Reaching consensus on water reforms in developing communities: a case of Community Operational Research in Kāpiti, New Zealand

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ABSTRACT

Addressing the problem of reaching consensus on water reforms was the motive for this Community Operational Research (COR). While water is comparatively abundant in New Zealand, a pattern of decline in the quality of its water resources has persisted. Living up to its 'clean and green' image is a significant goal forNew Zealand, withhigh economic value derived from the effects of its globally-recognised environmental credentials on key exports like agriculture, forestry, fisheries and tourism.A 2009 government task force (*Fresh Start for Fresh Water)* suggested that a 'business as usual' approach is undesirable, and water reform should be a priority. This paper is an account of *Community Operational Research* (COR) undertaken for a Master's thesis in 2008/9. It examines the challenges and opportunities facing Kāpiti, a rapidly growing coastal community,with water scarcity and quality constraints that had long prevented them from meeting their sustainable developmentgoals. The Theory of Constraints (TOC) and a Stakeholder typology were used to identify system stakeholders and examine their perspectives. Causal Loop Diagrams (CLDs) from Systems Dynamics were constructed to explore and circumvent potential negative outcomes. Thus, a case study in a community resource management setting is described that tests the effectiveness of the combined,problem-structuring framework, to explicitly inform urban water management, and water reform, in New Zealand. Future research may test the framework in the broader context of environmental management. Conservation management and biosecurity risk management are two potential settings.

Keywords: problem-structuring; TOC; stakeholder analysis; Community Operational Research, COR in societal problem analysis, COR in sustainable community development, resource management

1. INTRODUCTION

The motivation for this study was to consider how an entire community might take a more integrated and systematic approach to meeting the challenges of water management, and achieve healthier, more sustainable freshwater systems. New Zealand's urban communities are facing several challenges due to increasing population density and attendant competition for scarce natural resources. Urban water systems, in particular, are under increasing pressure to meet the expectations of residents and businesses (see KCDC 2009). Fragmented approaches to water policies and plans persist, despite ground-breaking environmental legislation like the Resource Management Act (RMA, 1991) intended to promote sustainable development and protect community interests in environmental, social, economic and cultural outcomes (Williams, 1997; Sheppard, 2010).

New Zealand has made progress in reducing point source pollution (from a single source, like a stormwater pipe) since the introduction of the RMA(1991) and also as a result of other, complementary, environmental reforms (Land and Water

Forum, 2010). The signing of a Clean Streams Accord in 2003 (MfE, 2003) for example, was a collaborative effort by the rural sector aimed at decreasing pastoral runoff. Whilst success should be acknowledged in some areas, non-point discharges, from diffuse sources like pasture or road runoff,continue to increase unsustainably and urban waterways remain polluted to an unacceptable level (Land and Water Forum, 2010).

Recent efforts in the area of water reform include New Zealand's *Fresh Start for Freshwater* programme (2009), with its government task force concluding that a 'business as usual' approach was undesirable. The related multi-stakeholder *Land and Water Forum* was set up in 2009, delivering three reports containing a range of recommendations (2010; 2011; 2012). The country's first *National Water Policy Statement* (2011) was released largely in response to the Forum's recommendations. The level of participation in the Forum nationwide, suggests willingness on the part of communities of interest, to be part of water reform. However, the means to undertake widespread reform remains the subject of debate, as the overall decline in the quality of water in our rivers, lakes and streams, and related losses in indigenous biodiversity, remain disappointingly evident (Land and Water Forum, 2010).

Operational research has been used increasinglyin natural resource sectors like agriculture, fisheries, forestry and mining (Bjørndal, Herrero, Newman and Romero, 2011). In the context of these industries, the focus isprimarily on meeting productivity objectives and optimising profitability (Midgley and Ochoa-Arias, 2004). This research departs from the more commonly applied stochastic programming models of 'hard' OR, to concentrate on people and their perspectives, acknowledging the 'leaky' boundaries between environmental and community matters (Midgley and Ochoa-Arias, 2004). The study seeks to comprehensively explore the 'boundaries of knowledge' (Midgley and Ochoa-Arias, 2004) across both categories, by taking a systems approach. Trutnevyte, Stauffacher and Scholz (2012:762) argue that mostcomplex societal problems require both 'hard' OR and 'soft' OR.The authors warn that some 'soft' OR methodsused for societal decision making, where stakeholders "aspire to the ideal-type future states of aproblematic system", do not sufficiently "elaborate on the feasibility and consequences of the visions"(Trutnevyteet al. 2012:762).This research explicitly seeks to include such an assessment, of both feasibility and consequences.

With near 40%of urban ratestypically spent on water and wastewater management in New Zealand(KāpitiCoast District Council 2012; Kāpiti Observer 2013), affordability is a key concern for communities. Thus, this study is concerned withincreasing awareness of the critical constraints to achievinghealthier, more sustainable and affordable water systems. A multi-method approach is used (Mingers and Brocklesby, 1997; Mingers, J. and Rosenhead, J. 2004), with the methodology demonstratedthrough thereal-world case of Kāpiti, a coastal settlement which has been debating water quality and security issues for more than a decade. The Kāpiti Coast District has a current estimated population of 49,000 (KCDC, 2013) and lies approximately 50km north of New Zealand's capital city of Wellington.In 2003, Kāpiti Coast District Council had adopted a *Sustainable Water Use Strategy*on the basis there was an urgent need to reduceper capita demand for waterand promote a better balance between residential growth and the use of water resources(demand management)(KCDC, 2013c). The following excerpt from Kāpiti's 2009 water supply review, presents some context, in respect of the water security dilemma facing the communitysix years on, and the pressing need for reform:

> ***Effectively, the community is likely to be in breach of consent limits within the next five years. Breaching the consent or running parts of the supply system out of water are not acceptable options*(KCDC, 2009:5/19).**

This paper is structured with Section 2 introducing themethodology; Section 3 shows the research findings; Section 4 sets out some conclusions and Section 5 is a reflection on the contributions of the research.

2. METHODOLOGY

2.1 Combining the Theory of Constraints, Stakeholder Analysis and Systems Dynamics

This paper examines community-based, collaborative decision-making for resource management, using a problem structuring methodology (Mingers and Rosenhead, 2004). Subsequent to a piloted investigation where examining the ethics of naming participants was of particular interest, a methodological framework was proposed that would integrate three complementary perspectives. The Theory of Constraints (TOC) was used with a Stakeholder Typology to identify potential system stakeholders and examine their perspectives, while Causal Loop Diagrams (CLDs) from Systems Dynamics (SD) were constructed with participants to explore and circumvent potential negative outcomes. The aim was to test the effectiveness of the combined framework to engage stakeholders to 'think through' the issues, identify the critical problems, and their potential solutions. The researcher adopted the descriptive term 'thinking out loud'. In naming the participants and sharing their perspectives in a structured way, the project departed from the more accepted approach to qualitative research, where confidentiality around the participants' viewpoints might be paramount. In this case, while most interviews were conducted individually, not only were views shared, participants had the capacity to know whose viewpoints they were.The ethical considerations of this approach were not inconsiderable, and the university's Human Ethics Committee gave due deliberation to the potential risks and benefits of granting ethical approval. Subsequent to conducting the Pilot study with two participants, approval was granted, with attendant conditions.

The Pilot study also revealed that the selection of participants might be assisted through stakeholder analysis. However, the initial stakeholder analysis process tested during the Pilot (Elias, Cavana and Jackson, 2002; Freeman, 1984, and Mitchell 1997) appeared unnecessarily complex for this community-based research. A simple model that seemed more suited to this context of Community OR, was discovered during a later literature search, in an award-winning paper by Rawlins (2006). Specific stakeholders linked with the strategic issue were identified according to the ten categories that appear in the figure below, following Freeman (1984). Note the bidirectional arrows, illustrating the nature of the relationship between the stakeholder and the system issue.

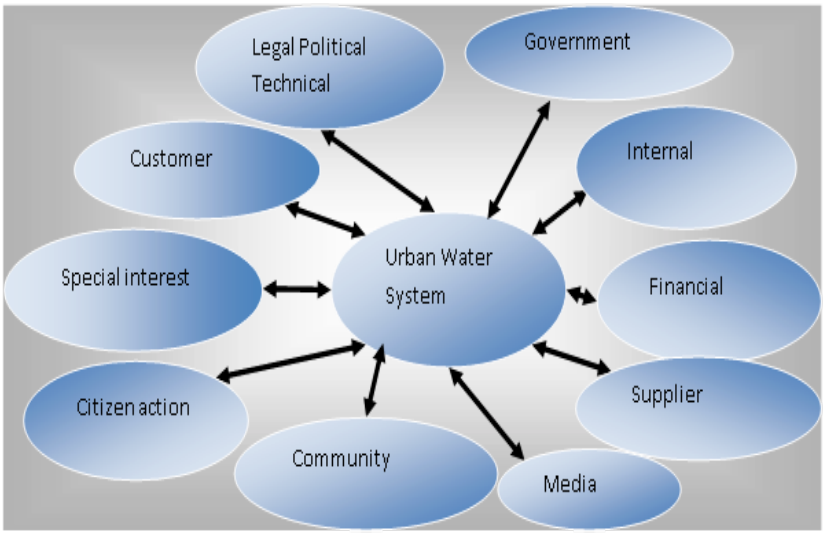

Figure 1. The Stakeholder map

Following the mapping of participants (Figure 1) using the generic stakeholder map (Freeman, 1984), emphasis turned to the linkages (Rawlins, 2006), or the connections between the system and the participant (Figure 2). The participant stakeholders were represented in each of the linkages, with all but two of the participants, closely involved with the system under study. 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, with normative linkages also present in some cases. Though geographically distant from Kāpiti, the two Starborough Flaxbourne (NZ Landcare Trust 2011) participants were selected for their situational linkage to the system problem, described in Rawlins (2006) as a 'normative' linkage. The Starborough Flaxbourne Soil Conservation Group are a collective of farm owners who have changed their farming practices to build farm systems that are healthy, resilient and profitable, in severely drought and erosion prone eastern Marlborough (in New Zealand's South Island).

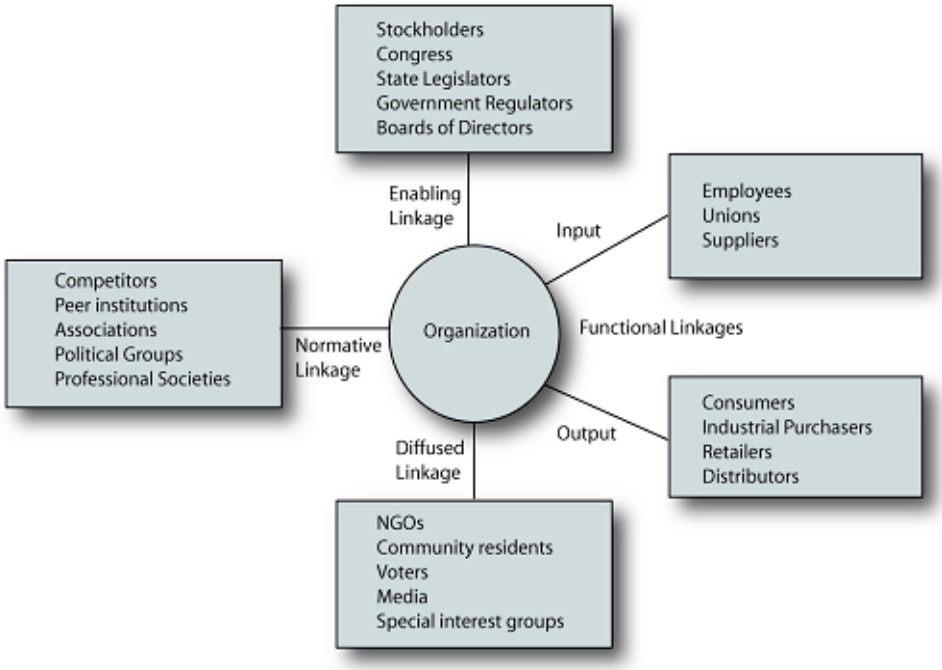

Figure 2. Stakeholder linkage model (Rawlins, 2006:4)

2.3 Introducing The Theory of Constraints

A suite of TOC tools, collectively known as the Thinking Processes, guides the process of managing change (Scheinkopf 1999; Dettmer, 2007). Kim, Mabin and Davies (2008) have surveyed applications of TOC Thinking Process (TP) tools, while Watson, Blackstone et al. (2007) have reviewed twenty years of TOC. With five main logic diagrams, TOC researchers diagnose what in the system needs to change, what it needs to change to, and how to make the change happen (Mabin and Davies, 2010). The TOC tools have evolved to include variants (described in Mabin and Davies, 2010) that also diagnose: Why change? How to sustain the change? How to develop a process of ongoing improvement? By engaging with the participant stakeholders identified through the Stakeholder typology, and using the Thinking Processes from the TOC methodology to represent the logic underpinning their views, the problems with the most undesirable effects on the system were identified. Solutions were sought and tested using TOC's Intermediate Objective (IO), Current Reality (CRT and CRB), Evaporating Cloud conflict resolution diagrams (ECs), Prerequisite (PRT) mapping procedures, and Causal Loop

Diagrams (CLDs) from SD. The last in a series of IO maps, a CRB and the Prerequisite Tree (PRT) are shown in this paper.

2.4 Intermediate Objectives (IO) Mapping and Uses

Begin with the end in mind. This is the premise behind using IO Maps from The Theory of Constraints (TOC) to define constraining issues and find solutions to complex and even geographically dispersed problems. Dettmer (2007) argues the Destination (or IO) map is critical to the success of the Thinking Processes and sound decision-making. The maps are logic-based and readily interpreted. Thus, IO Mapping is a useful tool for Operational Researchers working on people-centred problems. Its potential for informing community and environmental research, such as in urban planning and water management, has recently begun to be explored (Moore, 2009a; Shoemaker and Reid, 2005).

The research began with an idea to agree a 'clear, unequivocal goal statement' (Dettmer, 2007) among the participants, using TOC IO (intermediate objectives) mapping. The IO map is essentially a vertical hierarchy of requirements, cascading from an agreed goal. It logically describes the desired state of a system that needs improvement. It is a profoundly simple, yet effective way of identifying gaps, opportunities and critical constraints. Key to the success of this mapping procedure is that the requirements are always objective, never subjective (Dettmer, 2007). And they must logically connect in more or less general to specific order, down from one agreed end goal or'goal statement' (Dettmer, 2007).

By simplifying the desired system view and identifying the necessary conditions and critical success factors underpinning one agreed goal, complex and perplexing system states may be readily understood by stakeholders. Critical problems and potential solutions surface by applying the knowledge of what *should be* happening (from the IO map) and what *is* currently happening. The CRT from TOC can be used to map the Current Reality and identify critical gaps, while the PRT (Pre-Requisite Tree) can identify obstacles and potential solutions.A problem shared is said to be a problem halved. The value of IO mapping to Community Operational Research is in its simplicity. Specialist knowledge is not required to understand, share, and therefore, buy into, the vision that is systematically defined in an IO map, clearing the way for the stakeholders to agree the conditions required to support the goal.

Read the IO map in Figure 3from top down: *Inorder to…we must (ensure):*
In order to…
Achieve the goal of a more sustainable urban water system for Kāpiti
We must…
Have a secure water supply
We must also…
Live within our means
In order to…
Have secure supply *and*Live within our means
We must…
Have a resilient system, *We must…*Have a flexible system
Etc.
In order to…
Achieve reduced throughputs of potable water
We must…
Have superior (better than average) local government employees and communication
We must…
Have superior communication within the community on water issues…Etc.

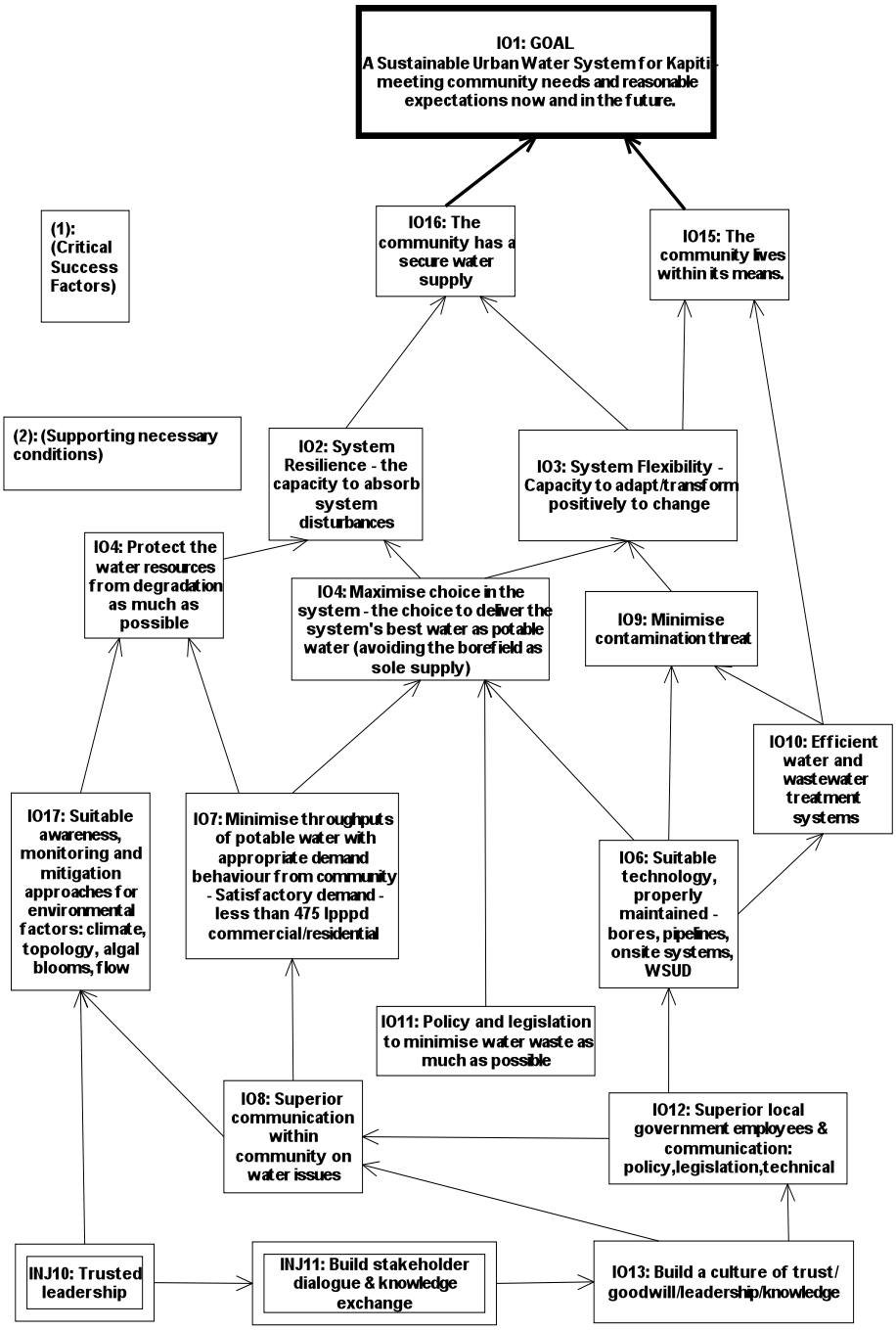

Figure 3. The final IO map

2.5 **The Current Reality – What really is happening?**

Current Reality Trees(CRTs) are sufficiency-based (*if…then*) logic trees used to compare reality with what is happening in the system now, principally, what is stopping the system from reaching its goal, as shown in the IO Map, in order to isolate what needs changing.A Current Reality Branch (CRB) focuses on one part of a system, reflecting only that part, which is unfavourable (Dettmer, 2007:92). The objective of the CRT/CRB is to isolate what needs changing by helping to identify the things that are clear indicators of system deficiencies, tracing them back to one or more basic causes (Dettmer, 2007:95).

Thus, Figure 3 maps the system destination (the Intermediate Objectives), while Figure 4 shows the Current Reality Branch (CRB) that focuses on the dilemma facing the Waikanae/Paraparaumu sub-region of Kāpiti, reflecting that part of the system most likely to impede the attainment of the agreed system goal. The CRB (*what to change)* was prepared in conjunction with a series of Evaporating Clouds EC's (Dettmer, 2007). UDE signifies an undesirable effect. MAG (the bowtie connector near base of Fig 4.) 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. Comparing the CRB (depicting participants viewpoints on a critical part of the system) in Figure 4, with the IO map in Figure 3, the reasons why the current reality differed from the preferred system, were able to be determined.

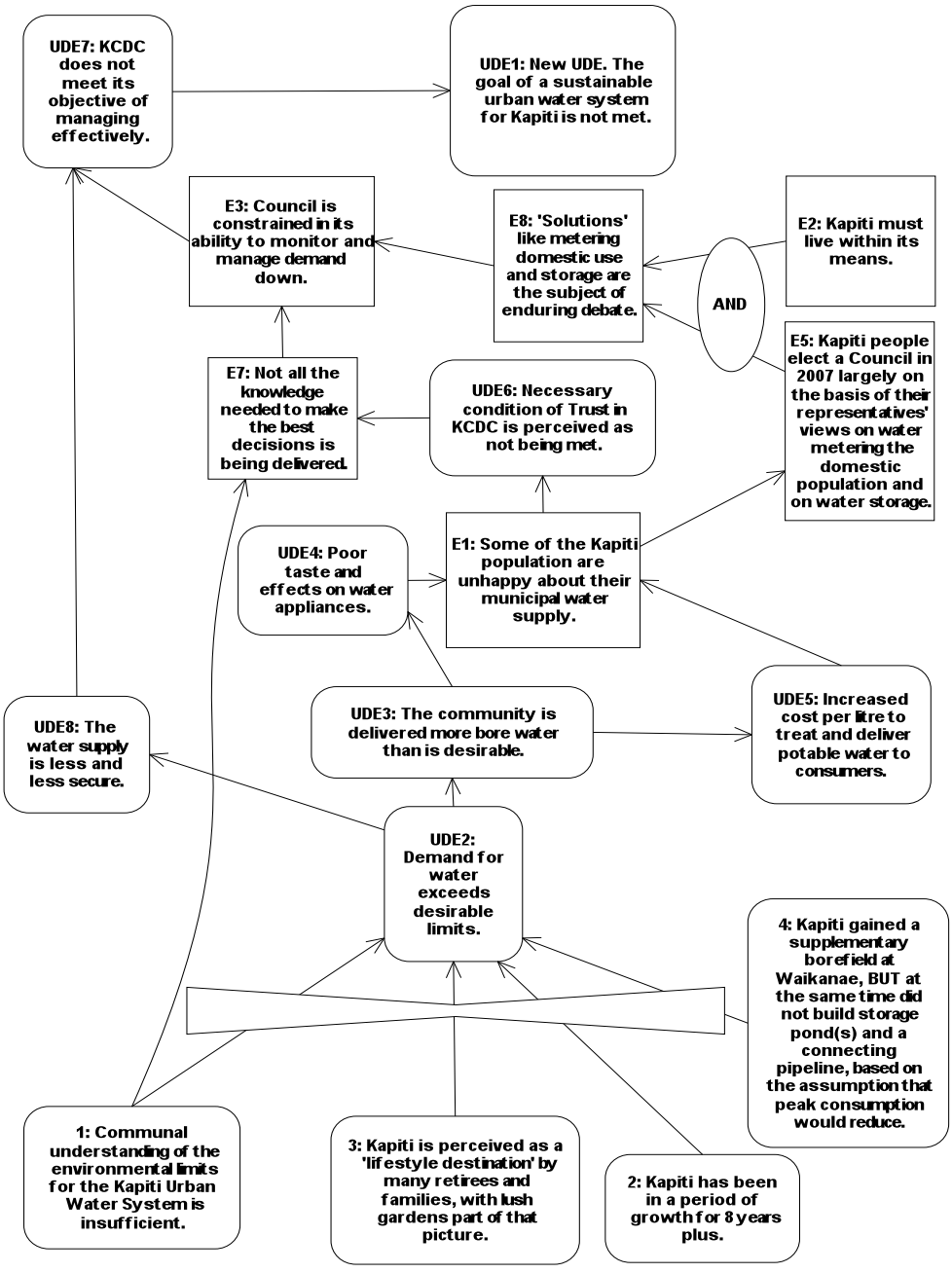

Figure 4. The CRB depicting what is happening in one part of the system

Read the CRB bottom up: *If…then*

If…Entities 1, 2, 3 and 4 exist together

Then…Demand for water exceeds desirable limits

If…Demand exceeds desirable limits

Then…The community is delivered more bore water than is desirable

If…The community is delivered more bore water…

Then…Costs increase (for treatment at the Waikanae Water Treatment Plant)

AND…

Water has poor taste and has effects on appliances…Etc.

If…KCDC does not meet its objective of managing effectively

Then…The Goal of a sustainable urban water system for Kāpiti is not met…Etc.

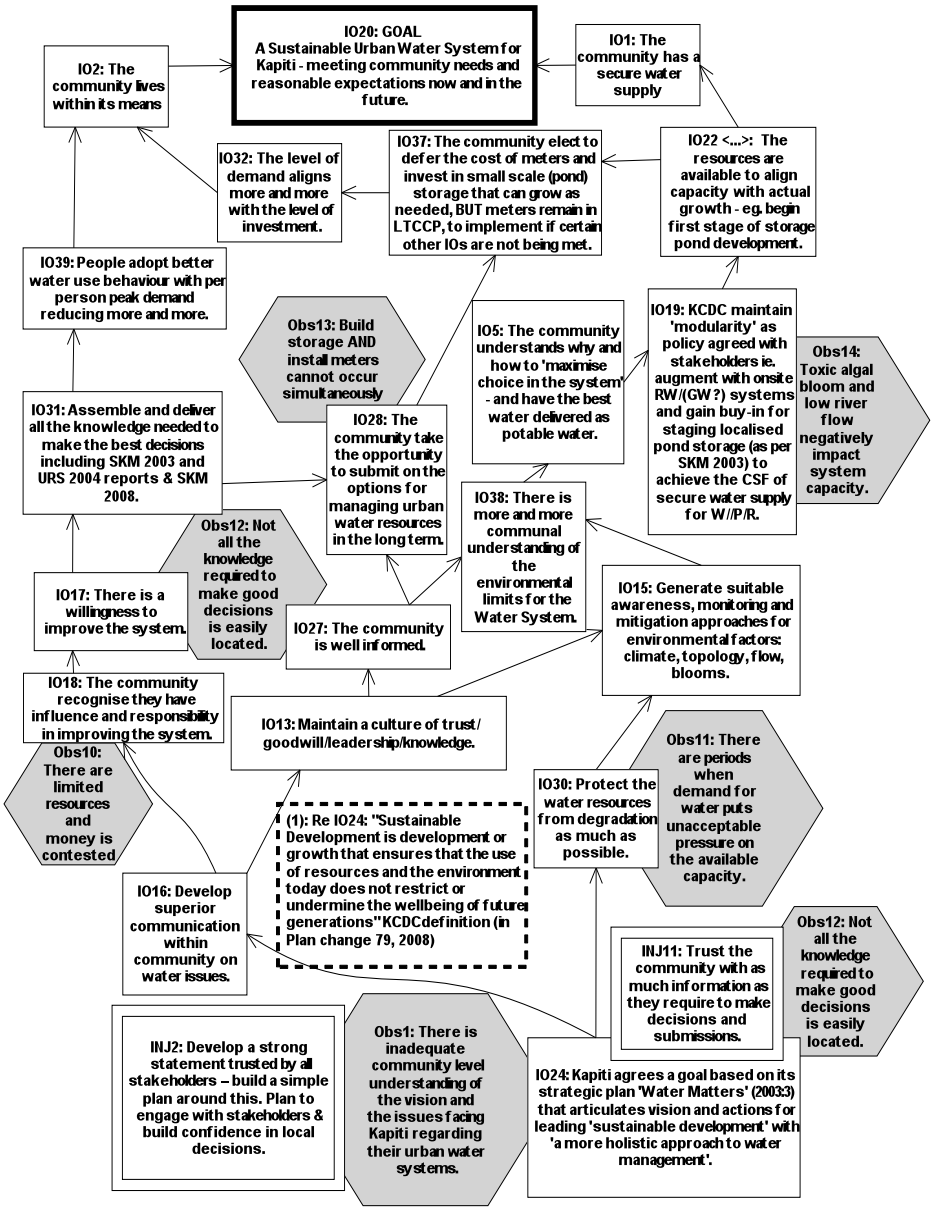

Figure 5. The PRT depicting what is happening in one part of the system

2.6 The Future – What must happen to achieve the community's goals?

Once the core problem has been recognised, the question is how to remove it? Consistent with Schragenheim (1999) and Dettmer (2007), the TOC tools selected were appropriate to this community research context. With two Councillors, a key conflict regarding water storage was explored, and broken, using ECs. CLDs from Systems Dynamics were then used to capture the dynamics of proposed system solutions and identify potential interactions and unintended consequences. CLD's were also used to show participants how a past 'quick fix' had turned into a 'fix that fails' (Senge, 1994).Agreement was reached on necessary interventions to prevent 'fixes from backfiring' (Senge, 1994:126). Using the EC and CLD in combination helps to devise robust solutions to avoid such negative side effects, as has been described in Mabin, Davies and Cox (2006).The CLDs are shown in Moore (2009:92/94).The next step was to formulate the 'roadmap' for change, or action plan. This was set out in a Prerequisite Tree (PRT), which intends to answer the question: *What must we do to achieve…*? The PRT and IO maps use *necessity* logic, whereas the Current Reality Tree (CRT) is a *sufficiency* structure (as is a Future Reality Tree). The aim of the PRT is to identify the minimum that must be done, to move from one step to the next.

Read the PRT backwards from the goal, thus:
In order to…
Achieve the goal of a sustainable urban water system for Kāpiti
We must…
Live within our means
We must…
Have a secure water supply
In order to…
Have a secure water supply
*We must…*Have the resources available to align capacity with actual growth
In order to do that…We must…
Ensure the community understands why and how to 'maximise choice' so KCDC can affordably deliver the best water in the system as potable water (in other words, protect the system's 'best water' – currently the river resource – as much as possible
And because of the obstacle…
Toxic algal blooms and low flow impact on consents and on the capacity of the river to provide the system's best water
We must…
Ensure KCDC maintains 'modularity' as policy…eg. onsite systems and other small scale storage/recycling systems to augment capacity (onsite systems may also encourage closer connection with the water cycle to increase understanding)
Read other obstacles as follows:
In order to…
Adopt better water use behaviour, with per-person peakdemand reducing more and more
We must…
Assemble and deliver all the knowledge needed for people to make the best decisions…
Because we must overcome the obstacle…
Not all the knowledge required to make good decisions is easily located
And, in order to…
Cultivate a willingness to improve the system
We must…
Ensure the community recognise they have an influence and a responsibility in improving the system
*Because…*There are limited resources and money is contested…Etc.

3. FINDINGS

This paper presents the findings from eighteen interviews with twenty-two participants, identified using the Stakeholder typology adapted from Rawlins (2006) and Elias et al. (2002). The researcher selected the Theory of Constraints (TOC) Thinking Process (TP) tools, in order to find out what to change, what to change to and how to cause the change. As part of this process, the researcher constructed IO maps to show the destination, as envisaged by the participant stakeholders. A Current Reality Branch (CRB) was prepared to visualise the current situation and to suggest where the core tensions lie. Conflict was captured, and broken, using the TOC Evaporating Clouds (EC), with the participation of two Kāpiti Coast District Councillors(elected representatives) and selected participants, whorevealed some weak assumptions, and gaps between the current and desired reality. This was central to understanding how to resolve critical problems affecting the system goal to find what to change to.

Causal loop diagrams (CLDs) in the form of a systems archetype (Senge, 1994; Senge 2008) from systems dynamics (SD) explored the potential negative effects of a suggested solution from the EC, highlighting the need to implement a sound strategy for communication with the public. Finally, a Prerequisite tree (PRT) was used as a means of finding out how to cause the desired change. The PRT identified current and future obstacles, highlighted misconceptions, and provided a formula for deciding the action steps needed to achieve the goal. For this community resource management problem, the PRT showed that technical or economic solutions are not enough. A 'will to improve the system' must exist. The IOs 17, 18 and 39 indicate that achieving the objective that the 'community live within its means' depends on harnessing that will. The system goal, therefore, depends as much on changing the behaviour of people, of the community, as it does on fulfilling economic and technical requirements. The need for changing behaviours creates a challenge in which people-centred Community OR could hold some advantages over more theoretical approaches. Further research is required to understand and quantify any potential advantages for community and environmental sustainability.

3.1. Thinking 'out loud'

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 possible solutions. Stakeholders' contributions represented in TOC trees and maps were analysed and refined with the involvement of willing participants. 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 necessary change that participants could, and invariably did, take ownership in. The TOC mapping procedures are akin to the stakeholders sharing their thinking 'out loud'. This has value as a process for community development, where complex resource management dilemmas exist, and consensus is sought.

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. Using a Stakeholder typology with TOC to 'justify' stakeholders in an analytical way, ensured that stakeholders with important historical or experiential perspectives were not unintentionally discounted or marginalised.

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 Councillorsand local *kaitiaki* (Māoriterm meaning steward or guardian – this and associated definitions in Royal 2012), and 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 or two

practitioners can gather and articulate the viewpoints,which can be checked with all the stakeholder participants, and from them, gain consensuson,and ultimately ownership of, the desirable 'future reality' and the 'roadmap' needed to reach it.

4.CONCLUSIONS

The combined methodological 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, lifestyle choices and climatic/topographical conditions.

This research project developed into what was essentially a 'conversation' on the subject of how we might manage our fresh water for better outcomes. The researcher 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 Starborough Flaxbourne Soil Conservation Group, with long experience farming under drought conditions, was identified using the Stakeholder typology. This group would seem to have a tenuous link to the Kāpiti urban water system, under a narrow systems definition (Moore, 2009a). In reality, group members were able to provide valuable experiential perspectives. Their experience in changing their farm systems and achieving profitability and growth, within severe water resource limits, brought a new layer of thinking and insight to Kāpiti's problems.

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 (alfalfa) in Eastern Marlborough instead of rye-grass and clover, is oneexample, with its obvious parallel in the Kāpiti context, of creatinglandscapesand gardens that that need little or no watering, of mandatory supplementary water tanks and greywater systems, and other less obvious implications.

TOC provides a constructive and non-threatening way to encourage a kind of deep-level reflection. In communities where many options and perspectives are raised, TOC provides a logical and collaborative framework for reviewing these, identifying the most favourable future reality and galvanizing action. 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. In a range of areas, communities, industry stakeholders, and iwi are taking steps to implement water reform and manage scarce water resources within necessarylimits (Land and Water Forum, 2011). The Land and Water forum (2011) concludedthat continuing, collaborative, action is imperative for progress on water reforms to be made.The Parliamentary Commissioner for the Environment (2000, 2001) had predicted more than 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 Land and Water Forum (2012) continue the theme, noting in their third and final report that reaching consensus is never easy and not always possible.The truth of this 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.

A potential challenge arises when the TOC practitioner disengages from the research, leaving 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 may help resolve this. Following the Kapiti case as it progresses, will reveal further study limitations and points to reflect on.

5. CONTRIBUTIONS

This Operational Research has its focus firmly on people and their perspectives and is a departure from the more commonly applied mathematical programming models. Instead, a series of conversations with diverse participants drawn (using stakeholder analysis) from an entire community, was developed into an action plan that was verified and tested using TOC's Thinking Process tools and CLDs from Systems Dynamics. This community-focused approach to dealing with resource management matters is implied in the *Treaty of Waitangi* (1840, see Young, 2001; Williams, 1997), and has been enshrined in New Zealand's contemporary environmental legislation (RMA 1991), a compelling motive to investigate approaches to COR in this country. This paper was further inspired by commentary nearly a decade apart, from New Zealand's Parliamentary Commissioner for the Environment (2000) and the government's 2009 *Fresh Start* taskforce, that suggested reaching consensus on environmental matters was one of the most pressing issues for communities. This structured and transparent process of engagement around an agreed goal appears to provide a logical platform for consensus-building. Itmay also provide a reliable way to assess the level of consensus among stakeholders (see Trutnevyte et al. 2012). This is an area for future research.

Water reform is arguably most effective when people are prepared to champion the need for change and the conditions that underpin the change. Since 2009, some of this study's most critical findings have been championed. In that year, KCDC created a new position of Water Supply Project Manager, with Phillip Stroud appointed to the role. Mr Stroud read the research findings this paper describes, and met with the author to learn more about TOC, and particularly IO mapping. In addition, he invited review of a new Water Communications Strategy and appointed an expert communicator who "brought to Council's Water Supply Project, strategic thinking that improved how the project communicated with the public. Implementation of a 'core script' helped the project succeed where others had failed"(Stroud, personal comment, 26 May 2010). Actions include investing in the afore-mentioned Communications Strategy to keep the public well-informed and encourage new water use behaviours. Multi-modal supply options like roofwater/greywater for outdoors, are encouraged in various meaningful ways by Council (and mandated for new buildings), while system transparency and the sharing of knowledge has been bolstered by the appointment of The Kāpiti Technical Advisory Group, led by former State Services Commissioner, Don Hunn.

Results to date show the community at large accepting they have a role to play in urban water reform. A perceivable lack of resistance to the suite of measures, and associated costs, to curb water demand is suggestive of the public accepting some responsibility for water reform (KCDC 2013a), alongside Council staff, Councillors, and legislators. Prior to the Pilot study, the ethics of this project seemed particularly challenging, given the participants' viewpoints on possibly contentious issues were to be openly shared, albeit in a structured way. On reflection, an environment of trust between interviewer and participants was crucial to the success of this approach.

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Figures and Tables

1. The Stakeholder map
2. Stakeholder linkage model
3. The final IO map.
4. The CRB depicting what is happening in one part of the system
5. The PRT depicting the minimum that must be done to achieve the goal

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