Reflections on and lessons from a deliberative process for water management – a New Zealand case study

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Abstract: In this paper we describe an approach, which involves inclusive participation by a wide range of community stakeholders, policy makers, and an interdisciplinary science team. This approach can be used to enable communities to take an active role in, and contribute to, the management of natural resources. This process is based on participatory deliberation of a series of ex ante scenarios – with a varying degree of catchment resource development. The deliberation was facilitated through repeated face-to-face workshops informed by interdisciplinary science models and community knowledge. The process involved social learning in which participants came to understand their own and other stakeholder values for the catchment and the environmental, economic and social impacts for themselves, others and the community. It allowed community values and priorities to be made transparent through use of a tool called the *deliberation matrix*, so that their input could form part of management decisions for environmental issues. We describe and reflect on this deliberation process.

Evaluation of the process revealed that participants were impressed with the deliberative engagement process and had gained confidence that the process would lead to positive outcomes. The process allowed participants to learn new and relevant information regarding the environmental issue at hand. However, there were a number of areas where the process could be improved or where issues require further consideration. These were: the intensity of the time and effort required from participants; the transparency of the process; a need to communicate and use information appropriately, and the low level of trust which participants placed in local government policy makers.

Keywords: Water management, public engagement, deliberation matrix, participative democracy, reflection

The Issue

Water resource management has become increasingly challenging due to of the complexity of the issues involved. These issues are characterised by significant uncertainty; a lack of consensus on their definition and on the most "appropriate solutions", contested values, and complex interactions between stakeholders, accompanied by a need to solve problems quickly. In New Zealand, over the last two decades, there has been increasing evidence that some of the country's freshwater resources are at, or over, their assimilative capacity limits and are becoming degraded (Ministry for the Environment, 2007; OECD, 2007). Increasingly, addressing the problem has become highly adversarial between those who want to increase development and those who wish to preserve the environment.

In this paper we report and reflect on the participatory public deliberation process of the Selwyn-Waihora (S-W) water quality and quantity management project in the Canterbury region of the South Island of New Zealand. The S-W catchment drains into a lake highly valued by the com-

munity. The aim of the project was to set policy limits on the amount of agricultural nutrients acceptable in the catchment waterways using a participatory process involving a range of different stakeholders with different goals and values for the region.

Global Approaches to Water Management

For most of the twentieth century, voluntary and regulatory approaches dominated water resource management. However, towards the end of the twentieth century a number of social and political factors came together. These included; increasing public mistrust of governments and science; a realisation of current scientific uncertainty in complex systems; a movement toward governance rather than government; a desire by governments to enhance civil society; an appreciation by governments of the value of social capital; a movement towards decentralisation of power and the democratisation of decision-making; the rise of sustainability science; and an appreciation of the urgency and need for action to prevent or reverse environmental degradation. These factors have led to a noticeable shift to participatory processes being used in a range of sectors including public policy, development, planning, environmental management (Tewdwr-Jones & Thomas, 1998), natural resource management (Parkins & Mitchell, 2005), and health policy (Abelson, et al., 2003).

Background to the Selwyn-Waihora Water Quality and Quantity Management Project

In response to the issue and the global context described above, in New Zealand, the Land and Water Forum was convened in 2009, bringing together a range of stakeholders with an interest in freshwater and land management. The Forum's objective was to develop a shared vision and a common way forward among all those with an interest in water, through a stakeholder-led collaborative process. Their first report (Land and Water Forum, 2010) called for new processes for management of the water resource, and outlined 53 recommendations covering science, governance, infrastructure, allocation and the need for setting limits for water quality and quantity. The Forum provided a national framework for Regional Councils to work with their communities to set freshwater objectives and develop limits for its use. The Forum also recommended integrated decision-making in catchments, continuous improvement of management practices to improve water quality, and clearer rights to take and use water within set limits.

In response to these national signals, the Regional Council of Canterbury, Environment Canterbury, notified the Land & Water Regional Plan (LWRP) in August 2012. The LWRP outlined a collaborative approach to delivering community aspirations for water management and the setting of water quality and quantity limits, with timeframes. To this end the region was divided into ten zones. Each zone has a committee consisting of appointed members and is expected to work collaboratively to develop water management implementation programmes for the region[59].

The Zone Committee is charged with producing a Zone Implementation Programme (ZIP) that will set limits for nutrients in the catchment.

The S-W catchment is one of ten zones identified in the Canterbury region. S-W Zone Committee was formed in September 2010 and is "a joint committee under the Local Government Act (2002) of Environment Canterbury and the Selwyn District and Christchurch City Councils" (Selwyn-Waihora Zone Committee, 2011:7). The Zone Committee identified a set of Priority Outcomes for the catchment. These Priority Outcomes embody values regarding the desirable "state of the world" in terms of environmental, economic, social and cultural conditions in the catchment and

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[59] Environment Canterbury website, http://ecan.govt.nz/get-involved/canterburywater/committees/Pages/about-zone-committees.aspx

are consistent with the goals of the Canterbury Water Management Strategy. The following nine Priority Outcomes were identified:

- Thriving communities and sustainable economies
- High quality and secure supplies of drinking water
- Best practice management of nutrients and water
- The integration of kaitiakitanga (Maori custom of stewardship and protection of the land, water and biodiversity) into water management
- Healthy lowland waterways
- Te Waihora is a healthy ecosystem
- Hill-fed waterways that support aquatic life and recreation
- The protection of alpine rivers and high country values
- Enhanced indigenous biodiversity across the Zone

Methods: The Deliberation Process Stages

A series of meetings was held to refine and validate the ZIP Priority Outcomes for the S-W catchment. The Priority Outcomes (and a number of agreed upon sub-outcomes) are the values against which a set of development scenarios, of differing intensity, for the catchment were evaluated. The evaluations were conducted by 13 stakeholder groups in a series of public deliberative events, following the steps outlined in Figure 1.

The deliberative events occurred approximately once a month for about a year. Each event lasted approximately four hours with a buffet dinner available to participants about mid-way through the event. Deliberations were attended by largely the same 60 – 80 stakeholder participants over the course of the deliberations.

The deliberation process was a participatory approach which sought to make the impacts of limit setting on the economic, social, cultural and environmental community outcomes transparent. Making impacts transparent helped participants to make informed choices regarding the issue. The deliberation process used was developed by merging two methodologies; the deliberation matrix (Faucheux & O'Connor, 2005; Guimarães Pereira & O'Connor, 1999; O'Connor et al, 2007; O'Connor & Spangenberg, 2007) and systems thinking and practice (Maani & Cavana, 2007). The principle behind the deliberation process was to create a "deliberative forum" that offered opportunities for participants to explore progressively, or in parallel, different potential solution scenarios and their likely outcomes across a range of community values (the ZIP Priority Outcomes) for the region, of an agreed problem. A systems perspective of the issue was important in order to understand that any policy decisions have an impact across a range of outcomes within the catchment. The deliberation exercises were iterative, allowing participants to go deeper to gain and explore increasingly detailed information.

Figure 1: The framework used in the Selwyn-Waihora water quality and quantity project.
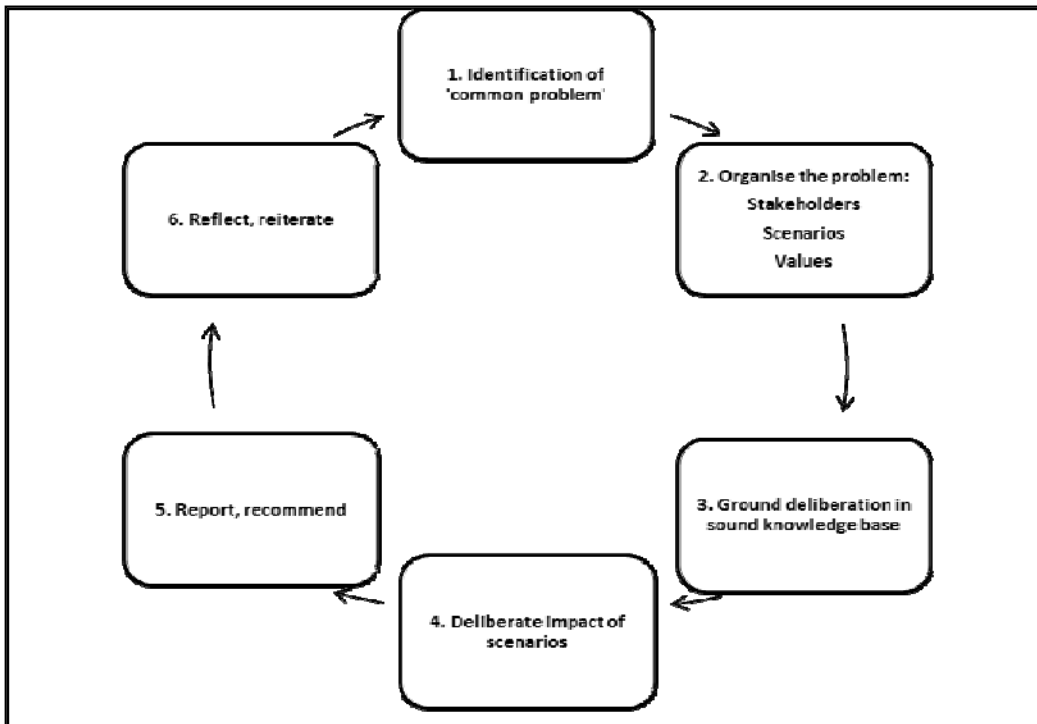
Building a Common Understanding of the Problem

Building a common understanding of the working of a catchment and the related issues was essential for collective community understanding of the common problem i.e., the need to set limits for catchment water quality and quantity. An interdisciplinary science team was set up to construct a series of models of the catchment that could be used when constructing and analysing scenarios. These systems models were later augmented by the local knowledge of participants. An initial workshop was held providing a range of people with the background to the problem, and inviting them and those they knew to be involved. Details from each of the workshops can be found on the website set up for this purpose.[60] Based on feedback, 13 stakeholder groups were identified.

Organising the Problem

The second step was organising the problem. There were two sub-steps involved, 1) Involving key stakeholders, and 2) Grounding the deliberation in a sound knowledge base. This second sub-step was achieved by identifying a set of relevant development scenarios for scientific description with reference to the ZIP Priority Outcomes.

Stakeholder Groups

The 13 stakeholder groups identified and engaged for the deliberations were:

- Rūnanga (local indigenous population group)
- Irrigation providers
- Dairy farmers and industry
- Arable/Horticulture/Viticulture farmers and industry
- Sheep and Beef farmers and industry
- Rural professionals
- Rural women

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[60] http://ecan.govt.nz/our-responsibilities/regional-plans/regional-plans-under-development/ellesmere-selwyn/Pages/community-involvement.aspx.

- Environmental advocates
- Recreation advocates
- Commercial/Tourism/Energy companies
- Education authorities
- Health/Local Authorities
- Community Boards and Committees

A report was produced reflecting on the process used for involving stakeholders, including problems associated with stakeholder selection, and some suggestions for improving the process (Mackay and Kelly, 2012). Mackay and Kelly (2012) recommended that lead agencies organizing public deliberations have a plan in place for identifying and selecting stakeholders. They developed a four stage iterative stakeholder identification process, 1) Build an initial community profile, 2) Develop an initial list of potential stakeholders, 3) Develop an understanding of the (local) issue from a local perspective and, 4) Build a stakeholder list and initiate conversations with these individuals, groups and organizations. Explication of each of these stages is given in the report.

Grounding the Deliberation in a Sound Knowledge Base
Three scenarios were developed, informed by visions for the future of the catchment. Scenarios can be driven by land use or outcomes (i.e. what would you need to do to get to a specified outcome) (see Figure 2). Two of the scenarios were land use driven, the third was focussed on an environmental outcome. For each scenario, nutrient load and water flow were used to calculate nutrient concentrations and model the likely impacts on the ZIP's priority values, including attention to the environmental impacts.

Figure 2: Start points of outcome and land use driven scenarios.
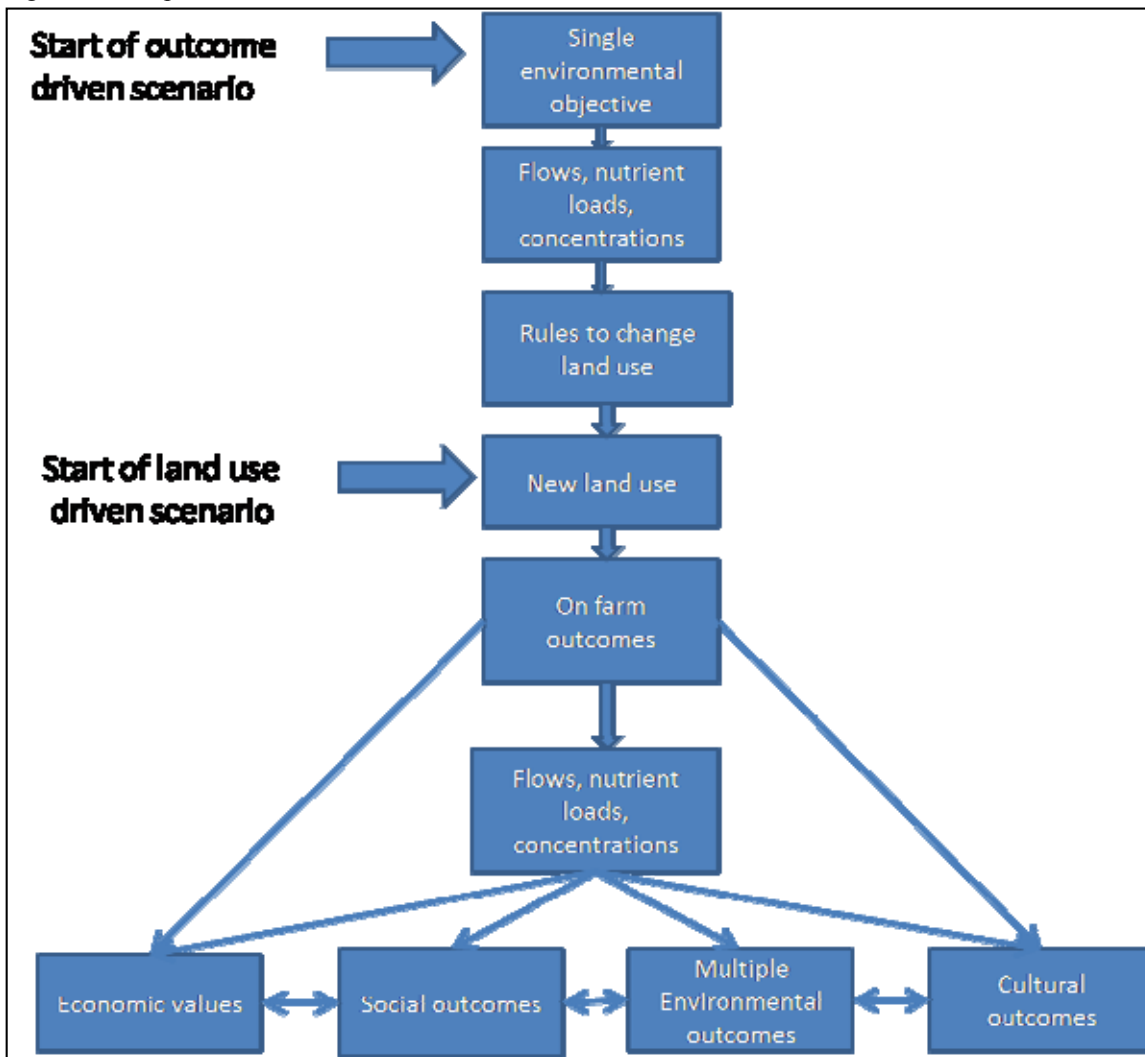
It was important that the scenario deliberation and analysis be conducted using scientific knowledge and sound process and systems models. In the S-W, this involved extensive interdisciplinary science analyses of the community driven scenarios, and the provision of extensive technical information at three different levels of complexity and detail. A one page overview document and a 30 page summary document were sent to participants about a week before each deliberation event took place. A 200-300 page technical report for each scenario was also made available on the internet for those participants who desired access to all the technical details.[61] A short technical session was also held, before each of the last few deliberation events, for those participants who wanted to question or explore further some of the details.

Deliberating the Outcomes of the Scenarios

At the beginning of each deliberation event a team of people, presented the scientific evaluation of the scenario, with respect to the Priority Outcomes, to the participants. Questions and observations were taken and clarifications given. The team was chosen for their ability to translate the science based outputs of the modelling into what this would mean on the ground (i.e. in the S-W catchment),

Using the information and analyses provided about the scenario by the interdisciplinary science team, as well as information deliberation participants brought to the process, each stakeholder

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[61] http://ecan.govt.nz/our-responsibilities/regional-plans/regional-plans-under-development/ellesmere-selwyn/Pages/community-involvement.aspx

group made judgments about the scenario's outcomes for the catchment as to whether the outcomes were acceptable (green) or not (red), or if participants believed they needed more information (blue). These judgments were recorded with coloured dots, in the deliberation matrix, along with the group's reasons for making each judgment. Each stakeholder group was managed by a facilitator.

Stakeholders were asked to consider the results from the deliberation matrix and try to come up with solutions or mitigations for the unacceptable impacts (turning reds to greens). That is, participants were asked to look at the outcomes that had been judged unacceptable and asked to generate ideas about what would need to happen to change the impact to an acceptable state. Notes were taken documenting ideas and suggestions that would enable appropriate changes. These were then able to be incorporated into the recommendations for managing the issue. Towards the end of the process, stakeholders were deliberately formed into mixed groups. In these groups they had the opportunity to meet and work with members of different stakeholder groups in order to gain an understanding of others opinions, and enable social learning.

Report and Recommendations
Documenting the judgments, discussions and solutions from stakeholders formed the basis of recommendations to the Zone Committee who were required to provide local government (Environment Canterbury) with recommendations to improve cultural and environmental outcomes in the S-W catchment while maintaining farm viability and economic growth. The final document produced by the Zone Committee incorporating the deliberative discussions with stakeholders can be found on line.[62]

Project evaluation
In addition to the above reflections on the deliberation process an evaluation process was built into the design of the project. The academic literature on public deliberation processes notes a lack of reliable and valid measures (e.g., Rowe and Frewer, 2000; 2004) regarding both process and outcome factors. In an earlier evaluation of the deliberation process in the Hurunui catchment in Canterbury, Small & Montes de Oca Munguia (2012) identified, from a literature review, a range of process and outcome constructs related to the success of the deliberative process and its outcomes, which they developed preliminary measuring scales for. These constructs and preliminary scales provided a basis for the evaluation of the S-W deliberations. Below, we briefly explicate this evaluation process, present headline results and discuss learnings and implications of the evaluation for future deliberative processes.

Evaluation Constructs and Instruments
Two survey instruments were developed and implemented (i.e. a before and a mid-point evaluation survey) based on the scales developed by Small and Montes de Oca Munguia. A third survey instrument (an after the event evaluation survey) was designed but remains to be implemented. Although designed as parallel instruments (i.e., before, mid-point and after), the survey instruments differ as different evaluation questions are suitable for different stages of the process. The constructs assessed in the evaluation component included (see Appendix 1 for more details):

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[62] http://ecan.govt.nz/publications/General/zip-addendum-at-150613-v6.pdf

- Representativeness of the stakeholder groups
- Stakeholder mandate
- Transparency of deliberation process
- Participant's access to information resources
- Information presentation and visualisation tools
- Participant learning during the deliberation process
- Participants' satisfaction with facilitation of the deliberations
- Participants' perception of their influence on the deliberation process and the project outcomes
- Social capital (with respect to land use and water management)
- Participant's perception of likely overall project success

The response scale used to measure the constructs was a seven-point Likert scale with anchors at three points (i.e. 1=strongly disagree, 4=neutral, 7=strongly agree). Thus, a low scale score represents a negative perception of the construct (e.g., lacks representativeness, lacks mandate, etc.) while a high score represents a positive perception of the construct (e.g. stakeholders are representative, participants do have a mandate, etc.).

Evaluation Results

Fifty-six surveys were returned at the start of the process, and thirty-eight mid-point surveys were returned. As can be seen from the min/max scale scores, at the start of the process, individual deliberation participants expressed a range of positive and negative perceptions regarding these constructs (Table 1). In the 'before survey' the mean scores for each item were marginally above the scale neutral midpoint - indicating slightly positive overall perceptions. Transparency and mandate received the most positive scores. The lowest mean score (4.5) went to the scale measuring participants' belief in the probability of the project achieving successful outcomes.

Despite agreeing to be part of the process, participants were, at this early stage, yet to be convinced that the S-W deliberation process would achieve its land use and water quality objectives, and that their (the participants) voices would be heard and heeded. Social capital was the next lowest with a mean score of 4.7. Scale reliabilities, as measured by coefficient alpha, were low adequate to moderate. The combined pre-deliberation evaluation scale had a mean score of 4.9 and a good coefficient alpha of .81.

Table 1. Pre-Deliberation evaluation scales: min, max, mean, SD, 95% CI, coefficient alpha (n=56)

Scale	No. Items	Min	Max	Mean	SD	95% CI[1] ±	Alpha[2]
Representativeness	2	1.0	6.5	**4.8**	1.20	0.31	.67
Mandate	2	2.5	7.0	**5.0**	1.14	0.30	.63
Transparency	3	3.0	7.0	**5.2**	0.86	0.23	.57
Project outcome	2	1.0	6.5	**4.5**	1.21	0.32	.74
Social capital	4	2.3	7.0	**4.7**	0.98	0.26	.74
Combined scale	13	3.1	6.1	**4.9**	0.68	0.18	.81

Note: scale scores: 1 = strongly disagree, 4= neutral, 7 = strongly agree (lower scores rate the factor more negatively and higher scores rate it more positively).

[1] 195% Confidence Interval of scale score.

[2] Coefficient alpha of scale

Results for the mid-point evaluation are presented in Table 2.

Table 2. Mid-Point deliberation evaluation scales: min, max, mean SD, 95% CI and coefficient alpha ($29 \le n \le 38$)

Scale	No. Items	Min	Max	Mean	SD	95% CI[1] ±	Alpha[2]
Issue definition	2	2.5	7.0	**5.4**	1.18	0.39	.84
Transparency of process	6	2.3	7.0	**5.2**	1.18	0.39	.88
Access to information	5	2.4	7.0	**5.4**	1.13	0.37	.87
Information tools	9	2.7	6.7	**4.8**	.96	0.32	.87
Time adequacy	3	2.3	7.0	**4.4**	1.30	0.43	.78
Structured dialogue	5	4.9	6.2	**5.8**	.84	0.28	.86
Participant learning	4	4.0	7.0	**5.6**	.84	0.28	.75
Participant influence	4	4.6	5.3	**5.0**	.98	0.32	.79
Social capital	5	3.9	5.9	**4.8**	.98	0.35	.76
Project success	3	2.3	6.7	**4.9**	1.09	0.38	.87
Combined scale (all scale items)	46	3.8	6.1	**5.2**	.82	0.27	.97

Note: scale scores: 1 = strongly disagree, 4= neutral, 7 = strongly agree (lower scores rate the factor more negatively and higher scores rate it more positively).

[1] 195% Confidence Interval of scale score.

[2] Coefficient alpha of scale

The mid-point scale constructs which received the highest positive ratings were the structured dialogue scale (Mean = 5.8), and the participant learning scale (Mean = 5.6). These two scales indicated that the participants were reasonably happy with the fairness, honesty and structure of the way the deliberation process was being run by the facilitators and presenters and with their own learning outcomes. The next most positive evaluations went to the constructs of issue definition (Mean = 5.4) and access to information (Mean = 5.4). The lowest scale score was time adequacy (Mean = 4.4 – a neutral to slightly positive score). Information tools scale (Mean = 4.8), social capital scale (Mean = 4.8) and the proxy score for overall project success (Mean = 4.9) were slightly to moderately positive. Combining all respondents' scale items into a single scale score for the project gave a moderately positive overall score for the project of 5.2 at project mid-point.

The above results indicated that participants were more impressed with the deliberative engagement process than at the start. By the mid-point of the project they were confident that the process would lead to positive outcomes for their own stakeholder group, and were reasonably confident of a positive outcome for land use and water quality and quantity. Participants were satisfied that they were learning new and relevant information regarding the water quality and management issue. There was also moderate agreement that participants were able to influence the process and outcome and that the project would successfully achieve its objectives of improved land use and water management.

Lessons and discussion

There were a number of areas in which the process could be improved or where there were issues that will require further consideration in future deliberations.

Time and Effort Required

A major area of concern is around the intensity of the time and effort required from the participants in the deliberation process. Time adequacy of the process received the lowest of all the mid-point evaluation survey scale scores (Mean = 4.4, only slightly more positive than neutral). More time would have helped participants assimilate and understand the complex information presented. Deliberating and evaluating the probable impacts of a scenario with respect to the Zone Committee's Priority Outcomes, was also a time pressured activity. However, despite these indications that not enough time was being allowed for some of the deliberation activities, qualitative comments on the mid-point evaluation survey also indicated that the intensity of time and effort required by the deliberations, up to the point of data collection, was much greater than the participants' original expectations.

Overseas experiences with collaborative approaches to catchment water management indicate the importance of allowing appropriate timeframes for participative public engagement and deliberation. In a study of 44 watershed partnerships in California and Washington (randomly selected from over 150 partnerships), Leach, et al. (2002:645) found that it takes "about 48 months to achieve major milestones, such as formal agreements and implementation of restoration, education, or monitoring projects." Researchers in the Advocacy Coalition Framework arena, which focuses on voluntary collaboration for policy development, suggested that it was necessary to take a long-term time perspective (i.e., up to ten years) to understand sub-system behaviour and impacts (Weible, et al., 2011).

Similarly, research into public engagement and deliberation processes (Rowe & Frewer, 2000, 2004; Rowe, et al., 2008) also stressed the importance of allowing adequate timeframes, as has research into inter and transdisciplinary research processes (Burton, et al., 2008; Jakobsen, et al. 2004; Tress, et al. 2003, 2005). In comparison with the timeframes advocated in the literature, the Environment Canterbury policy process was very time constrained – the Selwyn-Waihora Zone Committee was formed in late 2010 and their recommendations were due in late 2012. The Leach et al. (2002) study found that partnerships younger than 2 years had made very limited progress while partnerships of five years old had made a great deal of progress.

This is a significant cause for concern, as indicated by the findings of previous empirical research, such constrained timeframes may be 'setting the project up for failure'. Another important aspect, that the process and materials have been designed for, is to do justice to the public participants' efforts and commitment to the process, by recording and summarising as much of their discussions as possible. This process is also compromised by the comparatively brief time allocated to the deliberation of each scenario given the number of judgments focus groups participants are expected to make (i.e., approximately one hour for up to 22 judgments). These time issues present a dilemma in that although more time is required for the process, it is already very time intensive for the participants, who are all attending on a voluntary basis.

These constraining factors have necessitated creative and adaptive approaches to design of the deliberation process and materials in an effort to collect and display data in the most time efficient and effective manner and for the easy cognitive comprehension and assimilation of the large amounts of data generated in a deliberation. The degree to which these processes and materials will help the project succeed in producing the desired outcomes, under the current process constraints, is an empirical question. Currently we are collecting feedback and evaluation data from the deliberation participants and process facilitators in order that we may, on an ongoing basis, adaptively improve the process.

Transparency

Another area of concern was in some aspects of the process transparency. There was moderate agreement that there were no hidden agendas and good agreement that the deliberations were organised in a clear and transparent manner and run openly and honestly. However, between the before and mid-point evaluations there was backward movement (small to medium effect sizes but non-significant at the $p < .05$ level) regarding understanding of how the results of the deliberations would be used and how the process relates to policy development. This result suggests the need to continually reiterate to participants throughout the deliberation process how the results will be used and how they will influence the setting of policy and nutrient limits.

Participants were moderately satisfied with their access to information, the technical team's presentation of information, and that the information being presented was helping them better understand the issue. However, some of the information tools received fairly neutral responses. In particular, the economic implications, the social and cultural implications, and the on-farm implications of the scenarios received very modest (i.e., neutral) ratings. Participants were more satisfied with the explication of environmental implications of the scenarios. Deliberation participants were in partial agreement that the Zone Committee's priority outcomes were an appropriate set of values to examine the potential catchment development scenarios. These results suggest room for improvement regarding the scenario tools and explanation of scenario impacts on the values of economy, environment, society and culture. There may also be room for improvement in the development of priority outcomes and value goals for the catchment.

Trust

Of particular note (and concern) was the low trust which participants placed in local government policy makers and the lack of movement in this indicator between before and mid-point evaluations. This has implications for how the recommendations (and resulting regulations set up in the catchment) may be perceived and/or followed. On the positive side, although the related issue of participants' perception of public trust in water management in the catchment was only neutral in the mid-point evaluation survey, there was significant positive movement ($p < .05$, medium effect size, $d = 0.54$) in this question item from the before survey.

Reflections on the Deliberation Process and Social Learning

The evaluation results indicate that collective learning did occur. As part of the discussion, new ideas for addressing the issue were identified. It was hoped that by having the different stakeholder groups interact with one another, social learning about the 'other' would occur as personal relationships developed, enabling understanding of the 'others' values, circumstances and position, regarding the issue. There was some evidence that this was the case over the course of the deliberative events, as interaction between stakeholders increased and several groups joined together to present their views.

Each of the stakeholder groups spent considerable time exploring the science behind the catchment system in relationship to their values for the region and their personal stake in the issue. However, in this kind of 'in-group' there is a potential for the occurrence of group think (Janis, 1971; Turner & Pratkanis, 1998), group polarisation (Isenberg, 1986) and risky shift (Stoner, 1968). These group processes have the potential to lead to increased conflict with 'out-groups' with different values or goals, and the phenomenon referred to as devil shift (Sabatier et al, 1987), where out-group positions are exaggerated and out-group members demonised. While there was disagreement, and in some cases, little resolution to particular issues, interpersonal relationships and social capital were built up by mixing up stakeholder groups at different points and by ensuring there were breaks (e.g. for dinner) that also enabled a degree of mixing across stakeholder groups.

Further Reflection on Challenges for Deliberation Processes

Participatory approaches are not without their challenges and their critics. Pinpointing the stakeholders or community of interest and getting representation and participation may be difficult (Laurian, 2003). Barriers may include time commitments (Tewdwr-Jones & Thomas, 1998), lack of confidence in process or other actors, or lack of concern or awareness about the issue (Laurian, 2003), and perception of possible negative consequences of involvement in participation (Miraftab, 2003). Ideally, deliberative public engagement would involve all individuals and groups who had an interest or stake in the issue under deliberation (Parkins & Mitchell, 2005). In practice, this is not usually possible. Generally, such processes would only be attended by a fraction of the potential stakeholders or stakeholder groups. Lack of full participation raises issues of the representativeness and mandate of participants. Practices, such as the deliberation process outlined, help bring the public on-side, if only to a small percentage of relevant stakeholders. The deliberative process forced those involve to think through the problem and potential solutions and helped increase the acceptability of the final decision in the catchment.

The deliberation events described enabled approximately 90 people to take part in the process. These people participated in up to six or eight deliberations over a period of around nine months. This resulted in a highly educated group of people who became very familiar with the issue and potential impacts of solutions. We also saw evidence that the primary production sector was playing a role in using its farmer and agribusiness networks to inform a wider circle of people about issues.

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Appendix 1: Item statements used to measure representativeness, mandate, transparency, project outcome and social capital.

Scale	Item Statement
Representativeness	The participants who are attending the deliberation workshop are a fair cross-section of all the relevant stakeholder groups.
	All relevant community, general population and special interest stakeholder groups are adequately represented by the participants at the deliberation workshop.
Mandate	I feel that I have a genuine mandate to speak for the stakeholder group that I represent.
	Participants from other stakeholder groups have a genuine mandate to represent their groups.
Transparency	I do not think there is any kind of "hidden agenda" behind the deliberation workshops.
	It is clear to me how the results of the deliberation workshops will be used.
	I understand how the deliberative public engagement process relates to policy development.
Project outcome (probable success of project objectives)	Overall, I believe this project will be successful in meeting the expectations and needs of the stakeholder group whom I represent.
	I believe that the outcome of the project will definitely result in the adoption of improved practices and processes that have a positive impact on land use and water quality in the Selwyn-Waihora catchment.
Social capital (with respect to land use and water governance)	I believe public trust in water resource management in the Selwyn-Waihora catchment is high. (note: deletion of this item increased scale reliability)
	I am motivated to participate in future civic and democratic processes.
	I have faith in deliberative democracy and participative public engagement for the development of public policy regarding contested issues.
	I have faith and trust in local government policy makers.
	I have faith and trust in the expert advice provided by scientists for the development of evidence based policy.