Shaping More Sustainable Communities: a Case Study in Urban Water Management

Robyn M. Moore
Victoria Management School
Victoria University of Wellington
New Zealand
robyn@j.co.nz

Extended Abstract

Purpose
Urban water systems, in particular, are under increasing pressure to meet the expectations of communities, with water managers required to articulate sensible and sustainable management initiatives that will secure water supplies and protect water for its intended use, now and in the future. Despite policy and regulation intended to advance outcomes and integrate efforts within the complex area of urban water management, fragmented approaches persist, while a pattern of decline in the quality of New Zealand's urban water resources remains a cause for concern. Nearly half of urban rates in New Zealand apply to water and wastewater management. Thus, this study is concerned with increasing awareness of the critical constraints to achieving healthier, more sustainable systems that are affordable for New Zealand communities. The specific challenges facing a community pursuing sustainable urban water management objectives are examined and solutions sought and tested.

Design/methodology/approach
Subsequent to a piloted investigation, a methodological framework was proposed, based on integrating three complementary perspectives. The Theory of Constraints (TOC) was used with a Stakeholder Typology to identify 'typical' and 'atypical' system stakeholders and examine their perspectives, while Causal Loop Diagrams (CLDs) from Systems Dynamics were constructed with participants to explore and circumvent potential negative outcomes. Thus, a case study in a community resource management setting is described that tests the value of the combined framework.

Findings
The combined framework provided a source of deep insights into the challenges, dilemmas, potential solutions and side effects facing resource managers and other stakeholders in an urban water system under pressure from population growth and climatic/topographical conditions. It is possible that the combined theoretical framework can be applied to other resource management cases. The use of the Stakeholder Typology to complement TOC provided a tactical element not routinely evident in systems studies, valuing the experiential and historical perspectives of those who might otherwise be treated as being outside the system, their perspectives marginalised or ignored. Solutions that were sought and tested using TOC and CLDs have been put into practice and are driving actions and dialogue that to date, appear to be delivering positive change for the community and other stakeholders (see Moore 2009: Appendix 10).

Research limitations/implications

The present study provides a starting-point for further research combining TOC with a stakeholder engagement methodology in the resource management sector. One perceived limitation is that once the TOC practitioner disengages from the research, this leaves stakeholder insights to be shared with other stakeholders in a potentially ad hoc manner; if indeed they are shared at all, limiting ongoing improvement. Training an in-house TOC practitioner would help to resolve this. To a limited extent, this has occurred in this instance, with a Kapiti Coast District Council (KCDC) Water Project Manager receiving guidance in IO mapping from the researcher and having access to the full thesis. Following the Kapiti case as it progresses, will reveal further study limitations.

Originality/value

The combined TOC, CLD, and Stakeholder Typology framework has proven of value in seeking and testing a number of solutions to the long standing problem of water insecurity on the Kapiti Coast. In particular, the Kapiti Coast District Council has adopted a Water Communications Strategy and a stakeholder engagement process. These are necessary conditions for a more sustainable urban water system, according to the IO maps and CLDs prepared with Councillors and other participant stakeholders. That the thesis played some part in informing actions – with the researcher consulted to review KCDC's Water Communications Strategy (in September 2009) – is a notable and promising outcome of the study, from a resource management – and also a personal – perspective.

Key words: Sustainable urban water systems, Theory of constraints, urban water management, Stakeholder typology, Decision making, Case study.

1 Introduction

The motivation for this study was to consider how communities might take a more integrated and systematic approach to meeting the challenges of water management in New Zealand, and achieve more sustainable systems. Urban water systems, in particular, are under increasing pressure to meet the expectations of communities, with water managers required to articulate sensible and sustainable management initiatives that will secure water supplies and protect water for its intended use, now and in the future. Despite policy and regulation intended to advance outcomes and integrate efforts within the complex area of urban water management, fragmented approaches persist, while a pattern of decline in the quality of New Zealand's urban water resources remains a cause for concern. Nearly half of urban rates in New Zealand apply to water and wastewater management. Thus, this study is concerned with increasing awareness of the critical constraints to achieving healthier, more sustainable systems that are affordable for New Zealand communities. It tests the use of the Theory of Constraints (TOC) systems framework and a Stakeholder Typology to examine ways that communities might gain better outcomes from their investment in urban water management initiatives. The thesis demonstrates the methodology by focusing on Kapiti, a settlement north of Wellington, which has been debating and responding to water quality and security issues for more than a decade.

2 Methodological Approach

2.1 Ethical Considerations

Early in the investigation, the researcher applied to the University Human Ethics Committee for leave to request participants to be named. All participants subsequently agreed to their comments being attributed to their name, though not all wished to attribute their comments to an organisation they were affiliated with. Identifying participants is a departure from the generally accepted procedure in qualitative studies. However, the sharing of knowledge and perspectives in a systematic and transparent manner (the researcher adopted the term 'thinking out loud') is in keeping with the intention of the research design: to foster a supportive environment for stakeholder engagement, revealing deep insights and critical understandings by encouraging stakeholder participants to share their 'thinking out loud'.

2.2 Combining The Theory of Constraints and Stakeholder Typology

A brief Pilot Study conducted by the researcher revealed that the selection of participants with a stake in the system under investigation might be assisted by applying stakeholder analysis. Stakeholder mapping (Elias, Cavana and Jackson, 2002; Freeman, 1984), and Mitchell's (1997) Stakeholder typology, informed the initial participant selection process, while an award-winning paper on stakeholder analysis in Public Relations by Rawlins (2006) was discovered during a later literature search. This led to a further stakeholder group (the Starorough Flaxbourne Conservation Project from Marlborough) being identified and included in the study. Specific stakeholders linked with the strategic issue were identified according to the ten categories that appear in the figure below. Note the two directional arrows, illustrating the nature of the relationship between the stakeholder and the system issue.
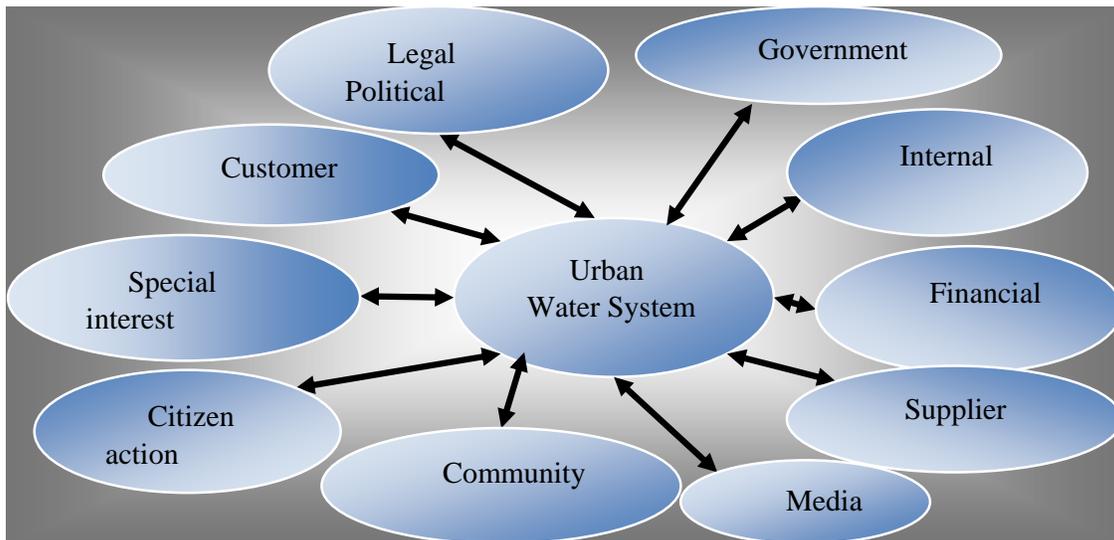
Figure 1. The Stakeholder map
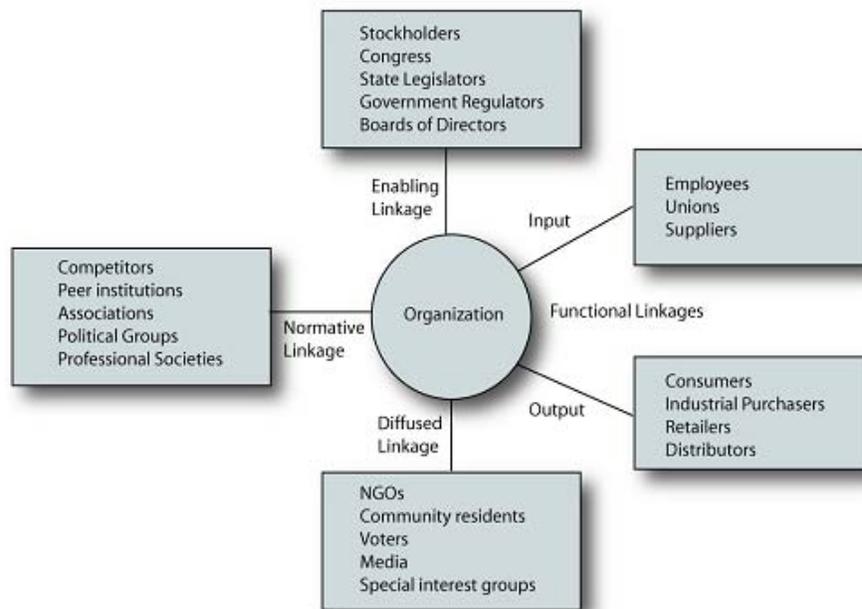
Figure 2. Stakeholder linkage model (Rawlins, 2006:4)

Following the mapping of participants using the generic stakeholder map (Freeman, 1984; Elias et al., 2002), emphasis turned to the linkages (Rawlins, 2006), or the connections between the system and the participant, with care taken to ensure the participant stakeholders were represented in each of the linkages.

The justification for the selection of the Starborough Flaxbourne participants is their situational linkage to the system problem, described in Rawlins (2006) as a 'normative' linkage. The 'community' and 'consumers', comprising around a third of the participants on the stakeholder grid (see Elias et al., 2002), have either a diffused or a functional (output) linkage. However, a normative linkage is also possible, given that a high proportion of the community members/consumers interviewed appeared to share common concerns and goals for their urban water system. KCDCs role in the thesis stems from a functional (input) linkage, while the Ministry of Health (MOH), Greater Wellington Regional Council (GWRC) and to an extent, the Department of Building and Housing (DBH), demonstrate enabling linkages.

By engaging with the participant stakeholders identified through the Stakeholder Typology, and using the Thinking Processes from the TOC methodology, the problems with the most undesirable effects on the system were identified. Solutions were sought and tested using Intermediate Objective (IO), Current Reality Tree (CRT/B) and Prerequisite Tree (PRT) mapping procedures, coupled with Evaporating Cloud conflict resolution diagrams (ECs) from TOC, together with Causal Loop Diagrams (CLDs) from Systems Dynamics. The last in a series of IO maps and the CRB are shown.

2.3   Reaching the Destination - with TOC IO Maps

The study began with an idea to agree a 'clear, unequivocal goal statement' (Dettmer, 2007) among participants. The vehicle for this is the IO or Destination map, which Dettmer argues is critical to the success of the Thinking Processes. The IO map 'fixes a firm baseline in space and time' (Dettmer, 2007: 68), with the researcher finding it necessary to change/refine the IO at various stages of the research, as certain

dynamics (plan changes for example) suggested that some IOs be reconsidered. IOs are connected in a logical hierarchy leading to the system goal. Applying knowledge of what *is* happening and what *should* be happening identifies gaps and determines the actions needed as part of systemic change. Read the IO map top down: *In order to...we must (ensure)...*
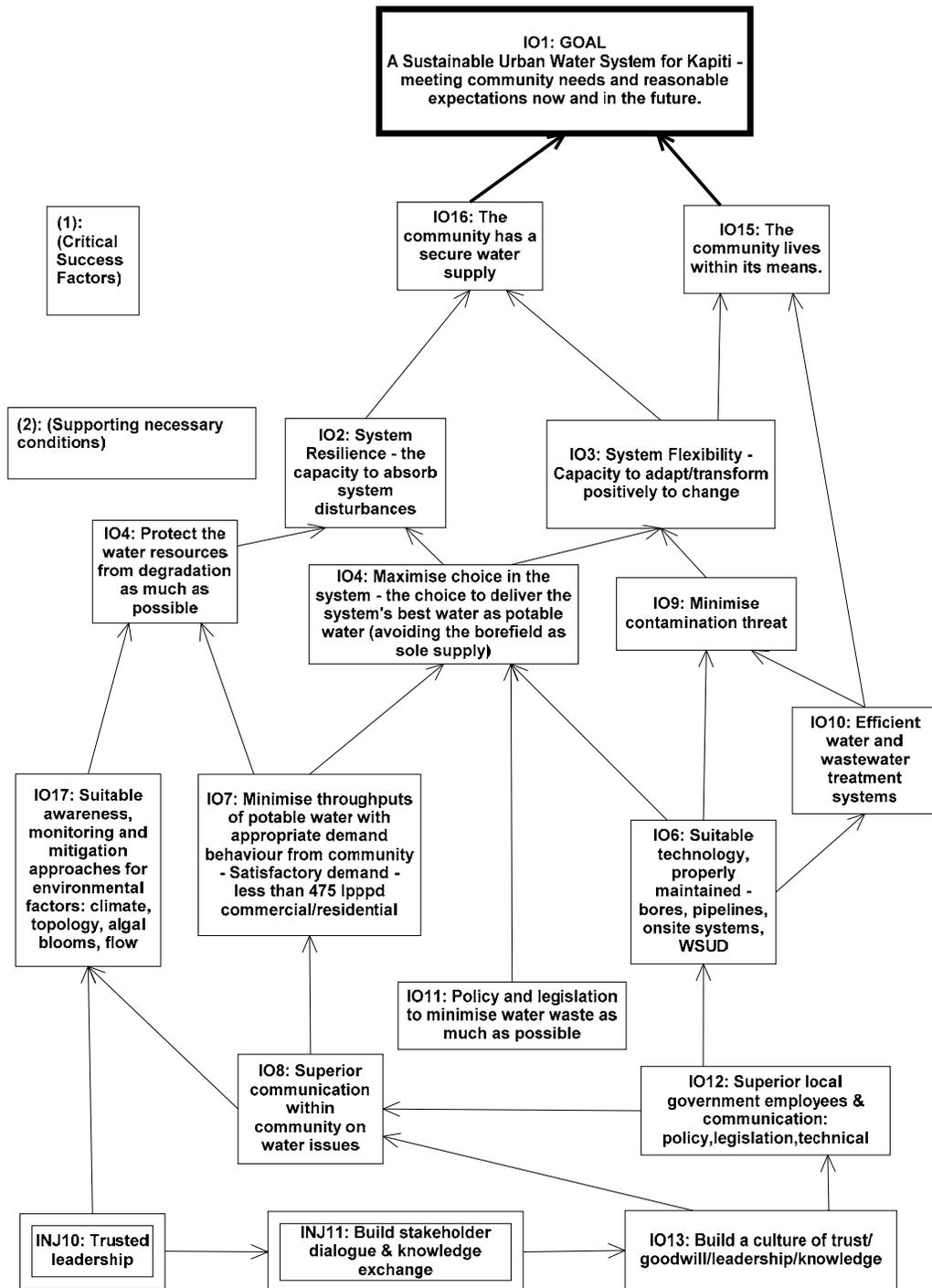
Figure 3. The final IO map prepared with input from all participants.

2.4   The Current Reality – What really is happening?

CRBs and CRTs are sufficiency-based (if…then) logic trees used to compare reality with system benchmarks in order to isolate what needs changing in a system. As such they only need to reflect the part of the system that is unfavourable (Dettmer, 2007:92).
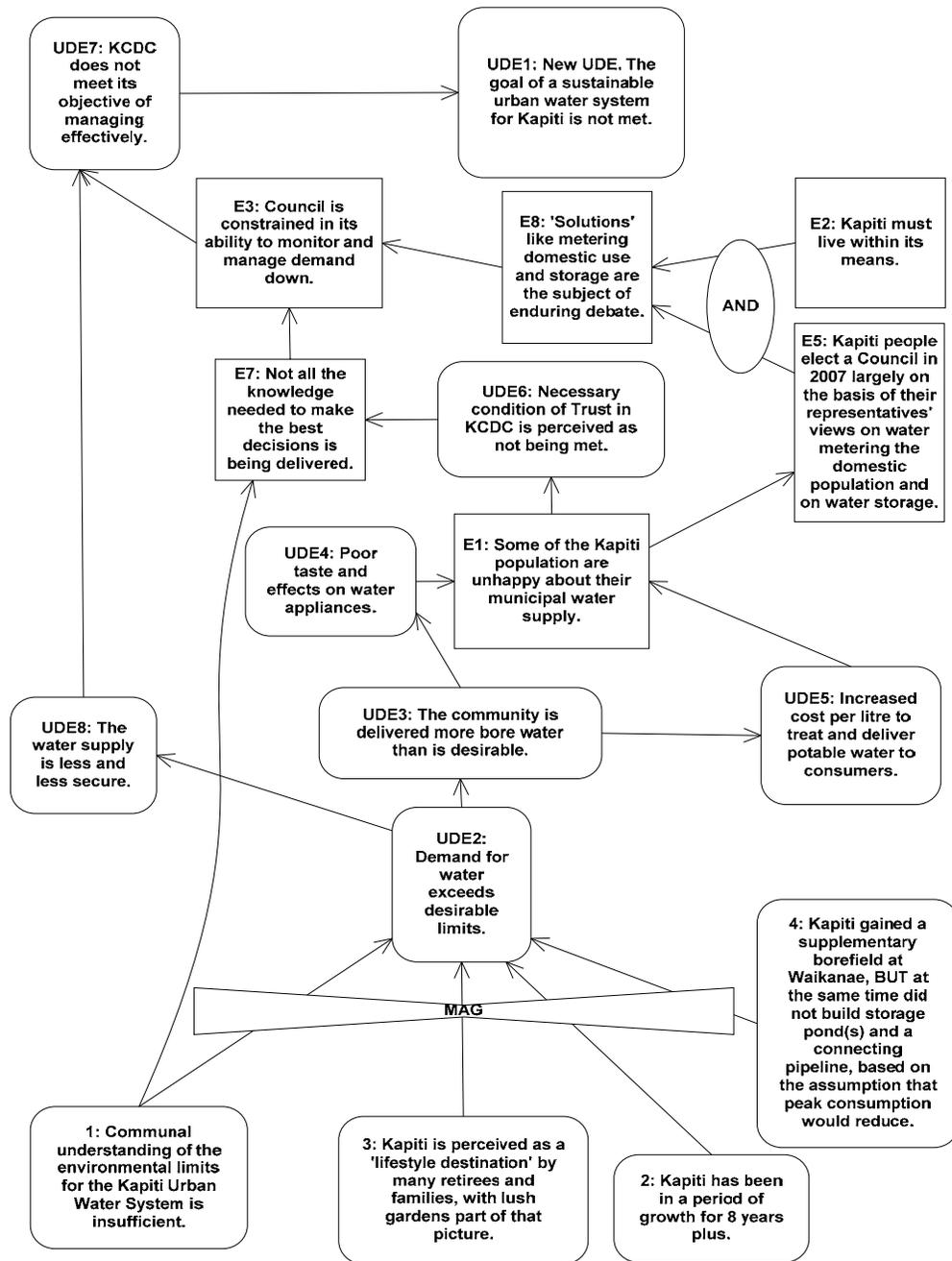
Figure 4. The CRB depicting what is happening in one part of the system.

The CRB reflects what is happening in the system now. Figure 3 maps the destination (the Intermediate Objectives), while Figure 4 shows the Current Reality Branch (CRB), focusing on the dilemma facing Waikanae/Paraparaumu/Raumati, and reflecting the part of the system most likely to impede the attainment of the system goal.

The CRB (*what to change*) was prepared in conjunction with a series of Evaporating (or conflict resolution) Clouds (or EC – see Dettmer, 2007). A UDE signifies an undesirable effect. The MAG shows four entities combining in a magnitudinal way to influence UDE2. One or more of these acts as a critical constraint to achieving the goal. Having focused on one part of the system using the participants' viewpoints, a broader CRT was constructed that could be compared with the final, most objective destination (IO) map of the system. The CRB and CRT are essentially gap-analysis tools (Dettmer, 2007). By comparing the CRB in Figure 4 with the IO map in Figure 3, the reasons behind the current reality differing from the preferred system were able to be determined.

3 Findings

The methodologies worked synergistically to give structure and clarity to situations, problems and perspectives, evoking a rich and valid picture of the system issues and potential solutions. The author contends that the TOC mapping procedures are akin to 'thinking out loud'. Participant stakeholders' contributions were captured and represented in the TOC trees and maps, that were analysed and refined with the involvement of willing participants. The participatory way that TOC was operationalised with the stakeholder typology and CLDs ensured that a variety of stakeholder perspectives and ideas came to light. Constructing the participants' 'conversations' into a systematic series of TOC trees and maps evoked the sense of an 'ongoing conversation' between system participants, even though most of them never met one another. This 'conversation' was the source of a 'roadmap' for change that participants could take ownership in.

Using a stakeholder typology with TOC to identify stakeholders in an analytical way ensured that stakeholders with important historical perspectives such as Greypower, were not unintentionally marginalised. The Starborough Flaxbourne Conservation Group, with their long experience of farming under drought conditions, was another stakeholder group identified using the stakeholder typology. This group would seem to have a tenuous link to the Kapiti urban water system at best, under a narrow systems definition. In reality, group members were able to provide valuable historical perspectives and critical insights into understanding Kapiti's problems and suggested innovative ways of dealing with them.

The methodologies of TOC, stakeholder mapping, and CLD's, combined to provide a means for the researcher to systematically work with a variety of key stakeholders, including Councillors, mana whenua (this and associated definitions in Environment Waikato, 2009), and central government agencies, without the need to have them all in the same room, or even in the same town. The value of this approach is not only to gain some deeper insights into how to protect urban investment in water assets, but also to conserve other scarce resources, notable among them, time. One practitioner can gather and articulate the viewpoints of all the stakeholder participants, and from them, gain agreement and ultimately ownership, of the desirable 'future reality' and the 'roadmap' needed to reach it.

The combination of problem structuring methodologies served to increase the participants' sense of connection and engagement with both problem and solution, with everyone's viewpoints validated by their part in the 'ongoing conversation'.

4   Conclusion

This thesis was essentially a conversation on the subject of how we might manage our fresh water for better outcomes. The study engaged with a number of willing individuals, all stakeholders in a New Zealand urban water system, and asked them for their perspectives about *the system destination, what to change, what to change to, and how to make the changes* necessary for more sustainable urban water systems.

The overarching message from the participants in this study is that for the urban water system to serve our communities and businesses better, the range of stakeholders must develop a deeper understanding of the system's limits and opportunities. If limits are not understood and agreed, it is difficult to live within them. If opportunities are not revealed, it is hard to grasp them (planting drought-resistant lucerne instead of rye-grass and clover for example, with its obvious parallel in the Kapiti context of planting gardens that do not need watering, and other less obvious implications). The thesis findings suggest that better decision-making is required to develop more sustainable environmental, and sound business agendas, that address the widest possible range of stakeholder interests. This is no small task. The participants were almost unanimous in the view that resource managers must take responsibility for raising the depth of understanding and gaining agreement towards a defined goal for the system and its range of stakeholders – and they need the resources and mechanisms to do it.

TOC provides a constructive and non-threatening way to encourage a kind of deep level reflection. However, the Pilot Study suggested that the TOC tools alone could not achieve the research objectives. There had to be a way of opening up the field of enquiry, and to facilitate ongoing reflexivity (Basset, 1995) and system improvement. The stakeholder engagement process developed in this thesis proved invaluable in this regard. Dettmer (2007) urges that simplifying approaches is the key to finding out what we know and that it is better to be approximately right than precisely wrong. This premise of simplicity was fundamental to the design of this research and to the process of ongoing engagement upon which this enquiry was constructed.

The Parliamentary Commissioner for the Environment (2000, 2001) had predicted nearly a decade ago that reaching consensus between stakeholders on environmental, social and economic goals for urban water systems would become one of the greatest challenges facing communities New Zealand-wide. The veracity of this appears indisputable in 2009 and is reason to value a methodological approach that might recognise the perspectives of diverse or divergent stakeholders, and at the same time provide the means to logically evaluate system issues and opportunities, and reveal suitable leverage points for motivating change.

5   Contribution

This paper has sought to make two contributions: the first is to test a methodology that might facilitate more integrated and better approaches to meeting the challenge of achieving more sustainable urban water systems in New Zealand; the second is to present the insights of participants to reveal assumptions underlying the not uncommon dilemmas faced by urban communities regarding water, and present a TOC 'roadmap' of the minimum changes required to resolve these dilemmas.

6   References

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