issues are of very high

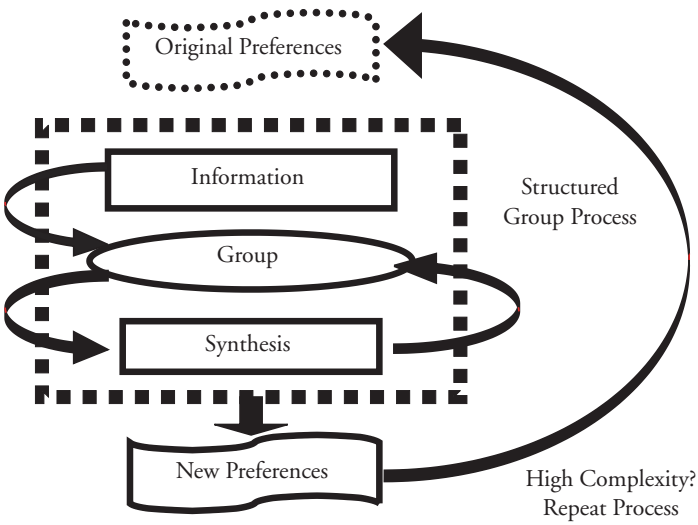

Figure 2.2: Structured Group Process

complexity, the discussion and synthesis process may consist of several iterations. This may also be the case if the group size is large.

Conjoint analysis structured the group process in several ways. The development of the criteria anchored the discussions to group members' preferences and interests, and away from their positions. The actual taking of the conjoint survey aided members in the construction of their preferences. Most importantly, the quantification of members' preferences gave them a better understanding of their own preferences and those of the other group members, and the participants were now able to better articulate these preferences. The quantification of preferences provided a means of communication between the group members, allowing for a more informed, more inclusive, and higher quality discussion. The results from the conjoint analysis also provided an 'audit trail', ensuring that the course that led to the end result of the discussion can be traced. Groups often need a means by which they can justify the outcome of their process. They need the ability to show how their decisions were reached. The results of the conjoint analysis provide this evidence.

Results

Our data consist of results from the pre- and post-deliberation conjoint surveys. Due to the small sample size and because the community group's meetings prior to this project had not been researched, anecdotal evidence from stakeholder discussions is used in conjunction with results from the conjoint analysis to examine the efficacy of structured group process.

Preferences of group members for the five river management criteria were elicited using our conjoint survey and are reported here in the form of relative importance weights. These weights depict the sensitivity of a respondent's preference ordering to changes in the level of each criterion based on the parameters of an underlying utility function. The weights are normalized so that they sum up to 100 per cent. See the Appendix for further discussion.

The initial conjoint survey was part of a larger survey measuring group demographics and opinions on a variety of watershed issues. Of the 16 members initially surveyed, one refused to complete the conjoint survey, while three others did not appear to understand what they were required to do. Of the 12 members who completed the initial conjoint survey, only seven completed the second conjoint

survey. Our results, therefore, are exploratory and indicate the need for further research.

The demographics for the seven respondents who completed both conjoint surveys are as follows. Their mean age was 52.7 years. Five out of 7 had completed college. On average, each respondent had spent 15 years in the watershed. The median respondent owned 36 acres of land. Two of the 7 respondents were riparian farmers whose livelihoods were highly dependent on the health of the river. The pre- and post-deliberation preference results for these seven individuals are presented in Table 2.6.

Table 2.6 Preferences for Criteria as Relative Importance Weights (in percent)

	Loss in Agricultural Land	*Buffer Width*	*Cost of Alternative*	*Number of High Quality Pools*	*Percent of the River that Meanders*
R3 Pre	46%	13%	2%	0%	2%
R3 Post	14%	57%	14%	0%	14%
R6 Pre	0%	20%	7%	20%	53%
R6 Post	0%	29%	0%	14%	57%
R8 Pre	66%	25%	0%	0%	8%
R8 Post	19%	38%	0%	6%	38%
R9 Pre	0%	20%	7%	20%	53%
R9 Post	0%	14%	0%	29%	57%
R10 Pre	22%	11%	11%	33%	22%
R10 Post	6%	28%	22%	33%	11%
R16 Pre	14%	0%	0%	29%	57%
R16 Post	14%	0%	0%	29%	57%
R18 Pre	0%	20%	6%	20%	53%
R18 Post	57%	7%	29%	0%	7%

Preference discussions centered on the reasons group members preferred the criteria they did and what the various criteria meant to them as watershed residents and river users. The preferences of Respondents 3, 8, and 18 changed most dramatically during preference discussions. Respondent 3 (R3) is a farmer in the riparian zone of the river who has lived in the watershed his entire life and has come to this process with very strong opinions against river conservation and protection. R3's initial preference for land taken out of agriculture decreased from a relative preference of 46 per cent to a preference of 14 per cent. His preference weight for buffers increased considerably,

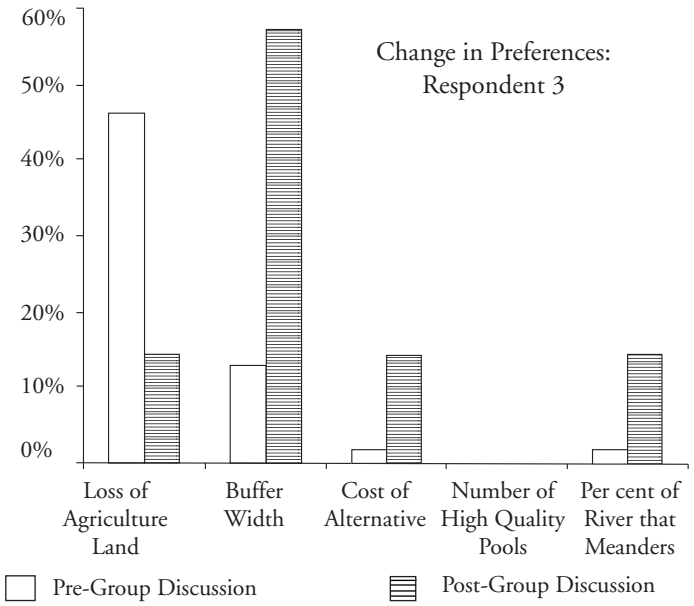

Figure 2.3: Importance Weights for R3

from 13 per cent to 57 per cent (see Figure 2.3). During the preference deliberations, R3 expressed that his opinion of the importance of agricultural land loss had changed due to group discussions. As a farmer who farms 100 per cent of his riparian land, he had a personal stake in this criterion. Information shared during discussions led him to a new understanding of the importance of buffers in ensuring the quality of the river, on which his livelihood is very dependent. Interestingly, his most and least important criteria (loss of agricultural land) in the first survey switched places in the second survey.

Respondent 8 (R8), also a riparian farmer, was one of the group members who expressed the strongest concerns about losing agricultural land to the river and gave a high weight to this criterion (66 per cent; see Figure 2.4). Like R3, how the river was managed personally affected her livelihood. Meanders in the river were initially not important to her (8 per cent). Nor were pools (0 per cent) or management costs (0 per cent). R8 stated that river health was very important and a desired goal, but not at the expense of her land and profitability. Like R3, how the river was managed personally affected her. After group discussions, R8's preferences changed significantly. Her preference weight for agricultural

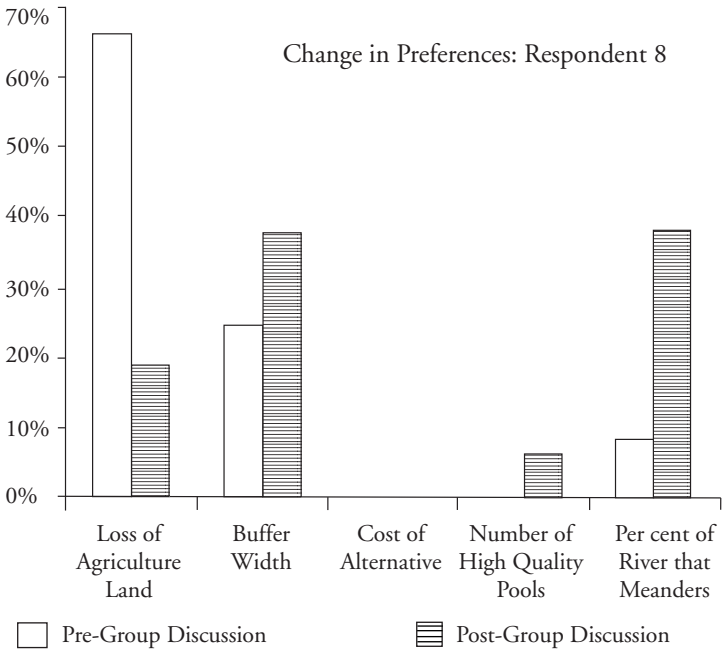

Figure 2.4: Importance Weights for R8

land loss fell to from 66 per cent to 19 per cent, while her preference weights for both meanders and buffers increased to 38 per cent.

For both R3 and R8 these dramatic shifts between preferences for land loss and meanders can be attributed to a specific exchange with a DEC river scientist during the preference discussions. R8 stated that she based her preferences primarily on the fact that a meandering river meant less agricultural land. A discussion ensued on the relationship between meanders and agricultural land, and the fact that it would take decades to establish a naturally meandering river, allowing riparian farming to continue. Both R3 and R8 came to this process with the desire to realize what they considered conflicting goals—river health and agricultural viability—and their initial preferences reflected this. It was not until their preferences had been quantified and articulated that they were able to understand this conflict and discuss it with the group. Clarifications from the DEC scientist helped them resolve this conflict and this is reflected in their post-discussion preferences.

Respondent 18 (R18) was not involved in the monthly meetings prior to the preference discussions. R18 had a great deal of knowledge

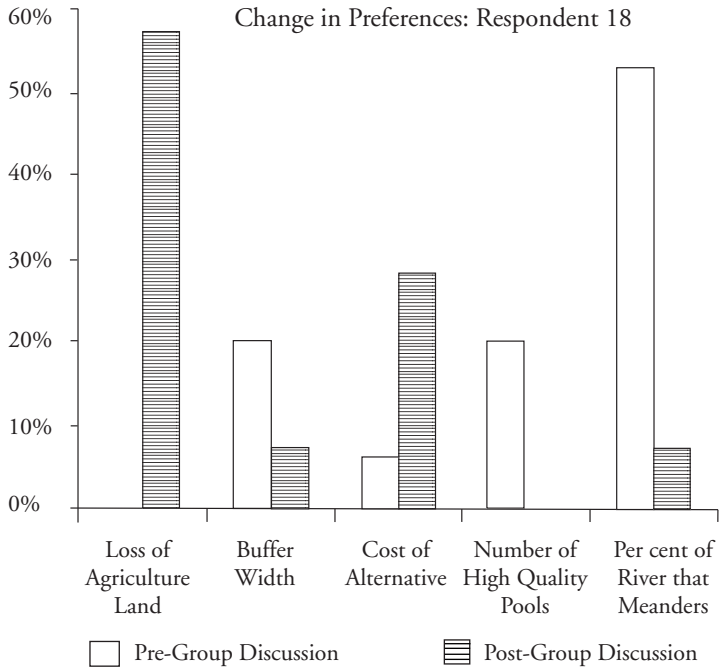

Figure 2.5: Importance Weights for R18

about the river as he played a major role in a local non-profit partnership focused on water quality issues. However, the discussion structured around preferences was the first group meeting he participated in. Without prior involvement in the group, R18 put the most importance on the percent of the river that meanders (53 per cent), followed by buffer width and high quality pools (both 20 per cent), and lastly cost at 6 per cent and agricultural land loss at 0 per cent (see Figure 2.5). After preference deliberations, these preferences changed dramatically. This is in part due to the fact that much of the information was new to R18, and we were able to capture his initial preferences unmodified by any group process. Although he had prior knowledge of river issues, he had not participated in the process and his preferences had not been influenced by the information and discussion of prior meetings.

Post-discussion, R18's preference for agricultural land loss increased dramatically to 57 per cent from 0 per cent. Much of this increase came from the change in his preference for a meandering river, which decreased to 7 per cent from 53 per cent. The value he placed on

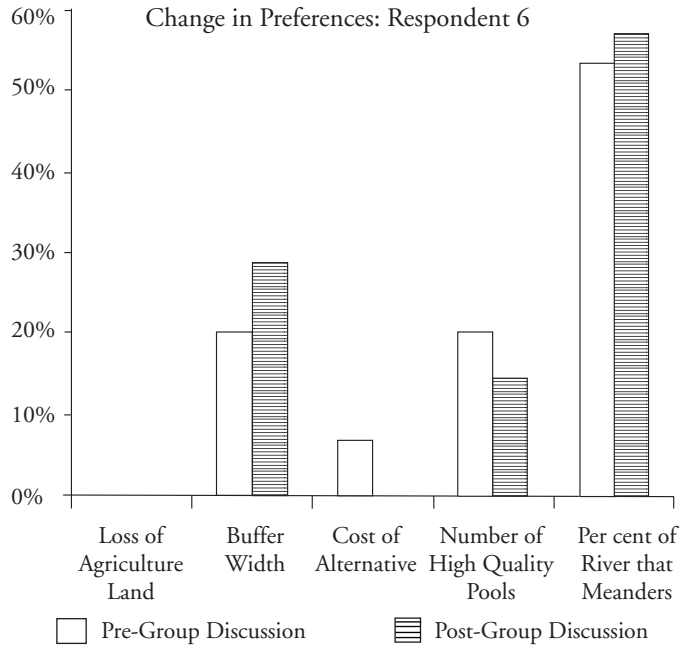

Figure 2.6: Importance Weights for R6

pools and buffers decreased from 20 per cent to 0 per cent and 7 per cent respectively. Finally, the importance of cost increased to 29 per cent from 6 per cent.

Respondent 6 (R6) and Respondent 9 (R9) were considered experts and had been involved in all development aspects of the process. R6 was a Forest Service scientist and R9 worked in a leadership capacity for a local partnership researching the water quality of the White River. Their preferences changed minimally (no more than 9 per cent on any one criterion), and the order of importance for the criteria did not change for either respondent (see Figures 2.6 and 2.7).

Given their expertise in river systems, it can be expected that their prior preferences were based on fairly extensive information and experience, and that group discussions would have a negligible effect on their preferences. If their preferences had changed dramatically, it would have caused the researchers to study the conjoint design for framing and consistency issues. Both respondents indicated that the preference discussions did not cause them to rethink any of their preferences or opinions. As scientists with common interests, their

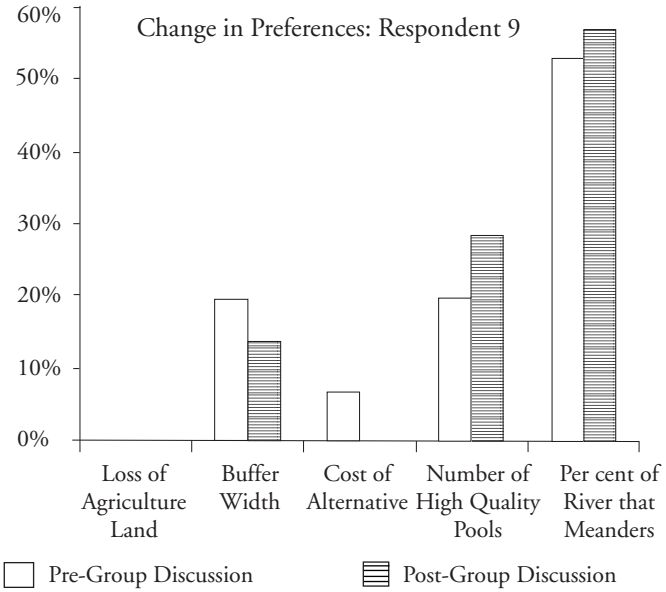

Figure 2.7: Importance Weights for R9

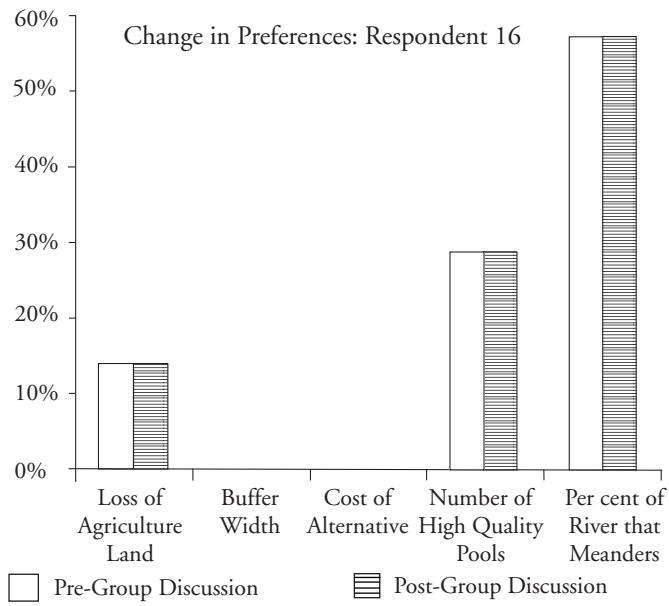

Figure 2.8: Importance Weights for R16

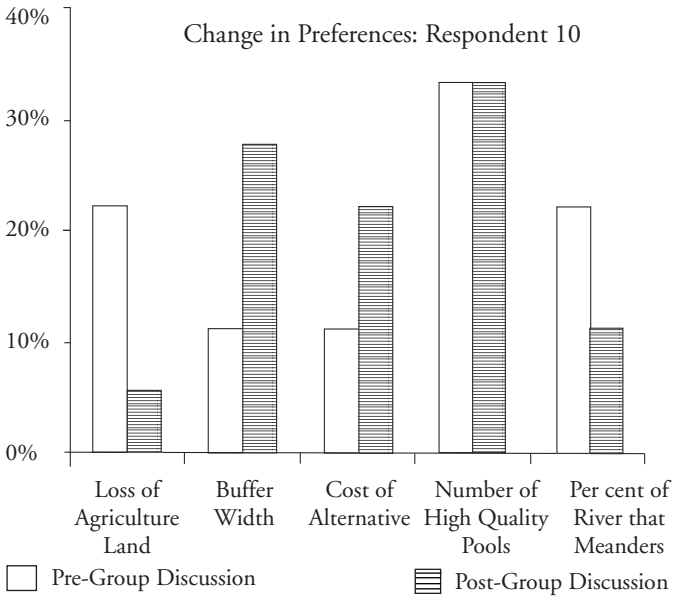

Figure 2.9: Importance Weights for R10

preferences were similar, and they placed more importance on the river health criteria (meanders, buffers and pools) and less importance on cost and loss in agricultural land.

Interestingly, Respondent 16's (R16) preferences pre- and post-discussion were exactly the same, as shown in Figure 2.8. R16 is a retired riparian land owner, hobby-farming 20 per cent of his land and using the river regularly for recreation. R16 did not regularly attend the meetings in the early stages of the process; he held neutral opinions as to the health of the river and how it should be managed.

Of the seven respondents, Respondent 10's (R10) weights were the most evenly distributed between the criteria in the pre-deliberative survey, with a spread of no more than 12 points between each level of importance (see Figure 2.9). In the post-deliberative results, his buffers and cost preferences increased by 17 and 11 percentage points respectively; while land loss and meanders decreased by 17 and 11 percentage points respectively.

It should be noted that the changes in preference can be a result of both education and group deliberation. Since most of the education took place prior to the first survey, we surmise that the change in preferences is primarily a result of deliberation. Of course, during

deliberations, further education takes place as group members attempt to clarify their perspectives. A future area of research is to examine how the introduction of science into the deliberative process impacts preferences.

Conclusion

Exploratory results indicate that structuring the group process around explicit, quantified preferences had a very positive impact on the process, allowing the group to have more substantive and detailed discussions about long-term river management. The group felt much more informed about river management issues and individuals become more confident about their opinions and preferences. The group was able to move forward in applying various alternatives to areas of the river instead of feeling trapped in discussions about their options. The group's collective efficacy—its 'shared perception of its ability to successfully perform a task' (Tasa and Whyte 2005)—increased.

Although these results represent a very small survey sample size, they indicate the capability of conjoint analysis to measure preferences and changes in preferences. An advantage of the small sample size is the researchers' opportunity to evaluate preference change with knowledge of the personalities and situations of the group participants, something a larger sample size may not allow. It should be noted that conjoint surveys are typically given to small facilitated focus groups; the complexity of the conjoint method does not allow for it to be easily used in mail or telephone surveys. Although it is difficult to determine with certainty that the changes captured by the conjoint truly reflect changes in the actual preferences of the respondents, the anecdotal evidence supporting these changes indicates that the conjoint captures some degree of preference change. Further studies with larger sample sizes would help determine the applicability of conjoint as a useful preference measurement tool.

In comparing the structured decision process to unstructured discussions that took place prior to this process, it was clear that using a quantitative framework served to facilitate dialogue between members about how to manage the river and made the communication process more productive. Stakeholders felt that the process served to raise awareness, generate new ways of thinking, revitalize the stream team, produce a solidly informed group, give the group a common language, and generate a high degree of optimism. Stakeholders

appreciated that they were involved throughout the process and that they were able to understand the process and how their preferences were valued and used in the ranking of the alternatives.

A difficulty in group research is to know with certainty whether a certain tool actually increased the quality and productivity of group discussions. Such is the case with this study on structured group processes. Determining the effect of structure on the quality of the group deliberations is difficult and relies on anecdotal evidence coupled with the conjoint analysis results. Additionally, it is difficult to link preference change directly to process structure, and we can only surmise at this point that there is a relationship between the two. Changes in preferences could also be a function of the group dynamic, the time allotted to the process, quality of the group's level of education, other group biases discussed above, the individual's range of opinion, survey biases, etc. In spite of these criteria, we feel these initial results support: (1) the use of conjoint analysis to measure changes in preferences of group members/participants; and (2) the use of a structured process to ensure the group discussions are productive. We feel that this research has implications for how small groups are organized and run in situations where the group needs to consider and make tradeoffs among multiple criteria or attributes, where there is a lack of consensus of opinion, and in situations where non-familiar goods or services are involved.

Appendix: An Overview of Conjoint Analysis

Conjoint analysis considers a good, service, or program (in our case a healthy river) in terms of its component attributes or characteristics (Green and Srinivasan 1990; Kuhfeld 2005). The good or service is evaluated based on various hypothetical combinations of these characteristics. Inferences about a respondent's preferences can be made, based on how the he or she evaluates these combinations. These preferences are in the form of relative weights or utility part-worths of the characteristics.

Conceptually, conjoint estimation procedures calculate individual attribute 'part-worth' values (weights) so as to produce bundle (or permutation) utility scores that are as nearly as possible monotonic with respondents' rankings (i.e., preferences). Many algorithms exist to perform these calculations. For example, SAS has a 'transformation regression' program to accomplish this task (Kuhfeld 2005).

In our research, a 'full profile' ranking methodology was employed, in which stakeholders were presented bundles or profiles consisting of selected

combinations of all attributes. Our study had five criteria with two levels each, for a total of $2P^{5P}$, or 32 possible combinations of criteria. Previous research indicates that asking subjects to rank such a large number of profiles produces respondent fatigue and, accordingly, error. To minimize the onerous nature of the ranking task, a fractional factorial design method is typically employed, offering fewer permutations (or bundles) to rank. However, care must be taken in producing a fractional design to ensure that the design remains efficient, in the sense that the variances of the coefficients are minimized. For researchers who seek efficient, orthogonal designs, various programs exist that perform the task virtually automatically (e.g., SAS).

We employed a 100 per cent efficient orthogonal metric main effects ANOVA model, with just 8 combinations. The model is fit using ordinary least squares. (For a detailed discussion of design efficiency issues, see Kuhfeld, 2005). The characteristics are the independent variables, the ranking of the combinations is the dependent variable and the preferences or 'part-worth utilities' are the coefficients â's. In this plan, all main effects are estimable and uncorrelated. On the negative side, this plan assumes away interactions. However, this is probably a small price to pay, given the reduction in number of profiles to be rated. The conjoint survey given to the stakeholder group is shown in Table 2.7, along with the ranking provided by one of the respondents. Respondents were asked to rank the profiles from the most to the least preferred.

Table 2.7 Conjoint Survey with Sample Ranking

Amount of land taken out of agriculture	*Number of high quality pools in the river section*	*Width of riparian buffer*	*Percentage of the river section that minimizes flood damage through meandering*	*Annual per capita average cost borne by local taxpayers to manage 1 mile of the river—in current dollars*	*Ranking 1 = best choice 8 = worst choice*
A 11-20 acres	Increases over time	150 feet	10 %	$100	3
B 1-10 acres	Does not change	150 feet	10 %	$100	6
C 11-20 acres	Increases over time	50 feet	75 %	$100	1
D 11-20 acres	Does not change	150 feet	75 %	$20	2

	Amount of land taken out of agriculture	*Number of high quality pools in the river section*	*Width of riparian buffer*	*Percentage of the river section that minimizes flood damage through meandering*	*Annual per capita average cost borne by local taxpayers to manage 1 mile of the river—in current dollars*	*Ranking 1 = best choice 8 = worst choice*
E	11-20 acres	Does not change	50 feet	10 %	$20	5
F	1-10 acres	Increases over time	150 feet	75 %	$20	4
G	1-10 acres	Increases over time	50 feet	10 %	$20	8
H	1-10 acres	Does not change	50 feet	75 %	$100	7

In ranking the bundles, stakeholders implicitly make tradeoffs between the attributes. From these rankings, the researcher can estimate, for each respondent, part-worth utility values for each level of each attribute. From these values, the relative importance of each attribute can be estimated. The appropriate formula is:

$$RA_i = \frac{\text{(largest part worth for } A_i - \text{smallest part worth for } A_i)}{\sum_{j=1}^{n} \text{(largest part worth for } A_i - \text{smallest part worth for } A_i)}$$

where:

RA_i = relative importance of attribute i
AB_i = attribute i

Given estimated part-worths for each level of each attribute, it is a simple matter to calculate the total utility of any particular bundle based on the relevant part-worths.

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