The Institutional Economics of Granting a River Legal Standing

A thesis submitted for the degree of Doctor of Philosophy of The Australian National University

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Declaration

This thesis is my own original work, except where stated in chapter six where the experiment was conducted in partnership with Dr. Joe Vecci. The results of the chapter can be found in the working paper:


Both authors contributed equally to the paper.

Julia Talbot-Jones

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**Editorial note**

Whanganui is the correct spelling for the name of the river. Historical confusion with ‘Wanganui’ arose from the local dialect where the ‘wh’ is pronounced as what. The Crown formally acknowledged the oversight in 1991 and the name of the river was formally changed from Wanganui to Whanganui after consultation with local Māori. In 2015, the name of the city of Whanganui and district were also corrected following a public consultation process. This thesis uses Whanganui, except for in proper nouns where the use of Wanganui is appropriate.
Abstract

The governance of water is of increasing concern to policy analysts. Several property rights systems, which allow for ownership of water by the individual, community, or state have been advocated, but no approach has been uniformly successful in resolving water quality or scarcity issues. In some cases, identifying alternative property rights arrangements for governing water systems could be useful. This research examines how a river system can be granted legal standing and the institutional economic effects of doing so. It is the first academic treatment of this subject. Focusing on the case of the Whanganui River, New Zealand, a careful critique of the new property rights arrangement - termed resource self-determination - is given. Using Ostrom's Institutional Analysis and Development (IAD) framework, game theory, and economic experiments, the economic and socio-ecological outcomes observed under state ownership are compared with the outcomes expected under resource self-determination. To understand how and why the new property rights approach was identified for the Whanganui River, a critical analysis of the institutional variables central to the identification of resource self-determination is also undertaken using a new dynamic version of the IAD framework developed as part of this research. The results of the study suggest that the implementation of resource self-determination is likely to result in an increase in transaction costs and a redistribution of water within the system, but that the new framework could successfully deliver on the objectives of the new legislation. For policy makers interested in replicating the approach for other river systems, words of caution, as well as recommendations, are offered.
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## Elements of the Te Pā Auroa framework

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ngā Tāngata Tiaki o Whanganui</em></td>
<td>a trust managing assets and liability issues of Whanganui Iwi</td>
</tr>
<tr>
<td><em>Te Awa Tupua</em></td>
<td>the Whanganui River catchment including all of its physical and metaphysical aspects</td>
</tr>
<tr>
<td><em>Te Heke Ngahuru ki Te Awa Tupua</em></td>
<td>the strategy document</td>
</tr>
<tr>
<td><em>Te Karewao</em></td>
<td>advisory group to Te Pou Tupua</td>
</tr>
<tr>
<td><em>Te Kōpuka nā Te Awa Tupua (Te Kōpuka)</em></td>
<td>the strategy group</td>
</tr>
<tr>
<td><em>Te Koretete au Te Awa Tupua (Te Koretete)</em></td>
<td>a NZD$30 million contestable fund</td>
</tr>
<tr>
<td><em>Te Pā Auroa nā Te Awa Tupua (Te Pā Auroa)</em></td>
<td>the institutional framework</td>
</tr>
<tr>
<td><em>Te Pou Tupua (Te Pou)</em></td>
<td>the human face of the river, guardians</td>
</tr>
<tr>
<td><em>Tupua te Kawa</em></td>
<td>guiding values</td>
</tr>
</tbody>
</table>
1 Introducing the research

1.0 Introduction

The question of how we can resolve issues of increasing resource pressures is of mounting concern to policy analysts. Without well defined and defended property rights, problems of overuse and underprovision prevail when environmental goods and resources, such as water, are non-excludable. The fundamental challenges of collective action necessitate decisions to be made over how property rights should be distributed to ensure the most efficient outcomes are reached.

Several property rights systems, which allow for ownership of environmental goods and resources by the individual, community, or state have been advocated, but no approach has been uniformly successful in resolving issues of collective action. As a result, the question of how property rights should be distributed and to whom remains one of the fundamental questions in environmental and institutional economics. This research addresses this question in the context of granting a river legal standing to evaluate the institutional economic effects of granting rights to environmental goods and resources – a property rights arrangement termed resource self-determination.

This is the first academic treatment of this question in this context. No other body of research has examined how granting a river legal standing will affect institutional economic outcomes. Further, no-one has shown how this change of status will affect existing theories, particularly in institutional economics. This research does both. It argues that resource self-determination will impact both economic and environmental outcomes but that it could be a robust alternative arrangement for governing river systems when the property rights system is integrated into broader legislative frameworks.
Because the effects of an institutional arrangement is context dependent, the discussion of the central research question is focused on the application of resource self-determination to the Whanganui River, New Zealand. The methodological advances made here and some aspects of the findings are relevant and applicable to other areas of environmental policy development, however. Property rights are the principal mechanisms through which policies regarding resource management work. As a result, understanding the institutional economic impacts of granting a river property rights has relevance to all areas of environmental policy.

In broad terms, the research questions addressed in this study embrace the challenges faced in evaluating the institutional economic outcomes of alternative institutional arrangements designed to solve environmental and natural resource problems – challenges that remain at the core of environmental economics, institutional economics, and public policy.

1.1 Why this study? Articulating the research problem

Increasing pressures on environmental goods and resources are heightening the demand for new institutional solutions. Conventional property rights approaches of individual, community, or state ownership have not uniformly resolved the issues of overuse and underprovision of non-excludable environmental goods and resources. As a result, there is a demand for innovative policy solutions that more effectively address social dilemmas.

Part of the problem for policy makers is that there is no panacea for solving environmental and natural resource problems. Policy makers must develop frameworks that maximise net benefits, keeping in mind the challenge of quantifying both market and non-market values and balancing competing demands. Further, in the area of environmental policy, the consideration of special interests and an acknowledgement of context are sometimes politically more of a crucial issue than the allocation of benefits. Hence in assessing
alternative property rights options, major challenges facing policy makers and the community are, not only assessing the probable outcomes of policy alternatives, but also determining the likelihood of that the arrangement will deliver “good” outcomes, whether defined in terms of resource conservation over time or economic net benefits.

In terms of economic approaches to managing water, the most widely used method to constrain and enable peoples' behaviour is the assignment of property rights to use and management. Since Hobbes (1651) and Smith (1791) the conventional approach to coordinating peoples' behaviour has been to allocate legal and economic property rights to the state or individual based on a man:nature dichotomy. More recently, Olson (1971) and Ostrom (1990; 2005) highlighted that in situations where groups are small and homogenous, collective organisation and management of environmental goods and resources is possible.

Stone (1972) proposed an alternative approach that collapsed the distinction between real and artificial persons through granting legal rights to environmental goods and resources. Although the proposal was deemed too radical for implementation at its conception, more recently, the idea has begun to gain traction at various scales of decision-making. In 2012, a formal agreement was signed that promised to grant the Whanganui River, New Zealand, legal rights, with legislation passed in March 2017. Likewise, in 2008 and 2011 respectively, Ecuador and Bolivia granted Constitutional rights to nature. In 2014 Te Urewera National Park in New Zealand was recognised as a person in law, whilst various municipalities in the United States have recognised the rights of nature to ecosystem health and wellbeing. Similarly, in Australia, various hybrid forms of the rights for nature concept have been integrated into environmental policy.

Little is understood about the economic and environmental effects of transferring property rights to environmental goods and resources, however. We know that transferring property rights affects levels of rent dissipation and wealth distribution in a group; but what happens when those property rights are
transferred to an environmental resource, like a river? For policy makers interested in identifying new ways to solve environmental and resource problems, an in-depth examination of the application of resource self-determination to a river system is timely. With more information about the institutional economics of granting environmental goods and resources legal standing policy makers can assess with more certainty the likelihood that resource self-determination will resolve the collective action problems faced in their region.

To summarise the research problem: the growing demand for environmental goods and resources is increasing the demand for alternative institutional arrangements, which improve the allocation and distribution of available supply. This is especially the case for water. The questions are, how can resource self-determination be applied to a river system and will it stand as a better approach for delivering long-lasting and socially desirable outcomes than more conventional property rights approaches?

1.2 The research approach

The research reported in this thesis addresses the task of evaluating the institutional economic effects of granting a river legal standing. It is proposed that an ex ante analysis of the application of resource self-determination to the Whanganui River be conducted to evaluate some of the potential effects of resource self-determination on transaction costs, resource use outcomes, and overall institutional robustness. All data collection and analysis was therefore completed prior to the recent legislation granting the Whanganui River legal standing being enacted in March 2017.

The research model takes inspiration from the Bloomington School’s approach to institutional analysis, in partnership with transaction cost economics. The Bloomington School’s combination of robust theory testing and hard-nosed empiricism provides a well-proven foundation for examining and evaluating the
new property rights arrangement. Transaction cost economics complements this approach by using the comparative metric of ‘transaction costs’ to assess the relative merits of an institutional arrangement. As a result, transaction cost economics can use deductive reasoning and hypothesis testing – a methodology rarely used in the Bloomington approach – to help unpack the puzzles of complex institutional organisation.

In order to examine resource self-determination in the context of a river system, an embedded case study research design is adopted that divides the research into two main strands. First, a comparative institutional analysis examining the changes in property rights is undertaken. This involves a qualitative institutional analysis guided by the Institutional Analysis and Development (IAD) framework and a quantitative evaluation of the possible outcomes using game theory and an economic experiment. Second, a dynamic version of the IAD framework is developed by synthesising dynamic game theory with the IAD. This framework is then used to help explain how and why such a ‘radical’ property rights approach was identified for governance of the Whanganui River. Finally, the results of each of these strands of research are brought together to evaluate the relative robustness of resource self-determination as a property rights approach for the Whanganui River compared with the existing arrangement of state ownership (Cox et al. 2010; Ostrom 1990).

In summary, the research approach of this thesis is designed to address the challenge of identifying and examining alternative institutional arrangements for the governance of river systems. It uses the case of resource self-determination to examine several of the core questions at the heart of institutional economics and environmental policy. The study advances the Bloomington School approach to institutional analysis and offers theoretical and empirical contributions to the literature. These are likely to be of some use and interest to policy makers and scholars alike.
1.3 The research objectives

The main aim of this research is to predict the likely institutional economic effects of using resource self-determination as an alternative property rights system for a river. The granting of legal standing to the Whanganui River offers the first example of this and much can be gained from undertaking an ex ante analysis of its proposed application.

At a more general level, the objective of the research is to bring further clarification to the ongoing debate of the role institutions play in influencing peoples' behaviour. There is a paucity of knowledge regarding institutions and institutional change, both theoretically and methodologically. This research seeks to address this inadequacy by presenting a theoretical examination of institutions and institutional change using the empirical analysis of the changing property rights arrangement governing the Whanganui River as a foundation.

1.4 The structure of the thesis

The structure of the thesis is as follows. Chapter two introduces the theory of institutions and institutional change, relating it to the property rights systems most commonly used to allocate and distribute water. It provides a background to the concept of resource self-determination and outlines the (limited) history of the system's use. General gaps in the literature are identified, which provide the foundations of the four research questions developed in chapter three.

Chapter three outlines the general research questions, which relate to the study of institutions and institutional change, and specifically question the effects of applying resource self-determination to a river system. An overview of the conceptual framework and research design used in this research is given. As explained in section 1.2, the research is grounded in the Bloomington School of institutional analysis and transaction cost economics. The research adopts an analytical approach that splits the embedded case study design into two central
strands. The first strand is focused on comparing resource self-determination with the property rights system of state ownership in the context of the Whanganui River using the IAD framework, game theory, and economic experiments. The second section focuses on institutional change. A dynamic version of the IAD framework developed in chapter three is applied to the case of the Whanganui River to help explain how and why resource self-determination was adopted as an alternative property rights arrangement. Finally, the institutional robustness of the new approach is evaluated using Ostrom’s design principles.

Precise details of the methodology are provided in chapter four. The case study is introduced and specifics of the mixed-methods used to gather and analyse data in order to answer the research questions provided. The results to each of the research questions are given in chapters five to eight.

Chapter five reports the results of the comparative institutional analysis as well as giving details of the Te Awa Tupua (Whanganui River Claims Settlement) Act, which was passed into legislation in March 2017. The analysis examines the existing institutional arrangement governing the Whanganui River and compares the interaction of rules and actors with the changes expected to occur following the implementation of resource self-determination. The potential significance of the change is then discussed in terms of the distribution of property rights. This discussion generates hypotheses for evaluating the possible economic and environmental effects of the shift from state ownership to resource self-determination in the case of the Whanganui River. These hypotheses are tested in chapter six.

Chapter six provides details of the game designed to approximate the institutional setting of the Whanganui River and test the hypotheses developed from the analysis in chapter five. It also outlines the experimental design and analyses the results of the experiment played in the laboratory. The results suggest that resource self-determination could impact environmental outcomes and that bargaining under the new arrangement could be more costly than the
existing property rights system of state ownership. The results also find that players become more self-regarding in situations where they are suddenly granted property rights, having previously been excluded from decision-making.

Following in the tradition of the wider institutional economics literature in which a dynamic analysis most commonly follows a static evaluation, chapter seven takes an historical approach to examining how and why resource self-determination was proposed for the Whanganui River. Declining water quality and water scarcity is a trend across New Zealand (Ministry of the Environment and Statistics New Zealand 2017) yet, legal standing has been proposed for the Whanganui River alone. Why is this and what causal variables contributed to the identification of resource self-determination? To answer these questions the dynamic IAD framework developed in chapter three is used to understand the motivation for granting a river legal standing in the case of the Whanganui River.

Chapter eight sums up the findings of the previous chapters by undertaking a final evaluation of the proposed institution using Ostrom’s design principles. It compares the robustness and resilience of the existing property rights setting of state ownership with what is proposed under resource self-determination.

Finally, chapter nine concludes, offering some closing thoughts and recommendations to policy makers interested in applying resource self-determination to other environmental goods and resources.

1.5 Summary

This research aims to examine what happens when, in law, you treat a river as a person. It is the first academic treatment of this subject. It is important because, as pressures on environmental goods and resources increase, new demands are being placed on institutional systems designed to constrain and enable peoples’ choices. In some cases, the consideration of alternative property rights systems – such as resource self-determination - could be useful. This research therefore
aims to examine the institutional economic effects of granting legal standing to a river system to determine whether it could be a robust alternative institutional arrangement for natural resource management.

To evaluate the new property rights system, this study aims to understand how the new arrangement will affect property rights, use, and management of the river system. Specific research questions are identified from gaps in the literature and answered using a research design that advances the theoretical and empirical research agenda of institutional economics. Ultimately, the findings show that, on a basic level, resource self-determination is likely to affect economic and socio-ecological outcomes. It concludes that resource self-determination may be a more robust property rights system for governing the Whanganui River than the existing property rights arrangement, however, it warns against replicating the approach for other river systems and common property resources without broader institutional integration.
2 Understanding common property institutions: nature, performance, and change*

2.0 Introduction

As resources such as water come under increasing pressure, there has been debate, particularly among policy-makers, about how best to alleviate social dilemmas (McCann 2013; Murphy et al. 2000; Saleth & Dinar 2004; Tisdell 2010). One of the recent advancements has been the granting of legal rights to environmental goods and resources, however, nothing is known about the institutional economics of such a property rights change. The absence of critical analysis is confirmed by the thorough review of the institutional and property rights literature undertaken in this chapter. The review also identifies significant gaps in the theoretical and methodological literature that motivate several of the general research questions pursued in this research.

Thus the chapter is composed of the following sections. Section one outlines the theoretical definition of institutions used in this thesis. Section two discusses how and why institutions change. Section three discusses the application of institutions to common property resources, highlighting the unique challenges of water resources. Section four provides background to the concept of resource self-determination. Gaps in the literature, which motivate the research questions outlined in chapter three, are teased out in section five. Section six draws some conclusions from the chapter.

2.1 Institutions: nature and definition

An institution is a self-sustaining system structuring social interaction. The most commonly recognised parameters of the system are the societal “rules of the game” (North 1990, p.3) or the “prescriptions that humans use to organise all forms of repetitive and structured interactions” (Ostrom 2005, p.3). Such rules or prescriptions can be formal or informal, both functioning to coordinate individual beliefs and incentivise and constrain the behaviour of actors operating within the system. Formal rules include those that are humanly devised and written down, such as statutory and judicial law. Informal rules, which may be unwritten, may at times be of equal or greater importance, and include social norms, conventions, and codes of behaviour.

Institutional rules are only effective when ‘in-use’\(^1\) and enforced. Working enforcement rules and mechanisms are thus an important component of any institutional system (Alston et al. 2016; North 1990). When rules are exogenous to the players of the game, as North and Ostrom suggest, an external third-party enforcer, such as the state, may be required, extending an institutional system to include the polity (North 1991). For this reason, an institutional system often has multiple components or hierarchical levels. Formal and informal rules can be nested and embedded so that the choices available to actors at a higher level will depend on the capabilities and limits of the rules at that level and at a deeper level (Ostrom 2005). For instance, rules pertaining to monitoring and enforcement may be specified at one level, yet affect actors operating at another.

Both Williamson (2000) and Ostrom (2005) consider a social institution to consist of up to four levels.\(^2\) Williamson considers the top level of an institutional system to be a level of ‘social embeddedness’ where the norms, customs, mores, and traditions are located. The second level in this system is the ‘institutional environment’, where the formal rules such as constitutions, laws, and property rights rest. At the third ‘institutions of governance’ level, the

\(^1\) Sometimes rules exist in form, but are not enforced (Commons 1931; Ostrom 2005). This research will focus only on working rules-in-use.

\(^2\) Others have also made important contributions to the analysis of institutional structure. For a sociological approach see Hooghe and Marks (2003) and a political science approach see Hall and Taylor (1996).
governance of contractual relations is the focus of analysis. This is where he and others interested in the economics of transaction costs focus their analysis, their argument being that the level of transaction costs determines the relative effectiveness of an institutional system (Coase 1937; 1960). When transaction costs are high at the governance level, the organisation of the institutional system becomes relevant, as an alternative arrangement may deliver a more efficient outcome (Williamson 1979). The final level considers these outcomes in terms of resource allocation and employment, which is also the primary focus of most neoclassical analysis, nesting transaction cost economics within the neoclassical fold.

Williamson's structure of an institutional system is similar to that detailed in Ostrom (2005, p.59). 3 Ostrom also identifies four levels of rules, each determining the activities that can be undertaken and the rules that can be made in each of the underlying levels. The metaconstitutional level is the equivalent of Williamson's idea of social embeddedness encompassing collective beliefs or worldviews. These rules are likely to help shape the rules made at the constitutional-choice level, which in turn, shape the rules at the policy-level, and operational-levels. These are discussed in greater depth in section 3.1.

Although some economists choose to define actors as institutions themselves (Granovetter 1985; Nelson 1994), actors are generally considered the players of the game (North 1990; Ostrom 1990). Actors can be either individuals or organisations, the latter being “groups of individuals bound by some common purpose to achieve objectives” (North, 1990, p. 5). 4 Boundedly rational, all actors make choices, which let them optimise their utility subject to their cognitive constraints (Ostrom 2005; Simon 1955; Williamson 2000). Because all interactions happen in a social setting, actors make strategic choices, which are the best response given the expected behaviour of others. When actors’

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3 It should be noted that although similarities can be drawn between Williamson and Ostrom’s institutional structure frameworks (indeed this is done by Ostrom (2005, p.58) herself), there are distinct differences in the approaches of the two. These differences are discussed in detail by Earl and Potts (2011).

4 Hodgson (2006) discusses how North was sometimes inconsistent in his identification of organisations as actors. As he states, organisations can be institutions, although institutions cannot be organisations. For the purpose of this thesis organisations such as NGO’s or government departments are going to be treated as institutional actors.
expectations of others’ behaviour are stable due to well-defined and enforced institutions, transaction costs are reduced, increasing the efficiency of the system as a whole (North 1990; North & Thomas 1973; Williamson 2000).\footnote{It is useful to note that Williamson (1985) asserts that institutions are formed to reduce transactions costs, whilst North (1990) considers institutions as determinants of transaction costs. This is one of the key differences between transaction cost economics and the institutions-as-rules-approach.}

Transaction costs have thus become a useful metric for comparing institutions (Allen 2000; Cole 2012; McCann 2013): those institutions with lower transaction costs tend to be more effective than those with higher levels of transaction costs.\footnote{The adoption of this metric and the nesting of the notion of institutions within a neo-classical framework allowed for the advancement of the “new institutionalism” (see. Coase 1960; North 1990; Ostrom 2005; Williamson 2000), picking up where the “old institutionalists”, namely John R Commons (1931), Thorstein Veblen (1898), and Westley Mitchell (1914), faltered (Arrow 1987). The old institutionalists viewed actors as entwined in a web of partially durable and self-enforcing institutions, which could shape actors’ underlying beliefs as much as they constrained actors’ choices. Some of the work of evolutionary economics follows in this tradition.}

For instance, when there is a strong correlation between the formal and informal rules in-use within an institution, actors’ are more inclined to follow formal rules and transaction costs are likely to be lower (Greif 2006, p.31). Likewise, when linkages between and within levels of the institution are strengthened, transaction costs are reduced, making an institution more efficient and therefore effective (Heikkila et al. 2011).\footnote{Important to note here is that, not only can transaction costs have multiple definitions and refer to different types of costs (Arrow 1969; Gordon 1994; Stiglitz 2000), but that transaction costs can influence the effectiveness of an institutional arrangement at different stages of the policy process including through enactment, implementation, and enforcement (Thompson 1999). McCann and Easter (2004) categorise a typology of transaction costs for transitioning to a water market which includes costs associated with: (1) research, information gathering, and analysis, (2) the design and enactment of enabling legislation, (3) the implementation of the new arrangement, (4) support and administration of the arrangement, (5) contracting costs, (6) monitoring/detection, and (7) prosecution/inducement/conflict resolution. Such a typology of costs can also be applied to the transition to other institutional systems. Some of these costs will be examined in this research.}

Because institutional systems tend to be durable rather than ephemeral phenomena, representing them as stable equilibria is a complementary view to the rules of the game approach (Aoki 2001; Bowles 2004; Greif 2006; Greif & Kingston 2011; Schotter 1981). By placing a theory of motivation at the centre of analysis, the institutions-as-equilibria notion identifies the expected behaviour of others, rather than the “rule” itself, as the critical coordination device and motivator of actors’ behaviour. Subsequently, the institutional system, which
emerges and persists, is assumed to be self-enforcing with each actor's behaviour being a mutual best response.

To clarify the difference between the two approaches: taking the case of speeding, it is generally expected that if the government raises the fine for speeding, the quantity of speeding will decrease. Under the rules of the game approach, the rule is the institution that determines peoples’ behaviour. Should people not behave as expected, it is either due to an actors’ expectation that the utility from breaking the rule will be greater than the product of the probability of being sanctioned times the utility loss of the sanction (the fine, the prison term, etc.) (Voigt 2013) or that a formal rule exists in-form but is not in-use (Alston et al. 2016). From the institutions-as-equilibrium perspective, it is not the rule itself, but the expectations about the behaviour of other actors (including those in specialised enforcement roles such as police, judges etc.) that creates institutional constraints and moulds actors’ behaviour. In other words, behaviour is motivated by beliefs about others' behaviour (and the presence of sanctions) rather than by rules, whether or not they are in-use.

Under the institutions-as-equilibria frame, institutions are exogenous to the individual but motivation is endogenously provided by all. As explained by Greif (2006, p.16), “[e]ach individual, responding to the institutional elements implied by others’ behaviour and expected behaviour, behaves in a manner that contributes to enabling, guiding, and motivating others to behave in the manner that led to the institutional elements that generated the individual’s behaviour to begin with.” Thus, as with the rule-of-the-game approach the central unit of analysis is the transaction, however, it is defined in the institutions-as-equilibria approach as an action that transfers some social attitude, emotion, opinion, or piece of information from one actor to another, rather than transferring a good or service.

Two pronounced differences between the two approaches are the treatment of enforcement and the interaction of formal and informal rules. Under the rules-of-the-game approach, enforcement rules are treated as exogenous to the
institution, whereas in the institutions-as-equilibria approach, the institution is seen as self-enforcing. This means that under the former view, if behaviour does not conform to formal rules, by default it is attributed to – and observed as governed by – informal rules. How this interaction plays out can greatly influence the arguments of institutional change covered in detail below. Under the institutions-as-equilibria view, a distinction between types of rules is not needed in analysis; both are understood to give rise to the shared beliefs, norms, and expectations that generate regularities of behaviour (Greif 2006).

Both approaches can be a useful part of the analyst’s toolkit. In the analysis of static institutions the choice of the approach and the language used is a matter of convention (Alston et al. 2016). The distinction between the two becomes more important in the dynamic analysis of institutions to answer questions pertaining to why and how institutions change.

As demonstrated in the following section, teasing apart the competing schools of thought provides an opportunity to advance the theoretical and analytical literature pertaining to institutional change. Specifically it raises questions of how and why alternative property rights arrangements, such as resource self-determination, might be identified as an alternative approach for addressing environmental and natural resource problems and how best to analyse the diachronic nature of such change.
2.2 Theories of institutional change

History demonstrates that institutions do not stay constant over time (Greif 1989; North & Thomas 1973). Even with regards to water systems, institutional frameworks are rarely static. For instance, in Australia, the western USA, Chile, China, and South Africa, the establishment of water markets resulted in the establishment of new institutional rules and a reassignment of property rights from state to private control (Grafton et al. 2011; Tisdell 2014). Likewise, the establishment of alternative arrangements for the governance of freshwater in New Zealand have seen management rights transferred from centrally managed systems to shared arrangements between the state and local indigenous groups (Memon & Kirk 2012). Two of the critical questions pertaining to these are: why do these institutions change and how can we analyse such change?

By definition, institutional change is the modification of a system regulating collective behaviour. The process of institutional change can be split into two broad categories, loosely extending the rules-of-the-game and institutions-as-equilibria approaches of analysis to a dynamic form. These are recognisable as the agency and structuralist perspectives of institutional change. The agency perspective extends the rules-of-the-game approach placing the actor at the centre of analysis and assuming that the individual can shape an institutional system to his or her own benefit (Alston et al. 2012; Libecap 1989; North 1990, 2005; Ostrom 2005). In contrast, the structuralist perspective extends the equilibrium view applying an evolutionary approach to change. Under this view, an institution is seen to transcend individual actors to evolve as a cohesive social structure; the whole being larger than the sum of its parts (Aoki 2001; 2007; Greif & Laitin 2004; Hodgson 1998b; 1998a). The choice of perspective affects the interpretation of institutional change by requiring the adoption of different units of analysis: the former, the individual, and the latter, the group.

Applying the agency perspective to the study of institutions considers that purposeful rule changes by actors drive institutional change. It assumes that actors motivated by their own utility will try to design institutional rules to
improve their individual payoffs. All actors are able to be both inductive and deductive in their strategic reasoning and make choices that optimise their utility in light of past experience and future expectations.

Ostrom (2005; 2013; Ostrom & Basurto 2011) assumes institutional change occurs when actors at one level perceive the rules governing their interactions to be unsatisfactory motivating them to “shift levels” to try to change the rules. A political bargaining process ensues, from which institutional change results if the proposed rule change is agreed to by the necessary “minimum coalition” as determined by the constitutional level rules (Greif & Kingston 2011). In a democratic system, this minimum coalition may be a majority; in a dictatorship, the dictator alone may be sufficient. The set of exogenous rules selected for ultimately depends on the interests of the actors setting the rules, the relative power of respective agents to seek out “rent” and influence the collective decision-making process (Olson 1982) and on existing rules that may continue to constrain actors’ behaviour (Mantzavinos et al. 2004).

Libecap (1989) uses a similar argument to explore the development of property right rules for common property resources. He argues that the distributional consequences arising from the allocation of property rights incentivises actors to engage in rent-seeking to try to alter rules to their own benefit. Lower level property rights are determined by actors who are motivated to optimise their own net benefit in a domain structured by higher level political rules, which are equivalent to the exogenous rules of the game. Alston et al. (2012), also suggests that property rights emerge because of the interaction of norms and politics. Using examples on the frontier in Australia, the United States, and Brazil, Alston and his co-authors argue that the initial allocation of property rights are determined by social norms, however, as competition grows, increasing rent dissipation or conflict incentivises the establishment of a commons arrangement which restricts entry and monitors use by claimants. It is thus the incentive of reducing transaction costs to increase individuals’ net benefits that motivates the development of formal property rights arrangements.
Alston’s approach to property rights analysis is aligned with a second strand of the agency perspective that views the development of rules as an outcome of evolutionary competition among alternative institutions (Alchian 1950; Demsetz 1967; Hayek 1973; Williamson 1979). Complementary to the political design perspective of Ostrom (2005) and Libecap (1989), the transaction cost perspective assumes that some sets of rules will lead to more efficient outcomes than others. Those institutions that minimise transaction costs will emerge and persist until such a time that an exogenous parameter shock causes an alternative institutional system to out-compete the existing arrangement. In this way, institutional change progresses steadily along an evolutionary path until some shock causes a qualitative shift in the institutional arrangement.

These two strands of the agency perspective both treat institutions as sets of rules and focus on how new rules are selected, assuming enforcement occurs exogenously (Aoki 2001). In contrast, the structuralist perspective takes an evolutionary approach to institutional change assuming such change is gradual on an equilibrium path and that institutions are self-enforcing (Aoki 2001; Bowles 2004; Greif 2006; Greif & Laitin 2004; Hodgson 1998b). Rather than rules themselves, it is the behaviour and the expected behaviour of others, which induces people to behave (or not to behave) in a particular way. This means that the design of an “institution” is beyond any one individual’s control; instead it is the behaviour of the group as a whole which determines its structure and evolution (Greif 2006).

Under the structuralist perspective new rules are adopted spontaneously and without design so that institutions evolve by self-selecting for optimal formal and informal rule configurations. Rather than institutional change being driven by an individual’s pursuit of his or her own net benefit (as is assumed to occur under the agency perspective), it is the optimisation of the aggregate net benefit that determines why one institution is selected over another. Institutional change is understood to come from exogenous parameter shocks, which cause a mass shift in actors’ beliefs triggering a state of cognitive disequilibrium within the institution and catalysing change (Aoki 2011).
A conceptual synthesis of the agency and structuralist perspectives sees institutional change as an evolutionary process driven by individuals seeking to optimise their utility. This is the approach to institutional change adopted in this research. In this way, loose parallels with biological evolution can be drawn. Species evolve by selecting for individuals who have the highest level of fitness, causing some traits to be favoured over others. Similarly, actors within the institutional system select for, or against, rules that are likely to convey them the most benefit.

Unlike biological evolution, however, institutional change is strategic and can occur at different time and spatial scales depending on the type of rules being affected. Such changes can pull and push the institutional system along its evolutionary path. Informal rules, the shared beliefs around how the institution (and society as a whole) operates, change slowly and spontaneously (Mantzavinos et al. 2004; North 1990; Ostrom 2005; Sugden 1989). In contrast, formal rules can be (relatively) quickly changed by design, selected for or against by actors using abductive reasoning (Greif & Kingston 2011). In this way, institutional change can be considered to follow an evolutionary path, punctuated by spontaneous events and the choices of actors motivated by their own utility optimisation.

Given this view of institutional change, how can such change be analysed?

Proponents of both the agency and structuralist perspectives agree that motivation for change must come from parameters exogenous to the institutions under study. When institutions are considered exogenous “rules of the game”,

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9 Important to note here is that Ostrom (2013) also drew from biological evolution in her explanation of institutional change. However, Ostrom draws strong parallels between the two processes which are not upheld in this discussion (Greif 2013; Poteete 2013).

10 As an extra point, given that informal rules are usually long standing, it’s likely that change will only come through the actions of many over a long period. Formal rules also take time to pass through various legislative processes but can be changed more quickly and easily by the actions of the individual, depending on the level at which the rules are established. For this reason, formal rules can be considered as more likely changed by the individual and informal rules by the group.
change becomes exogenous by default. In situations where institutions are endogenous, the drivers of change have often been considered environmental or technological ‘shocks’ (Greif & Laitin 2004). Such shocks can be large and induced by significant events such as war or through smaller disruptions such as the divergence of beliefs. For instance, if formal rules uphold some individuals’ beliefs but not others, actors can desist from following rules. The dissention of institutional actors whose beliefs do not correlate with enforced formal rules can impose costs on other institutional actors and cause a state of institutional disequilibrium over time (Aoki 2007; Brousseau et al. 2011).

In disequilibrium actors can no longer discern how to optimise their behaviour in light of their expectations about others’ likely choices. Unexpected behaviour can impose costs on those actors unable to anticipate others’ choices. If dissenting actors impose costs on actors in positions of agency at higher levels of the institutional system, the actors with agency may have an incentive to change formal statutory rules to improve their private net benefits, potentially changing the available action sets (and actor interactions) within the institution. In contrast, if the increased costs affect an actor at a lower level of the institutional arrangement there is little he or she can do except exit the institutional setting or ‘withdraw his or her consent’ by way of organised collective action (Levi 1990) or through the decentralised actions of many individuals (Kingston & Caballero 2009). Alternatively, actors may change their individual preferences to more closely align with the rest of the group’s (Akerlof & Kranton 2005; Bowles 1998, 2004), or, as Ostrom suggests try to move higher up the institutional arrangement so as to be granted the power to change the formal rules (Greif & Kingston 2011; Ostrom & Basurto 2011).

Through repeated interaction, actors learn how to optimise their returns to improve their individual outcomes. Actors engage in a process of trial and error where the failure to solve a problem leads to the trial of a new solution (Popper 1972). Because an institutional system consists of many rules providing

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11 Actors are only motivated to follow rules that correlate with their individual beliefs, helping explain why prohibition failed in the US in the 1920’s but is generally successful in the Middle East (Greif 2006). Likewise, it helps explain why some property rights arrangements work in some settings, but not others.
different signals to actors, however, it is possible that any one of multiple evolutionarily stable equilibria could emerge from the process of trial and error (Greif & Laitin 2004; Mantzavinos et al. 2004). These may or may not be efficient, yet could persist due to the relative bargaining power of actors, as determined by the relative opportunity costs of those participating (Knight 1992). For instance, in the development of property right rules on the frontier, formal rules were often imposed on a group of actors, despite them conflicting with the group’s long-standing informal rules (Alston et al. 2012). The resulting inefficient institutional equilibrium that then arose persisted because the greater bargaining power of one group of actors enabled them to enforce their own sets of beliefs as formal rules.

Institutional change can thus be understood as an historical, path dependent process, where the new roles established by actors are constrained by those rules already in-use (David 1994; Greif 2013; Mantzavinos et al. 2004). Within the Bloomington School no specific framework exists that accounts for such a process of change. Although Ostrom proposed a model to explain institutional change, the approach is built on a multi-level process dependent on the movement of actors between levels of the institutional arrangement (Ostrom & Basurto 2011). Further, by treating institutions as exogenous rules-of-the-game, the underlying assumption is that actors are unable to change the rules, which constrain them at the same level of the institutional arrangement in which they rest. As a result, to analyse institutional change within the Bloomington tradition, a new framework is required which allows for institutional change to be recognised as an evolutionary, path-dependent process driven by individuals seeking to optimise their utility.
2.3 Institutions for common property resources

In a positive transaction costs world, the design of institutions is important for encouraging the efficient use of public goods and common pool resources (McCann 2013; McCann et al. 2005; Reeson & Tisdell 2008). Jointly termed common property resources (CPRs) in this thesis, these categories of goods cover most environmental goods including freshwater, biodiversity, and fisheries. Both non-excludable, public goods and common pool resources are differentiated by the concept of rivalry or subtractability: public goods being principally non-rival or non-subtractable and common pool resources being principally rival and subtractable.

Because of their respective rivalry characteristics, in open access situations where rules constraining use and incentivising provision are absent, public goods are frequently underprovided and common pool resources are overused. This is a particularly pertinent issue for freshwater, where, in the absence of rules assigning rights to use and access, interdependency and competition among users can be pervasive. In some cases, overextraction of water or underprovision of water quality can impose externality or spillover effects on third parties. Similarly, information asymmetries can affect decisions over efficient allocation, which is only achieved when the present value marginal net benefits are equalised across all users. To address such ‘social dilemmas’, the most common collective response is the assignment of property rights to create some contract of excludability for the non-excludable goods and prevent rent dissipation (Alchian & Demsetz 1973; Furubotn & Pejovich 1974). Property rights are thus the socially accepted rights of actors to exploit assets for their benefit, with at least a partial right to exclude others (Grafton et al. 2000).

Yet property rights are about neither ‘property’ nor ‘rights’ (Hodgson 2014). Instead property rights are a collection of rules granting authority to particular actors to undertake actions related to a specific domain, in turn, creating the institutional system structuring social interaction (Commons 1968). For every type of property right there are a bundle of rules pertaining to use, excludability,
and divestibility, which motivate actors’ behaviour. These rules can be formal or informal and detail the right to access a resource, to use the resource, to make decisions about the management of the resource, to exclude others, and to divest your rights to others (Schlager & Ostrom 1992). Actors endowed with management, exclusion, and alienation rights grant rights to access and withdrawal to the user. Together this bundle of rules helps determine the structure of the overarching system, which ultimately defines how a CPR is used.

The most widely used CPR property rights system is ‘state control’. As shown in table 2.1, a state-run system vests CPR property right bundles in the state, the state being defined as the collection of elected public officials designated to make decisions at the level of constitutional-choice rules or the institutional environment. As early as Hobbes (1651), this was the recommended institutional response for addressing the overuse and underprovision of common property resources; elected officials being considered most able to represent the views of the majority (Hardin 1968; Olson 1971). However, this argument is based on rigid assumptions concerning the accuracy of available information, the monitoring capabilities and sanctioning reliability of the state, and low (or zero) transaction costs; all things rarely achieved in day-to-day life (Hayek 1945; Ostrom 1990).

When information, monitoring, and sanctioning are incomplete and transaction costs are high, rent dissipation and inefficiencies can cause society to look for alternative ways of coordinating CPR use. The most common alternative system is a decentralised approach, where property rights are allocated to individual actors rather than held by the state. For land resources, private property rights contracts can be complete with all five rights vested in a single actor; however, for other resources, such as water, complex systems of right allocation are sometimes necessary. For instance, in a water market, rights to access, use, exclusion, and divestibility may be allocated to the private individual, yet rights to management remain with the state. Even in well established water markets such as those in the western USA and Murray-Darling Basin, individuals may be granted the right to access, use, exclude others, and trade water rights, but the
responsibility of setting the total limit on extraction remains with central or Federal government (Bennett 2012; McCann & Garrick 2014; Tisdell 2009).

**Table 2.1**: The most widely used property rights arrangements for governing CPRs, such as water systems, categorised by to whom property rights are allocated.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Withdrawal</th>
<th>Management</th>
<th>Exclusion</th>
<th>Alienation</th>
</tr>
</thead>
<tbody>
<tr>
<td>State system</td>
<td>User</td>
<td>User</td>
<td>State</td>
<td>State</td>
</tr>
<tr>
<td>Private system</td>
<td>Individual</td>
<td>Individual</td>
<td>Individual (State)</td>
<td>Individual</td>
</tr>
<tr>
<td>Collective system</td>
<td>Community</td>
<td>Community</td>
<td>Community</td>
<td>Community</td>
</tr>
<tr>
<td>Co-management</td>
<td>User</td>
<td>User</td>
<td>Community</td>
<td>State or individual</td>
</tr>
</tbody>
</table>

Building on the work of Olson (1971), Ostrom (1990) brought attention to a third property rights approach for managing CPRs that challenged the notion that markets or state control were the only two alternatives for overcoming collective action problems. Ostrom found that in certain situations self-governance is possible (Ostrom 1990; Ostrom et al. 1992). Subsequently, it was found that actors who regularly interact were able to more efficiently manage a resource in some situations than a large central actor (Baland & Platteau 2003; Basurto & Ostrom 2009; Janssen et al. 2010; Libecap 1989; Ostrom 2011b). In addition, face-to-face communication (Ostrom 2008a; Ostrom et al. 1992), trust (Bohnet et al. 2006; Janssen 2015; Ostrom 2011b), reciprocity (Fehr & Gachter 2000; Giest & Howlett 2014; Velez et al. 2009) and strong leadership (Folke et al. 2005) can further reduce transaction costs below the level sometimes experienced when property rights are held by a central actor (Ostrom 2015). Small groups act as a network for transmitting information between group members reinforcing shared beliefs about what is ‘right’ or ‘wrong’ and creating an institutional arrangement that is self-enforcing.

Further variations of the three traditional property rights contracts have also been developed. In co-management systems two or more interest groups share
management rights. They are often used as a way of navigating cultural
grievance or as an alternate pathway for uniting diverse interests. For instance,
co-management arrangements may bring together actors with different
worldviews or subscribing to contrasting metaconstitutional rules (Berkes 2009;
Richmond et al. 2013). Such systems are effective when the incentives of joint
managers and users align, motivating all actors to behave in a way that
encourages efficient resource use (Adger et al. 2005; Baland & Platteau 2003).

More broadly, exogenous parameters and worldviews can significantly affect the
relative efficacy of various property rights systems. As pointed out in the
previous section, actors only follow rules when they are motivated to do so, so
rules that assign rights to water are only efficient when those actors to whom
they’ve been assigned believe them to have legitimacy. Further, all actors within
the institution must acknowledge the legitimacy of those rights – not only the
rights holder (Schlager & Ostrom 1992). As all rights have complementary
duties, a right implies that another actor has a commensurate duty to observe
that right. Should this duty not be observed, the property rights system will be
unstable and break down over time.

Thus, while to whom property rights are allocated can affect the distribution of
wealth and the level of rent dissipation associated with the use and management
of CPRs, so can actors’ beliefs and the exogenous contextual parameters. This
means that although property rights establish the parameters under which
decisions over CPR use are made, the capacity for these rules to achieve efficient
outcomes is not only dependent on the incentives created by the delineation of
decision-making authority, but also by how closely the rules are matched to
actors’ preferences and beliefs, the broader enforcement rules, and existing
social norms and historical context.

A robust property rights system is one that coordinates these elements and is
able to cope with external and internal shocks or disruptions to the system over
time. For policy makers interested in crafting long-lasting solutions to the
problems of over-allocation and declining water quality within a water system,
the review of the institutional and property rights literature so far suggests that it is the coordination of these elements that must be navigated to ensure actors are encouraged to exercise choices over common property resources efficiently.

2.4 Resource self-determination: A new institutional approach?

The property rights systems outlined above are based on a seminal assumption that environmental goods and resources are able to be owned in an absolute sense and that rules allocating rights to control and use are able to be assigned to various actors interacting within an institutional arrangement. The property rights system examined as part of this research relaxes these assumptions, collapsing the dichotomy between man and nature and reassigning property rights accordingly. The new approach grants the environmental good or resource legal standing and then proceeds to confer ownership of the environmental good or resource in the resource itself. Guardians or overseers are then appointed to speak on the resource’s behalf.

In the literature, the assignment of legal rights to non-human entities can be traced back to Salmond’s work on legal fictions (Salmond 1930) as well as early judicial rulings, which granted rights to Hindu deities12. More recently, Stone (1972) argued that natural objects, such as rivers, mountains, and forests, should be given legal rights similar to those of other inanimate right-holders such as trusts, corporations, joint ventures, and municipalities in order to better protect them under law. This would mean that nature could institute legal actions at its behest; that in determining the granting of legal relief, the court would have to take injury to it into account; and, finally, that relief would run to the benefit of it (Stone 1972). In other words a third party would no longer be involved in legal proceedings because injury to the natural object itself will become sufficient for the delivery of due compensation.13

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13 Building on Stone’s work, Morris and Ruru (2010) also discussed the application of legal standing to rivers in the New Zealand context.
By his own take, Stone was proposing “the unthinkable” – and, although the US Supreme Court initially took up the notion of nature having rights, little further action followed.\textsuperscript{14} For many, Stone’s proposal was too radical and perhaps too challenging to existing property rights and economic institutions (Stone 2010). Traditional property rights arrangements, like those outlined above, rely on a distinction between animate and inanimate objects that enables inanimate objects to be “owned” in an absolute sense. In a court this means that injury to an environmental good and resource is measured through the harm inflicted on the human owner or property rights holder rather than by the harm inflicted on the environmental good itself. Under resource self-determination this dialogue shifts. As the environmental good or resource is granted legal rights under resource self-determination, no longer can the environmental good or resource be owned by anyone or used without regard given to the resource’s health and wellbeing. Instead, similar to a legal minor, the resource is understood to own itself, with guardians appointed to speak on its behalf and bargain with potential ‘users’ over use.

Resource self-determination challenges the construct of ownership assumed in more traditional property rights systems, such as state, private, or collective ownership. Given the expectation that environmental goods or resources are economic goods over which bundles of property rights can be held, how users’ and managers’ behaviour might change in light of this development in property rights theory is unclear. There has been no empirical treatment of this setting or theoretical evaluation of possible impacts to-date. This creates a space for examination and justifies the study undertaken here.

\textsuperscript{14}In Sierra Club v. Morton [1972] 405 US 727. Available at: https://scholar.google.com.au/scholar_case?case=15417249624067275504&hl=en&as_sdt=6&as_vis=1&oi=scholarr&sa=X&ved=0ahUKEwj4ycre4uzTAhWBulQKHajCBpEIQgAMJjSgAMAA.
2.4 Grey spots in the literature

A canvassing of the literature highlights stubborn weaknesses in the theoretical and empirical dimensions of institutional economics. These include the study of alternative property rights systems that sit outside the boundaries of the state, market, or collective, the development of dynamic frameworks of institutional change, and the ex ante analysis of property systems before their implementation. These grey spots in institutional economics generally, and CPR research in particular, contribute to the rationale, justification, and motivation for the specific research questions developed in this study. Although, some of these weak spots were touched on in this literature review, they are now drawn out explicitly to provide motivation for the research questions outlined in chapter three.

Alternative property rights systems for governing CPRs

In cases where traditional property rights arrangement fail to deliver efficient outcomes, the identification of alternative property rights systems, which challenge the status quo could be useful. The most commonly used systems outlined in section 2.3 rest on the presumption that there is a distinct dichotomy between man and nature, allowing CPRs to be ‘owned’ in an absolute sense. An interesting proposition is that relaxing this assumption could allow for the emergence of alternative property rights setting which deliver different environmental and economic outcomes. Depending on the goals of the environmental policy, a property rights system, which collapses this dichotomy – such as resource self-determination - could prove an effective mechanism through which to relieve environmental pressures and deliver the desired policy goals. To test whether this is indeed the case, however, we need empirical data examining how resource self-determination could work in practice and identifying possible effects to ensure that the empirics support any a priori assumptions.
Research-based examinations of institutional change

The review of the literature showed that the definition of institutions and the drivers of institutional change are still contested. Ongoing disagreement about the origins of change makes analysis complex due to a lack of consensus over the key variables and parameters at play. A synthesis of central elements of the institutional economics literature in this chapter led to a conceptualisation of institutional change as an evolutionary, path-dependent process driven by individual decision-making. Within the Bloomington School there is no framework that can be used to guide analysis of such institutional change creating a demand for the development of a dynamic framework.

From an empirical perspective, more research-based examinations of institutional change will contribute to our empirical and theoretical understanding of what institutional variables and parameters motivate a change in property rights systems. Therefore, developing a framework, which addresses the central characteristics of institutional change from within the Bloomington tradition, and then applying it to an empirical case, will be a useful contribution to the empirical and theoretical literature.

Ex ante approach to testing alternative property rights systems

Institutions and their performance are mostly evaluated in ex post rather than in ex ante contexts (Alston et al. 1997). Yet, ex ante analysis of alternative arrangements can be useful for policy makers interested in institutional reform (Lacey et al. 2015; Rommel 2014; Tisdell 2009; Ward et al. 2008). Shifting from the status quo can be costly (Colby 1995) and informing the policy design process ex ante can reduce long-term expenditure. Within the literature there is room for more research to focus on ex ante economic analysis to help guide policy makers and ensure that any proposed changes in property systems are likely to deliver the desired incentives for alleviating environmental and economic pressures (Ward et al. 2008).
2.4 Conclusions

This chapter outlined the concept of institutions in an institutional economic theoretical setting. Based on the assumption that individuals acting in pursuit of their own self-interest fail to reach socially optimal outcomes in the absence of property rights, it showed how institutions coordinate actors’ behaviour to encourage the alignment of public and private interests. It demonstrated how various institutional systems can be used to address social dilemmas pertaining to the overuse of common pool resources and the underprovision of public goods. Yet it also highlighted the ongoing challenges of institutional economics, namely defining institutions and explaining institutional change, while bringing attention to the public policy challenges associated with designing effective institutions.

A review of the literature indicates two complementary strands of thought shape our economic understanding of institutions: the rules-of-the-game and institutions-as-equilibria approach. These both have value for the analyst’s toolkit and are therefore both used in this research. In chapter five, the rules-of-the-game approach to institutions is used to compare existing property rights arrangements with resource self-determination. While, because of the usefulness of both the rules-of-the-game and equilibrium approaches for understanding institutional change from an evolutionary perspective, both approaches are utilized for the dynamic framework developed in chapter three and tested in chapter seven.

The next chapter explains this further by outlining the conceptual framework used in this research to address the specific research questions pertaining to the adoption of resource self-determination as an alternative property rights system for governing CPRs and river systems.
3 Addressing the gaps in the literature: 
Research questions and research design

3.0 Introduction

Motivated by the research problem outlined in chapter one and the grey spots identified in the current theoretical and analytical literature, this chapter introduces the central research questions addressed in this thesis. The chapter also outlines the overarching research framework and research design used to evaluate the research questions.

Given the subject matter and objectives of this study, the Bloomington School approach to institutional analysis is the principle lens through which the research questions are addressed, with a secondary emphasis on the institutional transaction cost approach. An embedded case study is used as an analytical framework.

The chapter thus proceeds as follows. Section one outlines the general research questions. An extended section two specifies the research design and the theoretical and analytical frameworks. A background to the methodological approaches used to address the research questions are also provided. Section three concludes.

3.1 Research questions

As a reminder, the general research problem outlined in chapter one stated that in the face of growing resource shortages, alternative institutional arrangements are needed to relieve pressure on resources. It also explained that although resource self-determination has been proposed and used for the management of environmental goods and resources, little is known about the potential
institutional economic effects of granting legal rights to natural objects, such as river systems. Subsequently, assessing the potential impacts of applying resource self-determination to a river system is a core objective of this research.

In the discussion of alternative property rights arrangements in chapter two, the concept of resource self-determination was introduced. To examine resource self-determination in detail and to understand how it can be used for governing a river system, this research analyses the changing governance arrangement for the Whanganui River, New Zealand, which was granted legal standing in March 2017. It aims to provide an ex ante analysis of the institutional economics of granting a river legal standing and to provide insight to policy makers interested in replicating this approach more widely.

The research questions emerge from the theoretical and methodological gaps in the literature discussed in section 2.4. The first general research question asks:

**Research question 1: How does resource self-determination affect the distribution of property rights amongst actors operating within an institutional arrangement?**

This research question stems from the need to identify alternative property rights arrangements for water to address social dilemmas. As discussed in chapter two, property rights are a bundle of rights that affect levels of wealth and rent dissipation in a group. Under resource self-determination, legal rights are granted to a CPR. Understanding how this will affect the bundle of property rights and who will be assigned rights to access and withdrawal, management, exclusion, and alienation will help determine how applying resource self-determination may affect economic and environmental outcomes. Research question one is addressed in this study by undertaking a comparative institutional analysis of a state property rights system with the application of resource self-determination

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15 It should be noted that this research in its entirety was carried out prior to the Whanganui River being granted legal standing. At the time of submission the institutional arrangement is still to be implemented.
The second research question aims to evaluate the findings of the comparative institutional analysis. It considers how the new property rights arrangement may influence actors’ behaviour and economic and environmental outcomes. Specific hypotheses, which support the second research question, are generated by the institutional analysis and outlined in chapters five and six. Research question two asks:

**Research question 2: How will the identification of resource self-determination affect economic and environmental outcomes?**

Answering this question addresses another weak spot in the literature – the ex ante analysis of proposed institutional arrangements. It aims to predict the possible economic and environmental effects of implementing resource self-determination by comparing the strategic behaviour of actors interacting under a state property rights system with those interacting under resource self-determination. The possible impacts on water allocation are examined, as well as the relative levels of transaction costs compared.

The third research question is split into two parts. The first part, aims to shine new light on the diachronic elements of an institution over time. The second part aims to examine how and why institutions change, specifically how and why resource self-determination might be implemented as an alternative property rights arrangement for governing a river system:

**Research question 3: (a) How can we analyse institutional change when it is defined as an evolutionary process driven by individuals seeking to optimise their utility?; and (b) which institutional elements motivated a shift from state ownership to resource self-determination in the case of the Whanganui River?**

Motivation for asking this question is two-fold. First, it is useful to know the conditions under which resource self-determination would be proposed as an
alternative property rights approach for a river system. Why did decision makers opt for resource self-determination over more commonly used alternatives in the case of the Whanganui River? The Whanganui River faces many of the same environmental challenges as other rivers in New Zealand, so why has resource self-determination been used in this case and not others? Second, the question contributes to the broader discussion regarding the theoretical and empirical weaknesses associated with understanding institutional change outlined in chapter two. Ostrom (2013) stated that understanding institutional change is one of the next frontiers of institutional research and it was argued in section 2.5 that undertaking more detailed knowledge-based analyses of institutional change are needed within the institutional literature. By posing these research questions, this research intends to make theoretical and empirical contributions towards advancing this frontier.

The final question examines the likely robustness of resource self-determination as a long-lasting property rights arrangement for the governance of a river system. A robust system has been defined as one able to cope with external and internal shocks or disruptions, and thus, this final question asks:

Research question 4: How robust is resource self-determination as an alternative property rights system for the governance of river systems?

The results of this analysis aim to provide an ex ante assessment of resource self-determination as a long-lasting property rights arrangement and determine the likelihood of it achieving the intended legislative objectives. It provides an overarching assessment of whether or not the application of resource self-determination is likely to be a stable property rights system over a number of years.
3.2 Research design

To answer the research questions, a theoretical framework built on the Bloomington School of institutional analysis and transaction cost economics is supported by an analytical framework, based on an embedded case study design. The research orients towards a positivist ontological and epistemological perspective meaning that the data was collected and interpreted under the view that the research findings were generally observable and quantifiable. Elements of the theoretical and analytical frames are outlined in figure 3.1 and each component explained in detail below.

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**Figure 3.1:** A visual representation of the research design used to guide and structure this research.

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16 In qualitative case study research, perspectives such as the relativist or interpretivist perspectives are common alternative epistemological orientations. Such orientations consider knowledge to be created through interactions between the researcher and subjects so that findings are gathered using dialectical methodologies rather than through the verification or falsification of hypotheses. Dialectical methodologies are not suitable for answering the general research questions specified in chapter three, however, given that quantitative methods are also used in this thesis. Subsequently, a single reality independent of the researcher is assumed in this thesis, which supposes that research is conducted such that neither the researcher nor the subjects influence the other (Guba & Lincoln 1994).
3.2.1 Theoretical framework: Institutional economics

After canvassing the literature in the previous chapter, the overarching theoretical framework used in this research emerges from blending the Bloomington School’s abductive approach to institutional analysis with the more deductive reasoning of transaction cost economics.

i. The Bloomington School of institutional analysis

The overarching methodological framework used in this research is grounded in the Bloomington School of institutional analysis. The school embraces the complexity of institutions and, as an underlying objective, attempts to understand, chart, evaluate, and articulate the basic categories of social interaction. Alongside the Rochester and Virginia Schools of thought, the Bloomington School is recognised for its useful contribution to the development of public choice and new institutional theory (Boettke & Coyne 2005; Mitchell 1988). In combination with this, the Bloomington School’s focus on common pool resources makes it well suited as a guiding frame for this thesis.

The Workshop of Political Theory and Policy Analysis, Bloomington, Indiana has an interdisciplinary, pluralist research agenda built around two central pillars: polycentrism and social order. Early work of Vincent and Elinor Ostrom on public service industries and local public economies (McGinnis 1999; Oakerson 1999; Ostrom & Ostrom 1977; Ostrom et al. 1961) contributed to the development of polycentrism as it relates to institutions (Aligica & Tarko 2012; Polanyi 1951). Polycentrism refers to a social system made up of many decision centres, which have limited and autonomous prerogatives, yet are bounded by an overarching set of rules (Aligica & Tarko 2012). It contrasts markedly with the traditional monocentric approach to analysis, which assumes institutions always contain a unique centre of power and authority (Ostrom 1972; Ostrom et al. 1988).

The Ostrom’s application of polycentrism to institutions allows for complexity and diversity within institutional arrangements to be accounted for. Polycentric arrangements are understood to be self-organising and to have built-in
mechanisms of self-correction (McGinnis 2011b). There can be multiple arrangements operating at once at different levels in an institutional arrangement, which, when analysed through a polycentric lens have been able to create new lines of enquiry and to shed light on existing debates (Aligica & Tarko 2012).

The second central pillar in the architecture of the Bloomington School is the Ostroms’ view of social order. The theoretical tradition of institutions consistently oscillated between theories of market and state, identifying Adam Smith’s (1791) theory of social order on the one side or Thomas Hobbes’ (1651) theory of the leviathan on the other. Ostrom was interested in stepping beyond the dichotomy and developing a theory and framework that offered “an alternative that can be used to analyse and describe a variety of institutional arrangements to match the extensive variety of collective goods in the world” (Ostrom 1998, p.14).

Through a combination of theory development and hard-nosed empiricism, the Bloomington School’s approach to institutional analysis has shown that creative solutions to problems, such as the depletion of common pool resources, can exist outside of the sphere of national governments and markets. Results have shown that there is no one institutional arrangement that is “good” in all circumstances, instead, the goal of a wise policy is to search for an institutional arrangement, which “minimises the cost associated with institutional weaknesses or institutional failure.” (Aligica & Boettke 2009, p.34). To help evaluate these costs in this research, the Ostrom’s approach to institutional economics is complemented by elements of institutional transaction cost economics.

ii. **Transaction cost economics**
Institutional transaction cost economics is a complementary approach to the Bloomington School of institutional analysis. One of the advantages of the transaction cost approach is that it uses a measure, which is quantifiable and comparable for assessing institutional effectiveness. Such measures are transaction costs which refer to the effort, time, and expense involved in
obtaining the information necessary to negotiate, make, and enforce an exchange (Williamson 1985, p.2). Transaction costs can include the costs involved with preparing an institutional arrangement designed to govern CPRs as well as the costs associated with implementing and operationalising the property rights framework (McCann 2013; McCann & Garrick 2014).

The transaction cost approach originated with Coase (1937) and was further developed by Williamson (1973; 1985; 2000) to explain the evolution of market and nonmarket organisations within an institutional environment. To help explain institutional change and to compare the relative efficiency of one institutional arrangement over another North and Thomas (1973) and North (1987; 1990) integrated transaction costs within their broader rules of the game analysis of institutions to develop what has been termed ‘institutional transaction cost economics’ (Allen 2000; Saleth & Dinar 2004).

When comparing alternative property rights arrangements, low costs are generally preferred over high levels of costs; however, transaction costs alone cannot measure relative institutional performance. In some situations, not all of the relevant transaction costs can be fully accounted for in narrow economic terms. Some transactions within an institutional arrangement refer to non-market exchanges embedded within a society’s normative and cultural systems which are difficult to quantify, for instance (Commons 1934; Granovetter 1985). Further, when developing policy goals, maximising net benefits rather than just minimising transaction costs is usually a more appropriate metric to ensure that both abatement costs and environmental benefits are also accounted for in decision-making and evaluation (Krutilla & Krause 2011). Because approximating net benefits was not a primary goal of this thesis, using the transaction cost approach in partnership with the broader contextual analysis provided for by the Bloomington School created a more robust conceptual basis for this research rather than using one independently of the other.

As a reminder, under both the rules-of-the-game and the institutions-as-equilibria approaches the transaction remains the central unit of analysis; however, in the rules-of-the-game approach transaction costs refer to the costs associated with gathering information to facilitate the exchange of a good or service whereas in the equilibrium approach the costs refer to those associated with exchanging a social attitude, emotion, opinion, or piece of information between actors.
3.2.2 Analytical framework: The case study

To answer the research questions outlined in section 3.1, an embedded case study approach was used for analysis in this research. Two reasons are given for this. Firstly, prior to this research being conducted, no study had examined the institutional economics of granting a river legal standing, and thus a detailed investigation of the contextual conditions of its successful application was deemed useful for drawing preliminary causal inferences (Yin & Davis 2007). Secondly, using a case study to examine a CPR problem within the Bloomington tradition builds on 40 years of case-study research on the commons (Araral 2014). This provides a strong foundation for drawing inferences from theory and constructing external validity for the research (Poteete et al. 2010).

Generally a case study is used to examine real-world problems for which there are many more variables of interest than available data points. In a case study, rather than taking established socio-political entities as cases, as often occurs in large-N studies, the researcher “cases” (Ragin 1992, p.218) so that the object and the boundaries of the case studies are defined through the research project (Vennesson 2008). This aligns itself with the objectives of the Bloomington School, which sometimes blurs the distinction between the phenomenon of interest and the context in which it exists.

A case study inquiry relies on multiple sources of evidence, which should converge to demonstrate a finding’s consistency and provide validity to the research (Yin 2014). In some cases, a case study inquiry can also rely on several units of analysis to understand the context of the case study in question. This is known as an embedded case study design and is the analytical approach adopted for this research (Yin 2014). The advantage of an embedded case study, as opposed to its alternative, the holistic case study, is that it allows the researcher to identify relevant subunits for analysis and conduct a more detailed analysis of the case of interest. In turn, this can also contribute to a reduction in possible bias and more robust findings (Shipman 1997).

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18 When only single sources of observational evidence are used, unintentional biases can emerge, as the researcher can be tempted to adopt “subjective” judgments, which confirm a researcher’s preconceived notions rather than testing for construct validity within the case study (Flyvbjerg 2006; Ruddin 2006).
In the embedded case study, five complementary methodological approaches were adopted to examine the application of resource self-determination to a river system. Mirroring Ostrom’s (2005) approach to institutional economic analysis, initially a comparative analysis was conducted in two parts. Part one focused on understanding the context of the institutional environment. Guided by Ostrom’s Institutional Analysis and Development (IAD) framework, an analysis of the institutional arrangement governing the Whanganui River before and after the adoption of resource self-determination was carried out. The institutional analysis generated hypotheses about levels of transaction costs and resource allocation, which were then tested in part two of the comparative analysis. This was done by approximating the institutional setting as a game and then experimentally testing the game in the laboratory.

The second strand of the research aimed to contribute to the theoretical and methodological literature on institutional change and answer the third research question. By developing a dynamic version of the IAD framework and then testing it using the case of the Whanganui River this part of the research explained how and why resource self-determination was identified as an alternative arrangement for governing the Whanganui River.

The final step before concluding involved a qualitative analysis of the institutional arrangement using Ostrom’s (1990) design principles (Cox et al. 2010). These were used to predict the relative robustness of resource self-determination as an alternative governance arrangement for the Whanganui River.

A comprehensive methodological review of each of the components of the embedded case study is provided in the following sections.

i. Exploring the institutional context: The Institutional Analysis and Development framework
To address part one of the institutional analysis and answer the first research question from within the Bloomington tradition, a comparative analysis of
resource self-determination and state ownership was conducted guided by the Institutional Analysis and Development framework (figure 3.2). Recognised as the principal analytical instrument in the toolbox of the Bloomington School, the IAD framework is a conceptual map that lets inquiry be organised into a subject and set of variables to examine (Blomquist & DeLeon 2011; Ostrom 2005). As explained in Cole (2014) the framework has been described as “one of the most developed and sophisticated attempts to use institutional and stakeholder assessment in order to link theory and practice, analysis and policy” (Aligica 2006, p.89).

Figure 3.2: The Institutional Analysis and Development framework (Ostrom 2011a, p.10). This framework is used to guide the comparative institutional analysis reported in chapter five.

The action situation is the core component of the framework and is treated as an informal representation of a repeated game (Polski & Ostrom 1999). It is a domain in which boundedly rational actors hold a position, observe information, select actions, engage in patterns of interaction, and realise outcomes from their interaction (McGinnis 2011a; Simon 1955). For instance, in the case of a river, actors assigned the positions of users and managers may engage in bargaining over water use in the action situation, constrained and incentivised by the

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19 The alternative analytical framework in the Bloomington School arsenal is the Social-Ecological Systems framework (McGinnis & Ostrom 2014; Ostrom 2007; Ostrom & Cox 2010). This framework places greater emphasis on community and resource interactions than the IAD – something that was not the focus of this research.
structural variables and the expected choices of their fellow actors. Within the action situation all of these actors are assumed to share some common information about the situation but not necessarily the same set of benefits. Often, the respective information endowments and the delineation of power amongst the actors can greatly affect the benefits or payoffs each actor can receive. It is assumed that the relative potential net benefits assigned to actions and outcomes act as external incentives and deterrents for actors in a situation, with the possible final outcomes being determined by each actor's available action set.

This action set is determined by each actor’s expectations of the likely behaviour of others operating within the action situation as well as three sets of exogenous parameters\(^{20}\): rules, community attributes, and biophysical and material attributes. Working rules-in-use designate relevant aspects of the institutional context and can include formal and informal rules, as discussed in chapter two (Cole & Ostrom 2010). Working rules-in-use are the rules of interest in this research. They can be classified as position rules, which specify a set of positions for actors, as boundary rules which specify how actors enter or leave their positions, authority rules which determine the set of actions assigned to each position, aggregation rules which specify the transformation function from actions to outcomes, scope rules which specify a set of outcomes, information rules which specify the information available to each position, and payoff rules which specify how benefits and costs are required, permitted, or forbidden to players (McGinnis 2011a). For CPRs, property right rules, which determine which actors have been authorised to carry out which actions with respect to the use and management of the good or resource are of particular importance.

Social and community attributes encompass all relevant aspects of the social and cultural context of the action situation of interest. Relevant attributes of the community include trust and reciprocity, a shared or common understanding of

\(^{20}\) Ostrom (2005; 2011a) calls them Exogenous Variables to account for the fact that these states can change over time as a result of feedback loops operating within an institutional arrangement. As discussed in section 2.2, however, the details of this feedback loops are only weakly explored in the literature, instead institutional analyses which use the IAD framework assume that rules are exogenous to actors within the action situation.
members of a community and social capital (McGinnis 2011a). Shared collective beliefs or ‘cultural repertoire’ also play a role, at times blurring the distinction between social and community attributes and informal rules. What has been found is that when capacity for these aspects is provided for, less confrontation occurs within the action situation (Ostrom & Cox 2010). The final element considered to affect the action situation is the diversity of biophysical variables, which the institution is designed to manage. Such variables refer to whether the goods and services can be defined by the characteristics of common pool resources or public goods, thereby determining the type of interaction had by actors within the action situation.

Within an institutional system there can be multiple action situations nested within and across several layers of analysis (McGinnis 2011c; Ostrom 2005). As discussed in section 2.1, a polycentric institutional arrangement can consist of multiple levels, so that the actions available to an actor at a lower level are determined by the capabilities and limits of the rules at that level and those at a higher level. Figure 3.3 shows that operational level rules directly affect decisions made by actors at the lowest level of the institutional arrangement. Such rules and actions are affected and shaped by actors’ actions taken at the policy (formerly collective choice) level. They are then further constrained by the constitutional choice rules, which shape the possible rules and action sets available to actors at the policy choice level of analysis.\(^{21}\)

\(^{21}\)Figure 3.3 outlines a top-down approach to decision-making. In a bottom-up system (Ostrom 2005; Polski & Ostrom 1999) operational rules are understood to shape policy rules, which, in turn shape constitutional level rules.
A critical, but rarely studied, final level is the metaconstitutional level. At this level the rules coordinating actors’ collective beliefs about how the world works are situated. Although unobservable, metaconstitutional rules influence lower levels of the institutional system, shaping informal and formal rules. When actors hold different metaconstitutional worldviews conflict can arise, creating institutional inefficiencies and providing motivation for institutional change (Greif 1989; 2006).

Linkages, which connect the multiple decision centres within and across levels of governance, are important considerations for analysis using the IAD framework. Defined as a point of interaction or cooperation between two or more actors, linkages enhance the capacity of actors to address problems or overcome dilemmas (Heikkila et al. 2011). As explained by Heikkila and colleagues (2011), in transboundary resource management, terms such as “co-management” (Adger et al. 2005; Berkes 2002; Carlsson & Berkes 2005; Pinkerton 2003; Watson...
“institutional interplay” (Spranz et al. 2012; Young 2002) and “boundary organisations” (Cash & Moser 2000; Lee et al. 2014) are often alternative terms used to explore the connection between actors across multiple levels of governance and decision centres. Within the IAD framework, linkages can be indicated by a formal rule, strategy, or regularised action that establishes interdependencies amongst two distinct actors around a specified task (Ostrom 2005). The strength of a linkage can affect the delivery of outcomes. When linkages are weak as a result of ill-defined rules, ineffective enforcement, or poor levels of trust and reciprocity, institutions can be inefficient and ineffective at delivering intended outcomes.

ii. Evaluating the “play of the game”

While the differences between institutional settings can be investigated using the IAD, the role particular assumptions or rules play in achieving outcomes is not always made explicit by the framework. Evaluating the play of the game is subsequently the objective of part two of the comparative institutional analysis.

Within the Bloomington and transaction cost economics schools, several metrics have been developed to compare various institutional arrangements. To compare environmental impacts, it is useful to evaluate how any institutional changes may affect peoples’ choices around resource use. From an economics perspective, transaction costs represent the first truly useful comparative metric for assessing economic effects (Coase 1937; 1960; Cole 2012). By showing which arrangement minimises the costs of transacting, researchers and policy makers are able to use transaction costs to help determine which arrangement is most likely to maximise social welfare, keeping in mind the importance of net benefits for assessing the full economic impacts of an environmental policy (Krutilla & Krause 2011).

Ostrom and colleagues working in the Bloomington tradition repeatedly approximated the complexity of institutional settings in game form and tested behavioural predictions in the laboratory (Ostrom et al. 1994). Thus, these previous studies provide a methodological foundation for answering research
question two, which asked about the economic and environmental effects of resource self-determination. A methodological review of both game theory and experiments is given below.

**Game theory**

Games are a way of modeling strategic interactions, that is, situations in which an actor’s action is influenced by his or her expectations about another’s behaviour and that this strategic element is recognised by all actors’ party to the interaction. A game identifies the actors or players and specifies a list of every course of action available to each actor (including actions contingent on the actions taken by others, or on chance events). This is known as the strategy set. A game also identifies the payoffs associated with each strategy profile (combination of strategies), the order of play, and the amount of information held by each actor at each stage.22

A classical game presents a possible outcome of strategic interaction assuming all players are completely rational. The rationality assumption consists of two components: first, individuals are assumed to form, on average, correct beliefs about events in their environment and about other people’s behaviour; second, given their beliefs, individuals choose those actions that satisfy their preferences. Because these highly stylised assumptions fail to properly account for the ‘irrationalities’ often observed when human actors interact, they are sometimes relaxed to more accurately represent human nature (Schelling 2010).23

Models of classical game theory can often be divided into two types of games: non-cooperative and cooperative games. Non-cooperative games deal with situations in which players compete and make decisions independently from one another whereas cooperative games consider situations in which groups or coalitions of players make decisions together.

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22 Such working parts of the game became the universal working parts of the action situation in the IAD framework (Ostrom 1998).
23 For example, relaxing the rationality assumption has enabled concepts such as bounded rationality and learning to be integrated into games through evolutionary game theory. Such concepts have not yet been integrated into classical games (Osborne 1994).
The non-cooperative game of alternating offers (Rubinstein 1982; Shaked & Sutton 1984; Stahl 1971) has been the most widely used model for understanding real-world processes relating to various property rights settings.\textsuperscript{24} It models the bargaining process as a sequence of offers and counter-offers and assumes that when actors are self-interested and have complete information they should always arrive at an outcome that is Pareto efficient (Osborne & Rubinstein 1990).

In such games, the interaction of players is often displayed in extensive form. This means that the model of the game specifies the possible order of events, allowing each player to consider his or her plan of action not only at the beginning of the game but also whenever he or she has to make a decision.\textsuperscript{25} In extensive form games and repeated games, it is assumed that actors will use backward induction to analyse their situation, determine the consequences of their actions and the likely choices of others, and choose accordingly (Smith 2010).

In the bargaining game, the institutional environment governing the bargaining process is specified by an explicit set of rules which provides for two common characteristics of real-world bargaining: the increased costs and risk associated with waiting to complete a transaction, and relative bargaining power. Because the process of bargaining is time consuming, costly delays provide actors with an incentive to complete a transaction sooner rather than later. In the alternating bargaining model, this is captured by a discount factor that approaches one (\(\delta=1\)) as actors become infinitely patient. Similarly, the game is able to capture relative bargaining power by specifying an institutional environment, which allows for first-mover advantage.\textsuperscript{26}

\textsuperscript{24}The alternating bargaining model was an extension of Nash’s (1950) normative bargaining model.
\textsuperscript{25}In contrast, normal form games model situations in which each player chooses his or her strategy once and for all simultaneously with all other players. This means that when choosing a plan of action, each player must make his or her decision without being informed of the plan of action chosen by any other player.
\textsuperscript{26}In any bargaining arrangement, the party with the lower costs has greater bargaining power allowing them to secure a larger share of the good or resource as a result (Knight 1992). Bargaining power thus derives from the capacity of an actor to benefit by inflicting costs on another, as can occur whenever an actor is able to make the offer in a negotiation.
Although the bargaining game is often used to examine peoples’ behaviour under different property rights settings, it is important to note that the type of question being asked can determine the best modeling approach to use and the outcomes ultimately reached (Madani 2010; Ostrom 2010a). For instance, although the interaction of actors operating under different property rights settings has come to be defined by non-cooperative bargaining, early game theorists interested in cooperation modeled the interaction of users of CPRs as a prisoner’s dilemma game (figure 3.4(a)) (Dawes 1973; 1975; Hardin 1968; Hardin 1982; Olson 1971; Schelling 1978; Tucker 1983). In the prisoner’s dilemma, there is a possible strategy for each actor that, if taken, yields higher payoffs to the actor than any other possible strategy. However, when all actors try to maximise their payoffs by adopting this strategy, each arrives at an outcome that is worse for all; in this case, the Nash equilibrium. A coordination failure results because each actor fails to take account of the impact their decision will have on others.

![Figure 3.4: The prisoner's dilemma game (a) and the assurance game (b) make clear how much of an impact payoffs have on actors' choices. In the prisoner's dilemma, the dominant strategy is for both players to defect; however, in the assurance game, a player's best response is dependent on the other player's choices.](image)

In any case, what game theory is able to make explicit is that it is the possible payoffs available to actors, which have the greatest effect on actors' behaviour. For instance, when interactions of users of common property resources are modeled as a prisoner’s dilemma, the distribution of payoffs means that the dominant strategy leads to the underprovision of public goods and overuse of common pool resources. In contrast, the assurance game (figure 3.4(b)) (Sen
1967), which is also a strategic coordination game, shows why some users of CPRs may not always end up in a social dilemma (Camerer 2003).

Because of how the payoffs are structured, the assurance game has multiple equilibria of which at least one is considered socially optimal. This means that in the assurance game actors have the same likelihood of achieving a socially optimal outcome as they do of achieving one that is not. It suggests that when actors make their decisions in a group setting, they have the potential to gain from mutual cooperation but will choose to defect when they anticipate that others will defect. Therefore, in situations where groups manage to cooperate, the assurance game suggests that one of the reasons they succeed is that there is no risk of failed cooperation as actors trust that others participating in the game will make a choice that is to the benefit of the group. In situations where groups do not successfully coordinate their behaviour (the risk-free strategy), it is because each actor does not trust the other will cooperate.

As these two examples demonstrate, in some instances the most effective institutional remedy to a social dilemma or an allocation problem can depend on how the problem is viewed (Bowles 2004). If policy makers are concerned about levels of cooperation, yet view actors as playing a version of the prisoner’s dilemma, the only way to ensure actors arrive at an outcome that is socially optimal is by a permanent intervention by policy makers to change the payoffs or the rules of the game. However, if actors are viewed as playing a version of the assurance game, a desirable outcome can be reached by a one-time rather than permanent intervention, which nudges users towards the socially optimal equilibrium.

Game theory can offer planning, policy, and design insights that not garnered using other traditional quantitative methods of environmental policy (Shogren 2005). For policy makers interested in specifying an institutional environment characterised by different property rights structures, the bargaining game can be useful. For those interested in cooperation, games such as the prisoner’s dilemma or assurance game may be a more suitable focus. However, in both
cases, a common problem remains - that the strict rationality assumptions rarely hold in real world processes. Subsequently, testing games in the laboratory can provide complementary insights into peoples’ behaviour in a group setting.

**Experiments**

In the mid-1980s, a group of interdisciplinary scholars performing studies in the field began to discover that the empirical evidence they were observing was not consistent with the predictions made by conventional game theory (National Research Council 1986). These field insights were confirmed when tested experimentally under controlled conditions (Ostrom et al. 1994). Such findings catalysed the evolution of experimental economics and, since then, economic experiments conducted in the lab and field have provided important and novel insights into the workings of human decision-making and institutions (Bolton 2010).

Field experiments involve testing theories and studying institutions under controlled conditions in the field in an effort to understand more about the ‘real world’ (List 2006). By creating a setting with a mixture of control and realism field experiments create a useful bridge between the laboratory and naturally-occurring data (List & Price 2013; 2016). Unfortunately, however, field experiments can be costly, making lab experiments a practical alternative in some cases. Lab experiments can test theories and institutional effects at relatively low cost (Falk & Heckman 2009). They are also useful for asking policy questions where the proposed programme intervention has no counterpart in reality and where constructing counterfactuals are difficult to do in the field (Camerer 2011; Janssen et al. 2010; Ward et al. 2006). Subsequently, this research uses a laboratory experiment to test the unique predictions of a classical game and evaluate the effects of resource self-determination on environmental and economic outcomes in the case of the Whanganui River, New Zealand.

When the non-cooperative bargaining game, described in the previous section, is played in the lab to understand more about how actors make decisions over
CPRs under different property rights settings, players rarely behave as game theory would predict (Croson & Johnston 2000; Dreber et al. 2012; Hoffman et al. 2008; Leliveld et al. 2008; Oxoby & Spraggon 2008). In the version of the bargaining game most commonly used, a positive monetary amount, the ‘cake’ is split by one actor (the proposer) and distributed (Güth et al. 1982). The other party (the receiver) can either accept the proposed distribution or, if there is no agreement, both parties get zero. The game theoretic solution assigns nearly all the cake to the proposer, the receiver being expected to realise that getting some of the cake, however small, is better than nothing. These predictions are rarely supported experimentally, however. Instead, players have been shown to be significantly more cooperative than would be expected using game theory. In the standard version of the game, rather than offering receivers the smallest positive amount of the pie, proposers have been shown to offer receivers, on average, around 40-60% (Ostrom 2010b). Such offers are then almost always accepted.

In addition, receivers’ acceptance rates tend to decrease with smaller offers, and that they approach zero quite quickly for offers below 20% (Güth & Kocher 2014). This suggests that receivers are not only guided by profit maximisation, but also by what might be considered ‘fair’. If a proposer is receiving a substantially greater payoff than the receiver, the receiver might be inclined to reject the offer, even at a cost to him or herself. In turn, the proposer may also be aware of the receiver’s willingness to reject unfair offers or be guided by their own fairness concerns when making offers to the receiver.

When the bargaining game is applied to property rights problems, experimental results again diverge from game theory predictions of players’ choices. Early property right experimental research showed that the allocation of property rights to players in the bargaining game caused individual players to become more self-regarding, with a heightened effect when the property right was ‘earned’ (Hoffman et al. 1994). More recent experiments have shown that the allocation of property rights can also impact social preferences (Dreber et al. 2012; Huang 2000; van Dijk & Wilke 1997), loss-aversion (Leliveld et al. 2008; Sarlo et al. 2013), feelings of entitlement (Hoffman et al. 1994; 2008; Lesorogol
2014), and have wealth effects (Oxoby & Spraggon 2008). Separately, experimental research has shown how property rights arrangements have spillover effects on individuals or groups who are not directly party to an exchange (Bland & Nikiforakis 2015; Murphy & Howitt 1998).

Further, contrary to game theoretic predictions, experiments have also suggested that peoples’ decisions are not independent of their experience. Third parties have been shown to retaliate against past treatment, impacting resource allocation outcomes (Herz & Taubinsky 2014). Likewise, Bednar et al (2015) recently found that individuals’ future behaviour is likely to depend on their past behaviour, showing that players take their experience with them into new settings. For the identification of resource self-determination for the Whanganui River, this has important implications as it suggests that policy makers who treat each property rights setting as independent could tend towards underestimating or over stating predictions.

Experiments can be a useful tool for policy makers to determine the possible effects of property rights rule changes ex ante (Shogren 1993; Ward et al. 2008). They provide insights into actors’ strategic behaviour in a setting where real consequences exist for peoples’ choices. This allows for a priori assumptions about peoples’ behaviour to be tested in a controlled environment. For this reason, experiments and the bargaining game in particular are used in this research to answer the second research question and determine the likely effects of resource self-determination on economic and environmental outcomes.

iii. **Analysing institutional change: The dynamic IAD framework**

The second major strand of this research examines the diachronic aspects of institutions. As outlined in section 2.2, the subject of institutional change within institutional economics remains divided by competing schools of thought. Within the Bloomington School itself, no comprehensive theory or analytical framework exists which marries the two schools of thought and supports the concept of institutional change as an evolutionary process driven by individuals
wishing to optimise their utility – the definition of institutional change developed in section 2.2.\textsuperscript{27}

This definition is not supported by the IAD framework because the framework treats the institutional ‘system’, or the ‘rules of the game’, as exogenous. When rules are treated as exogenous, they are unable to be changed by actors operating within the action situation. This precludes the analysis of purposeful institutional change. Further, the game underlying the framework in the action situation is conceptualised as a repeated game that does not provide for the evolution of the institutional system as a whole or the adaptive learning of individuals (Greif 2013; Poteete 2013).

An opening exists to extend the IAD to enable it to be used for explaining institutional change. Inspiration can be taken from other dynamic analytical frameworks outside of the Bloomington School and by integrating the important elements of institutional change outlined in section 2.2 into the framework. In the rules of the game tradition Mantazavinos et al. (2005), Alston et al. (2012), and North (1990) have all proposed frameworks in which actors motivated by their own utility drive change. Similarly, frameworks supporting the notion of evolutionary change have been developed which focus primarily on the motivation of self-enforcing expectations (Aoki 2007; Greif & Laitin 2004).\textsuperscript{28}

Shared characteristics of these frameworks are that institutions are treated as endogenous to the action situation and those that use game theory, model players’ interactions as dynamic rather than classical games. To transform the IAD into a dynamic framework suitable for the diachronic analysis of institutions, it is proposed that these two elements are also accommodated

\textsuperscript{27}Identified as a frontier of future work, Ostrom (2013) made a preliminary effort at positing a method for recording rule changes, suggesting a stepwise record of rule changes could be made to examine the processes that lead to changes in rule configurations, analysing it with biological evolution in circumstances where the intentional choice of rules is not possible. For rule configurations to evolve, she argued: “there must be processes that (1) generate variety, (2) select rules based on relatively accurate information about comparative performance in a particular environment, and (3) retain rules that perform better in regard to criteria such as efficiency, equity, accountability, and sustainability” (Ostrom 2013, p.25).

\textsuperscript{28}Stretching beyond the economic approach to institutional analysis, Mahoney and Thelen (2010) also propose a framework for gradual institutional change that builds on the literature of path dependence as it relates to institutional change (eg. David 1994; Greif 2006; North 1990).
within the IAD framework, first, by recognising rules as endogenous rather than exogenous and, second, by synthesising dynamic game theory with the IAD.

**Recognising institutions as endogenous**

From a theoretical perspective, institutional change must be considered partially endogenous, purely because only those who are affected by the institution have any motivation to alter it (Brousseau et al. 2011; Cole & Grossman 1999). In any institutional arrangement, informal rules can only be changed en masse and thus informal rules can be considered exogenous to the individual but endogenous to the group (Greif 2006). In contrast, depending on their position within the institutional arrangement, a single actor can change formal rules. Formal rules can therefore also be viewed as endogenous, however, their relative endogeneity is determined by the position held by the actor in the institutional system. For actors operating at the lower levels of an institutional system, all formal rules are exogenous; however, for those at higher levels, all formal rules can be considered endogenous. This means that in any multi-level system some actors operating within the action situation will have the power to change the working rules in-use.

Such endogenous change will be predominantly “overwhelmingly incremental” (North 1990, p.89) as “[the] sequence of connecting events...allow the past to exert a continuing influence upon the shape of the present” (David 1994, p.206). Over successive periods actors learn about the consequences of their decisions through a process of trial and error, and update their choices accordingly (Mantzavinos et al. 2004; Popper 1972). However, with each update they remain constrained by the existing institutions, biophysical conditions, and the broader community attributes (McGinnis 2011a). Together this interaction produces a gradually evolving equilibrium path facilitated by the systematic reinforcement of beliefs and rules over time.

Exogenous disruptions or shocks can cause individual actors to update their beliefs and rules rapidly, however, so that the gradually evolving equilibrium
path becomes a punctuated equilibrium path. Small exogenous disruptions can be triggered by technological advancement (Arthur 1989), the movement or entry of an actor within or into the action situation (Basurto & Ostrom 2009), or changes in exogenous domains influencing decisions in the institutional arrangement of interest. McGinnis (2011c), for instance, considered how networks of adjacent action situations influence the institutional domain of interest. Although the three case study examples were examined using the original IAD framework, McGinnis showed how the action situation of one institutional arrangement can exogenously influence the value of one or more of the working components of an adjoining action situation. In an effort to explain institutional change, Ostrom and colleagues (Ostrom 2013; Ostrom & Basurto 2011) also employed the idea of exogenous disruptions, but considered them to be captured by the choices of actors at one level affecting those at another level. These types of events are considered small disruptions and can be viewed as interruptions to the gradually evolving institution.

Over successive periods, however, repeated disruptions may cause beliefs and rules to diverge so that “critical junctures” emerge which increase or decrease the range of choices available to actors (Collier & Collier 2002). Such events can trigger a parametric shift in equilibrium through the rapid adjustment of beliefs and rules and impose significant shocks on the institutional system (Greif & Laitin 2004). Similarly, events such as war (Kingston 2007) can also impose significant shocks on the system and cause qualitative shifts in the institutional equilibrium. In the process of institutional evolution, such shocks and disruptions provide exogenous impetus for progressive change, in extreme cases driving the institutional equilibirium from one state to another (Aoki 2001; Greif 2006).

Adapting the IAD framework to account for endogenous evolutionary change requires rules to be incorporated directly into the action situation rather than being categorised as exogenous to the action situation. The next section

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29 The concept of “punctuated equilibrium” was initiated by Eldredge and Gould (1972) and came out of evolutionary biology.

30 It is in this way that Ostrom is able to keep rules exogenous through the process of institutional change.
demonstrates that this adjustment can be made quite easily by modeling actors’ interactions in the action situation as a dynamic game rather than a classically repeated game.

**Using dynamic game theory to explain diachronic processes**

When rules are viewed as exogenous as is the case in the IAD framework, the most suitable game theory approach for modeling actors’ interactions is a classical game. In a classical game, rules create the pre-existing domain in which players interact and are unable to be changed by the players. When institutional change is viewed as an evolutionary process driven by actors seeking to optimise their utility, however, actors must be given the authority to change the domain of the game in which they interact. This can be achieved by substituting the classical game for a dynamic game in the action situation.

A canvassing of the literature shows that two central approaches have emerged for analysing institutional change through a dynamic game theory lens: the ‘evolutionary’ and ‘equilibrium’ modeling approaches. In both approaches each repeated strategic interaction is expressed as a static game either in normal or extensive form (Friedman 1998). The game form, including the payoffs and possible strategies generally remains exogenously given and fixed and players are given the opportunity to choose among different combinations of alternatives (Smith 1980). It is generally accepted that traits or alternatives that increase net benefits are preferred over those that do not (Hodgson 2007).

In the first ‘evolutionary’ approach to analysis, a self-enforcing convention of behaviour is established independent of third-party enforcement or conscious design (Axelrod 1984; Lewontin 1961; Maynard Smith 1972; 1982; Smith & Price 1973; Sugden 2005).31 Players are assumed to lack common knowledge about the rules and structure of the game, are understood to be boundedly rational, and thought to inherit their strategies from choices made in previous rounds. Evolutionary games model the strategic interactions of actors by

31 Additional representative works in evolutionary game theory are those of Sugden (1989), Aoki (1995; 2001), Young (1998), and Bowles (2004).
creating a situation in which (a) higher payoff strategies displace lower payoff strategies over time, (b) there is some inertia, and (c) players do not systematically attempt to influence other players' future actions and are therefore unconcerned about reputation effects (Friedman 1998). This distinguishes evolutionary games from classical games, such as the bargaining game, in which players often share common knowledge, are assumed to be purely self-regarding, and are understood to administer calculated threats where necessary (Hodgson & Huang 2010).

The alternative game theoretic approach is that developed by Greif (1989; 2006), Milgrom et al. (1990), Greif et al. (1994), and Calvert (1995) among others and is known as the 'equilibrium' approach. These examples use sophisticated concepts of equilibrium, such as subgame perfect equilibrium, to explore the dynamic nature of institutions (Greif & Laitin 2004). A subgame perfect equilibrium prescribes a strategy for each player constituted as a comprehensive plan of action choices contingent on all possible future states of the game. Each element of the evolving institutional arrangement must therefore be self-enforcing.

To explain endogenous institutional change using a subgame perfect framework, Greif and Laitin (2004) introduce the concept of 'quasi-parameters'. Quasi-parameters refer to parameters, which are exogenous in the short-run, but change into endogenous variables through the course of the game. At each stage in the game, Greif and Laitin argue that changes in quasi-parameters disrupt the equilibrium, providing an impetus for institutional change. As a result, institutional change may follow a punctuated equilibrium path, in which gradual changes in quasi-parameters occasionally lead to a ‘crisis’ (and institutional change) when it becomes clear that existing patterns of behaviour no longer constitute a self-enforcing equilibrium.

The strength of this model is its ability to identify stable strategies that support mutually desirable payoff profiles, however, one of the pronounced weaknesses is that its use of the subgame perfect means that the approach fails to reveal why a certain institution evolves in one place, yet does not evolve elsewhere. Aoki
(2001) overcomes this limitation by defining the ‘system’ as a set of shared beliefs about how the game is played and extending the equilibrium game framework. Rather than representing institutions using equilibria or a subgame perfect solution concept, Aoki (2001, pp.197–202; 2010, pp.124–128) uses rigorous set-theoretic notions to derive the concept of institutions as summary representations of equilibria.

As shown in figure 3.5, in Aoki’s conception of an institution, the institution is the collective beliefs of all actors interacting within the institutional arrangement. This is represented as the rules of the game. The domain of a game is the set of actors along with all of their available action sets in each successive period. The action profile is thus the combination of actions chosen in one period by all actors in a domain. Over successive periods, an action profile in one period generates a consequence for all actors. This consequence describes all possible physical states affecting the payoffs of actors within the domain while accounting for external environments and historically determined states of the domains at the beginning of a period. The consequence of one period defines an initial (exogenous) state of the next period, labeled the consequence function. Thus, the physical consequences in the state space for each action profile, as well as an historically given initial state, represent the exogenous rules of the game and can act as an exogenous starting unit for the analysis of institutional change.
Figure 3.5: Institutions as rules cum shared beliefs. Adapted from Aoki 2007, p.9.

This conceptualisation of dynamic change is useful because it views a changing institution as a summary representation of an equilibrium outcome in a game rather than a set of enforced rules or a complex state of subgame perfect equilibrium. This allows for: (1) the evolving institutional system to be analysed as a whole, (2) the identification of an exogenous starting unit necessary for the study of endogenous change, and (3) the incorporation of exogenous shocks or disruptions into the frame – all elements identified in the previous section as necessary for the analysis of endogenous institutional change.

Yet, this approach remains constrained by Aoki’s own definition of institutions. Aoki views institutions as a self-sustaining system of shared beliefs so that change is thought to only occur if actors’ beliefs change on critical mass. This means that, a change in a statutory law is not considered an institutional change unless it simultaneously and systematically alters the perception of many individual actors to induce a qualitative change in their strategic choices. New institutions only develop in response to an environmental shock, or internal crisis in the domain, or some combinations of both.
Thus, although Aoki’s summary equilibrium analysis is assessing the choices of each individual, institutional change occurs at the collective or social level of an institutional arrangement. By defining institutions as a system of shared beliefs, it fails to make allowance for the fact that the selection of institutional equilibria is not only driven by the beliefs of the critical mass as expected under the structuralist perspective, but also the relative payoffs and power of independent agents anticipated under the agency perspective. In addition, although, Aoki does emphasise that ‘symbolic markers’, such as rules, summarise the properties of equilibria (Aoki 2001; 2007), he does not acknowledge that rules themselves are a necessary condition for coordinating peoples’ behaviour (Binmore 2010).32 In situations where actors have heterogeneous individual beliefs, formal rules and their enforcement become a critical component of the institution for coordinating peoples’ choices.

These missing elements can be effectively addressed by synthesising Aoki’s approach to institutional change with the multi-level elements of Ostrom’s original IAD framework, however. In the following section Aoki’s approach to institutional change is embedded into the IAD framework. What results is a new dynamic IAD framework that is theoretically and conceptually robust for the analysis of institutional change.

**Extending the IAD for dynamic analysis**

The current shortfall of the IAD framework is that it does not explicitly address the process of institutional change. By basing the framework on a repeated game and including feedback loops in the framework, Ostrom acknowledges that institutions involve repeated interactions, but by treating rules as exogenous does not provide for the endogenous evolution of rules or the purposeful adjustment of rules by actors within the action situation. To enable the IAD framework to explicitly provide for the evolution of an institutional arrangement driven by individuals seeking to optimise their utility, institutions need to be

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32 Aoki does emphasise that ‘symbolic markers’, such as rules, summarise the properties of equilibria (Aoki 2001; 2007), however, he does not formally create a link between the equilibrium and rules based accounts of institutions, nor the agency and structuralist perspectives.
treated as endogenous and the interaction of actors within the action situation modeled as a dynamic game.

Building on the discussion of institutional change in chapter two and the discussion above, the previous section identified three important analytical components of institutional change to help explain why one institution is selected over another. These components were the identification of an exogenous starting unit, the synthesis of evolutionary and purposeful change, and exogenous shocks or disruptions. Aoki’s dynamic model of institutional change identifies an exogenous starting unit, provides an explanation of why one institution is selected over another, and allows for evolutionary analysis of the institutional system as a whole. He also considers the shift in institutional equilibrium that can come from exogenous shocks. Purposeful institutional change can be considered in the analysis by synthesising Ostrom’s multi-level institutional map with Aoki’s model as is described below.

Ostrom’s starting unit of analysis for the IAD is the action situation, or the working parts of the game (McGinnis 2011a). In the dynamic form of the framework, the starting unit of analysis is the summary representation of the equilibrium outcome of the game labeled the consequence function, in figure 3.6. Identifying the exogenous starting unit requires pinpointing the self-sustaining, salient patterns of social interactions at play at the time the researcher wishes to commence their analysis as well as the outcomes, which arise from such interactions. As with Ostrom’s action situation the researcher can record how actors interact in the domain and the action sets available for each of them. The consequence function, which specifies particular (physical) consequences of concern to some or all of the actors equates to the outcomes observed in the action situation in the IAD.
Fig 3.6: A dynamic version of the IAD framework constructed by synthesising Aoki’s version of a dynamic institution with Ostrom’s IAD framework. In this dynamic framework, institutional change is motivated by exogenous shocks or disruptions that cause actors operating within the action situation to update their beliefs and supporting rules. Informal rules are assumed to be endogenous to the group as a whole, while formal rules are endogenous to actors at the higher levels of the institutional arrangement. Smaller disruptions can destabilise the institution over time, while larger shocks can spur a qualitative shift in equilibrium. After each disruption or shock, actors evaluate the outcome reached and determine which step to take based on the ‘consequence function’ of the previous period.
The initial consequence function is considered to be the outcome of a gradually evolving state of equilibrium bounded by the exogenous variables outlined by Ostrom in the IAD framework, namely the biophysical characteristics, the community attributes and the rules-in-use (Aoki 2001, p.186). Actors operating within the institutional arrangement are understood to hold beliefs about how the world works and how others are likely to behave. These beliefs constrain and influence individuals and organisations enabling such actors to form strategies to optimise their mutually-consistent choices. As each actor’s strategy is based on their expectations of how they expect others to behave, the group jointly constructs an equilibrium state, which is represented by the rules-in-use.

This state of institutional equilibrium coordinates behaviour until such a time that some sort of exogenous shock disrupts the equilibrium. As discussed, these shocks can shift the institution qualitatively so that it jumps from one equilibria to another, or simply interrupt it so that individuals iteratively update their beliefs in the existing action situation causing the pattern of institutional change to follow a punctuated-equilibrium path. Significant shocks are categorised by a shift in worldview and a measurable shift in decision-making power, while smaller disruptions are recognisable through progressive rule changes and gradual social change.

Although Aoki assumes that institutional change occurs as a result of a shift in beliefs by the majority, should the shock or disruption affect a decision-making actor at an upper level of the institutional arrangement, he or she may change the rules to better reflect his or her new set of beliefs, whether or not the new beliefs are shared with others. In situations where the shock is not large, individuals may update their beliefs about the social landscape iteratively creating a punctuated equilibrium path. This pathway will also display path-dependence, as the development of both informal and formal rules will be explicitly moulded by, and adapted from, the consequent function of the previous period.
Purposeful rule changes by actors optimising their utility are incorporated into the dynamic framework by assuming that each actor operating within the institutional arrangement has his or her own set of beliefs, which guide their decisions and motivate their choices. At each level of the institutional arrangement actors with the authority to change rules will do so if deemed of benefit to themselves. However, as actors are only able to change formal rules at the level of the institutional arrangement at which they rest, those at lower levels of the institutional arrangement will be limited in what change they can engender. Actors at higher levels of the institutional arrangement, however, will be able to actively change formal rules and impact the choices available to actors at lower levels of the institutional arrangement.

The assumption is that formal rules are more likely to be endogenous to actors who have greater authority to design and change formal rules at the upper policy or constitutional levels of the institutional arrangement. Those at lower levels of the institutional arrangement will find the design of formal rules outside their control and will have to drive change through processes outside of the institutional arrangement in which they operate. Similarly, it is assumed that informal rules will evolve gradually without design unless all actors exposed to an exogenous shock update their beliefs simultaneously causing a qualitative shift in equilibrium.

This new dynamic IAD framework allows institutional change to be analysed when defined as an evolutionary process driven by individuals looking to optimise their utility. In chapter seven this dynamic IAD framework is applied to the case of the Whanganui River to help explain how and why resource self-determination was selected as an alternative approach for governing a river system.
iv. **Measuring institutional robustness: Ostrom’s design principles**

As a final mode of evaluation, the overarching robustness of resource self-determination is assessed and compared with state ownership in chapter eight. This evaluation aims to answer the fourth research question to determine how long lasting and stable the new arrangement is likely to be. This is a significant challenge for reasons that are both methodological and substantive. The most significant issues of method stem from the sheer number of conditions that may be relevant to the relative stability of an institutional arrangement. For instance, in a comparative analysis of three key works on resource governance (Baland & Platteau 1996; Ostrom 1990; Wade 1988), Agrawal (2001) found 36 separate characteristics identified by the authors as central to the successful governance of common property resources.

Likewise, there are issues with inter-scalar comparisons. Do inferences that are valid at the local level also apply to more macro-level phenomena? What about cross-scale analyses? Young (2002) concluded that cross-scale interactions create an inescapable tension where the benefits of higher-level arrangements, measured in terms of opportunities to consider biophysical interdependencies and to engage in ecosystem management, is contrasted with the costs of operating at higher levels. These costs include the difficulty of tailoring the arrangement to local conditions and local actors. Together, these tradeoffs create challenges for identifying characteristics that translate into robust governance frameworks.

From a substantive perspective, within most lists characterising robust institutional arrangements deficiencies remain in the set and type of characteristics identified. Often the resource characteristics themselves are lacking, with little attention given to how various aspects of a resource may affect how, and whether, users are able to sustain institutions (Agrawal 2003). Likewise, many lists pay only limited attention to the exogenous social, institution, and physical environment (Araral 2014). As discussed, variables exogenous to the domain can affect choices made within the institutional
arrangement. Likewise, the interaction of states and markets outside of the domain can explicitly shape the variables under study.

Ostrom’s (1990) design principles are not immune to these methodological and substantive challenges, but they provide a convincing set of variables for understanding why the results of institutional design are robust in some cases, yet fail in others (Cole 2012). Empirical testing of studies designed to evaluate the principles have supported the general hypothesis that when a group designs a property rights system that meets most of the design principles, there is a greater probability that it will survive disturbances over time (Cox et al. 2010; Ostrom 2008a). Because the principles are built on the presumption that local solutions, which are less costly, are preferred to more distant social choice forums, which are more costly, the conclusions of the principles can be considered consistent with a comparative transaction-cost analysis (Cole 2012).

For this reason, analysis of the proposed application of resource self-determination to the Whanganui River is a useful complementary predictor of the likely success of the new arrangement. While testing peoples’ behaviour experimentally can evaluate the possible impacts a change in property rights may have on environmental and economic outcomes, it is unlikely to be able to capture the nuances of the institutional arrangement, which could influence the long-term success of resource self-determination. Therefore, the final evaluation takes Ostrom’s design principles and uses them as a broader predictive tool of resource self-determination’s robustness in the context of Whanganui River. Using the design principles as a comparative measure, resource self-determination is also compared with state ownership to identify whether the new arrangement is likely to be more stable and robust than the existing property rights system governing the Whanganui River. The results of this analysis are given in chapter eight.

33 The list of Ostrom’s design principles used in this research follow Michael Cox and colleague’s (2010) extension of Ostrom’s eight design principles. That this was a necessary extension appears to have been first discussed in Agrawal (2001).
3.3 Conclusions

This chapter outlined a methodological framework for this research nested in the Bloomington approach and complemented by transaction cost economics. Over 40 years of research on common pool resources in this tradition has demonstrated the diversity and complexity of institutions and the impact they can have on peoples’ behaviour. Frontiers remain, however, not least in the analysis of dynamic institutions and the identification of property rights regimes that sit outside those more commonly examined.

The review of the methodology literature discussed the various analytical approaches used in this research, highlighting the value of adopting an embedded case study approach to analyse the complex case of applying resource self-determination to a river system grounded in theory. The following chapter introduces the case study in careful detail and outlines the methods used for data collection and analysis.

34 Important to note here is that it is necessary to show, not only that results are in line with theory, but that alternative explanations are not supported.
4.0 Introduction

The previous chapter introduced the research questions and outlined the research design used in this thesis. It explained how, in the spirit of the Bloomington School and transaction cost economics, the research questions are addressed using a research framework designed to advance a theoretical and empirical research agenda. As discussed, this research examines the institutional economics of granting a river legal standing using an embedded case study. The case study can be separated into two key analytical strands: a comparative analysis comparing resource self-determination with the centralised property rights system and an historical analysis exploring institutional change. A qualitative analysis is then conducted examining the relative robustness of the resource self-determination compared with the existing property rights system of state ownership.

This chapter introduces the case study of the Whanganui River and provides insight into the specific mixed-methods used to answer the research questions and advance the research agenda. In section one, the case study is introduced and community attributes and biophysical characteristics of the catchment outlined. These are considered some of the exogenous parameters of the institutional arrangement. In section two, the process undertaken for selecting the case study site is explained. The qualitative and quantitative data collection process is explained in section three. Section four summarises the analytical approach as further details of each process are provided in chapters five, six, and seven. The chapter is concluded in section five.
4.1 Introducing the case study: The Whanganui River, New Zealand

From the base of Mt Tongariro, the Whanganui River weaves through New Zealand’s central North Island for 290km flowing into the Tasman Sea beside the town of Whanganui. As New Zealand’s longest navigable river, the Whanganui has always been a major 'highway' linking the coast and the interior. Prior to European settlement in the 1830's, the river supported a population of (at times) over 2000 Maori and many more would travel up and down its length, trading goods and travelling across country (Young 2006). More than 140 pā (settlements) were located along the river, many of which were large and permanent kāinga (villages) (Waitangi Tribunal 1999). For the people of Whanganui, Te-Atihauenui-a-Paparangi, the river has always been of high cultural and spiritual value.


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35 See glossary of Māori terms in Appendix i.
36 Prior to European settlement, the total Māori population in Aotearoa-New Zealand was estimated to be around 100,000. By 1843 it had already fallen to between 50,000 and 80,000 (King 2003). Today around 15% of New Zealand’s population (around 600,000) identify as Māori (Statistics New Zealand 2013).
Following European settlement stock and tradable goods were transported up and down river and to early visitors the Whanganui became known as “the Rhine of the Pacific” (Downes 1921). The New Zealand government (the Crown) began to formalise its institutional control over the river from the 1870's, using the river for gravel extraction and hydropower (Waitangi Tribunal 1999). Today the Tongariro Power Development Scheme (TPDS) operated by Genesis Energy Limited (Genesis) diverts 82% of the headwaters of the Whanganui to help supply around 5% of New Zealand’s electricity (Waitangi Tribunal 2015). The diverted water can be considered consumptive flow as it is not returned to the river, instead being channeled north to Lake Taupo and released into the Waikato River. Genesis is the largest user of water on the Whanganui River, although as of November 2016 172 other operators also had consent to extract and use water.

Map 4.2: The Tongariro Power Development Scheme catchment area (Waitangi Tribunal 2013, p.1066). 82% of flow is diverted from the headwaters of the Whanganui River for operation of the western diversion.
The river catchment covers approximately 7100 square kilometres of steep hill country, alpine areas, indigenous forest, scrub, farmland, and exotic forestry (Horizons Regional Council 2003). The majority of the catchment is managed as private property, although parts of two National Parks, managed by the Crown sit within the catchment’s boundaries. The catchment covers four local government jurisdictions and encompasses several small towns and settlements of which most are located beside the Whanganui River or its tributaries. These include Taumarunui and the town of Whanganui, which has a population of almost 43 000 (Statistics New Zealand 2013). Communities in the catchment are largely bi-cultural and on average have a higher unemployment rate than the rest of New Zealand (Statistics New Zealand 2013). Industry and agriculture remain the drivers of growth in the region.

In terms of non-market economic values, since time immemorial the Whanganui River has been central to the life of local Māori. For Te Atihauanui the river is an ancestor from whom the Iwi descend and towards whom they have a responsibility. There have been long-standing contests over ownership and control of the river, with the rights held by the state being repeatedly challenged by the Iwi in court. The river also has high recreation and tourist values. More than 5500 people canoe or kayak the river annually, usually spending between three to five days on the water (Department of Conservation 2012a). Some of the river’s tributaries, like the Whangaehu River, offer some of the world’s best trout fisheries, contributing further to the river’s recreational value. The river also has high natural and environmental values providing habitat for the endangered whio (blue duck) and several other endangered species, including native fish.

The risk of soil erosion is an inherent feature of the landscape due to the relatively young soft-rock geology and the magnitude and frequency of storms

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37 Whanganui and the other small centres along the river are largely bicultural. Unemployment levels are over 2% higher in Whanganui than the rest of New Zealand, sitting at 9.6% rather than 7.1% (Statistics New Zealand 2013). The town is reliant on industry for economic prosperity. The river is an important component of the town’s identity for both Māori and non-Māori (Pākehā).
38 This report states that between 2005/06 and 2011/12 visitor numbers on the ‘Whanganui River Journey’ increased by 43.5%, so the quoted figure of 5500 annual canoeists is now likely to be higher.
(Manderson et al. 2013). This risk has been exacerbated by extensive land clearance resulting in degraded water quality and reducing the productive capacity of surrounding farmland (Horizons Regional Council 2003). Water quality in the catchment has also deteriorated due to effluent from sewage discharges and run-off of animal manures and nutrients from up-stream farms. This has led to some lakes and rivers in the Whanganui Region declining to a point where it is too risky to swim or gather food, and aquatic life is being affected (Horizons Regional Council 2016b).

Water quality in the Whanganui River itself is rated as ‘fair’, which means that it is generally suitable for swimming (Horizons Regional Council 2016, s.5); however, a report by NIWA on water quality in the Whanganui River published in 1995 concluded "[its] degraded condition is unsatisfactory in a river with major tourist and conservation values..." (NIWA 1995, p.9). From a cultural perspective, local Iwi also consider the health of the river unsatisfactory. The mixing of the waters of the Whanganui River by the Tongariro Power Development Scheme is an affront to the river and Iwi’s mana (honour, prestige) and the river, which once tasted of kowhai flowers, now runs slow and sluggish (Young 1998).

In 2012, a preliminary agreement was signed by representatives of Whanganui Iwi and the Crown, formally acknowledging the special status of the Whanganui River as an ancestor of the Whanganui Iwi and promising the development of a framework that would recognise the legal rights of the Whanganui River and its catchment. At the time of writing, the proposal had been formalised as the Te Pā Auroa framework as part of the Te Awa Tupua (Whanganui River Claims Settlement) Bill 2016, which was passed into legislation in March 2017. This Act offers the first example of river being given legal rights “from the mountains to the sea” and it is thus this case and property rights change that is examined in this research.
4.2 Selecting the case study site

To answer the research questions pertaining to the institutional economics of granting a river legal standing, it was necessary to study a substantively important case where resource self-determination had been proposed for governing a river system. At the commencement of this research in 2013 there was only one example of this: the Whanganui River, New Zealand.

Within the case study literature, some scholars have argued that the selection of extreme cases, like the adoption of resource self-determination, adds little value to the literature (Achen & Snidal 1989; Geddes 1991; 2003). Their concerns lie in the potential for selection biases and the risk of “inferential fallacies” that have “devastating consequences” for findings’ validity (Achen & Snidal 1989, pp.160–161). However, good theories must be able to explain substantively important cases as well as those randomly selected. The application of resource self-determination and the selection of the Whanganui River case present a useful opportunity to test long-standing institutional theories within a new property rights setting.

Others have also suggested that the analysis of single cases provides little opportunity for a generalisation of results (Donmoyer 2000). Agrawal (2001) for instance, argues that the wide range of different variables to which the success (or failure) of certain institutional arrangements is often attributed reduces the generalisability of results and that the conclusions drawn from single cases are often only relevant to the case under consideration. However, examples of influential case study research show that this is not always true. Single case studies can influence the scientific discourse and, in some cases, have motivated the establishment of broad-based research programmes. Successful case studies address the potential weaknesses of single case analysis by grounding the research questions and hypotheses in theory, thereby maintaining external validity in analysis and providing for transferability (Lincoln & Guba 1985) if not generalisability, of findings (Donmoyer 2000).

39See (Allison 1971; Dahl 1961; Skocpol 1979) for examples of influential single case studies.
The case of the Whanganui River offers a definitive example of how a river system can be granted legal rights. The case provides an opportunity to compare a state property rights arrangement with the system of resource self-determination by comparing the existing property rights arrangement with the future system. It also allows for the ex ante analysis of economic and environmental effects of the property rights change – one of the grey spots in the literature identified in chapter two. In addition, the case provides an opportunity to undertake a research-based analysis of institutional change using the new dynamic IAD framework developed in chapter three. Finally, the case is able to be analysed using Ostrom’s design principles to draw conclusions about the likely robustness of resource self-determination as an alternative property rights arrangement for governing a river system.

4.3 Data collection

Both qualitative and quantitative data were collected as part of this research. Qualitative data were gathered from interviews with actors operating within the institutional arrangement governing the Whanganui River and triangulated with data gathered from archival records and various document sources. Quantitative data, used for evaluating the findings of the institutional environment, came from a laboratory experiment. The process of data collection for each data type is described in turn.

4.3.1 Qualitative data: Interviews and fieldwork
The primary qualitative data used to answer research questions one, three, and four were gathered from in-depth interviews with 33 actors involved with governance and use of the Whanganui River. The interview periods were split into two blocks, with interviews with 15 subjects taking place between June – August 2014 and interviews with a further 18 actors undertaken between October-November 2015. The majority of interviews were individual interviews conducted face-to-face in Wellington and in Whanganui, New Zealand; however, by necessity two interviews were conducted over the phone and Skype due to it
not being possible to meet with the subjects. Two interviews were conducted with two subjects each (one of these subjects also participated in an individual interview before contributing to a second) and one interview was conducted in a group setting.

Interview subjects were actors at each level of the institutional arrangement governing the Whanganui River. An initial scoping study, plus pre-existing knowledge of the water governance structure in New Zealand, contributed to a preliminary identification of key stakeholders and organisations. Individual interview subjects were selected using purposive sampling and then through the snowball technique, whereby suitable interview subjects were identified from recommendations of other interviewees (Atkinson & Flint 2001). In several cases, interview subjects introduced me to future interviewees, which enabled access to subjects that would have been otherwise difficult to contact. Potential network biases were mitigated by ensuring that the interview subjects initially selected came from a range of backgrounds and by remaining attentive to the perils of relying too heavily on information obtained from one interviewee’s referrals (Biernacki & Waldorf 1981; Mosley 2013).

The interview subjects were contacted initially via email, prompted with reminders and called by telephone when necessary. Interviews were open-ended but followed a basic structure that was offered to subjects before meeting, enabling them to prepare for the discussion should they wish. Thus each interview can be classified as a semi-structured interview (Starr 2014). Subjects were asked about how governance of the Whanganui River was administered under the state property rights system as well as their expectations of how it would operate following the river being granted legal standing. Interviews usually lasted around 40 minutes, with the longest extending to 90 minutes and the shortest being only 20 minutes.

Approval to collect interview data was given by the Australian National University Ethics Committee as an Expedited Ethical Review E2. This meant that the data collection process was considered to “engage participants who are fully
competent and not vulnerable in research settings that are relatively benign, [but that the circumstances are] not what the participants would encounter in everyday life”. Consent was sought from each participant who offered to partake in the interview process prior to the interview commencing and it was made clear to interviewees that they could withdraw from the interview at any stage.40

A copy of the information sheet and consent form shared with participants are available in appendices (ii) and (iii).

Once collected, data were stored on a password-secured computer and the consent forms locked in a secure cabinet separately to any hard-copy interview data. Audio-recordings were transcribed using headphones as soon as practicable following the interview and the dictaphone stored on the researchers person (travelling from interviews) or in a locked storage device. The audio recording was removed from the dictaphone as soon as it was viable and stored on a password-protected computer. It was agreed that all data would be stored for at least five years following publication.

The time period of data collection covered the period directly after resource self-determination was proposed as a new property rights arrangement for governing the river and the 18 months following. Throughout this period there was much uncertainty about the legislation (passed in March 2017) and how it would be operationalised. This made persuading some actors to take part in the research quite difficult. Over the period of data collection, there was a significant level of anxiety about the potential for the public to react negatively to a river being granted legal rights and the impact this could have on the legislation being successfully passed. Significant investment had been made through the negotiation process and neither negotiating party (the Crown and Iwi) wished to treat their respective investments as sunk costs. As a result, in addition to the formal interview subjects, several people were interviewed about the subject but their comments were made officially off-the-record.

40 One interview subject did pull out of the research citing a conflict of interest.
As is important for ensuring the validity of interview data, the comments made by interview subjects were triangulated with documents and archival records where appropriate. Documents such as policy, legislation, and news sources were of particular value for understanding the linkages prevalent in the governance arrangement of the Whanganui River. These were principally sourced online. Archival records, such as early reports of life on the Whanganui River were gathered from the Whanganui Historic Museum’s archive. The Museum has a significant collection of documents of early life on the Whanganui River and the social attitudes that dominated interactions between actors. Other archival material was gathered from the University of Canterbury and Victoria University of Wellington, and several books from the National Library of Australia.

The triangulation process involved cross-checking the accuracy, relevance, and completeness of the information given by the interviewees against information from other sources (Starr 2014). The process was also inverted to check the validity of my interpretation of documents and reports with interviewees to elaborate my understanding of the data (Jick 1979) and confirm its accuracy (Denzin 2009). Ultimately, the collection of qualitative data and its subsequent analysis provided a strong contextual basis for the quantitative analysis and contributed to the elucidation of the institutional economics effects of applying resource self-determination to a river system (Danermark 2002).

4.3.2 Quantitative data: Laboratory experiments
To evaluate the effects of the institutional change governing the Whanganui River, data on peoples’ behaviour under the two settings were gathered from the laboratory. All experimental sessions were carried out at the Monash Laboratory for Experimental Economics, Monash University, Australia, between October and November 2015. A total of 108 undergraduate students from various disciplines were recruited to participate in the experiment using the Online Recruitment System for Economic Experiments (ORSEE) (Greiner 2004).
The specific hypotheses for the experiment were generated from the analysis of the institutional environment carried out using the IAD so that the hypotheses identified for evaluating the findings from the qualitative data were not generated until the qualitative analysis was complete. Significant time was spent translating the findings of the IAD into game form and designing an experiment, a process, which is outlined in detail in chapter six.41

Again ethics approval was sought from the Australian National University Ethics Committee in 2015 and granted prior to conducting the experiment. This time, approval was given as a Low-Risk Expedited 1 Protocol as it was considered that the participants would only be engaging in activities similar to what they would encounter in everyday life. The experiment was carried out in line with the ethics approval and the procedure outlined in detail in chapter six.

4.4 Analysis of data

The qualitative data collected as part of this research were preliminarily organised and examined using data displays. This process began during the fieldwork and continued through analysis. These data displays took two forms and spurred two different analytical strategies; each of which was selected to best address the research questions. Each will be now described in turn.

For the comparative analysis of the existing and proposed institutional arrangements governing the Whanganui River, the exogenous variables and actors interacting in the institutional arrangement governing the Whanganui River were identified from the qualitative data. Interview data were manually coded to identify key actors and rules and triangulated with documentary evidence where possible. Key statements of interviewees were cross-checked with data from other sources and entered into the data display accordingly.

41Initially the objective had been to design an experiment addressing actors’ levels of cooperation under the two property rights settings, centralised control and resource self-determination. However, a canvassing of the literature showed that property rights arrangements were more commonly tested using non-cooperative bargaining games. Subsequently, it is in this tradition that the evaluation proceeded.
Attention then turned to understanding the changes proposed under resource self-determination and the analytical process was repeated to determine the effect resource self-determination will have on property rights.

To evaluate these changes and quantify the possible effects on environmental and economic outcomes, data collected in the lab was statistically analysed using STATA. Both a within and between analysis of the existing and future institutional arrangements was conducted at the individual level to test three general hypotheses generated from the qualitative institutional analysis. Further details of the analysis are given in chapter six.

A second analytical strategy was employed to understand how and why resource self-determination was selected as an alternate property rights arrangement for the Whanganui River (Carus & Ogilvie 2009). The dynamic version of the IAD framework outlined in chapter three was tested empirically. Transcriptions of the interview data were printed and coded thematically, separating data points into causal variables acknowledged by theory to contribute to institutional change. These variables included rules that were treated as endogenous and exogenous shock parameters. Data gathered from document sources and archival records were similarly organised and coded. What emerged was a map of path-dependent institutional change for the Whanganui River, which clearly outlined the role various factors played in the eventual identification of resource self-determination.

The overarching objective of this process was two-fold. Firstly, the research aimed to contribute to theory by examining whether institutional change could be considered endogenous and to determine whether diachronic change was indeed a combination of evolutionary progression and individual utility maximisation as had been proposed in chapter two. Secondly, this section of the research aimed to examine empirically how and why resource self-determination was adopted as a property rights approach for a river in New Zealand.
4.5 Conclusions

The research design adopted for exploring the institutional economics of granting a water system legal standing uses an embedded case study design. The use of mixed-methods for data collection and analysis allows a comprehensive picture of resource self-determination to be painted by accounting for both qualitative and quantitative elements of the case. It allows the research questions to be addressed as well as the grey spots in the literature outlined in chapter two. Together this allows for a contribution to be made, which advances both the empirical and theoretical literature.

The selection of the case was dictated by it being the only example of resource self-determination proposed for a river system at the commencement of this research. Although some researchers express concerns about single case study designs, the combination of qualitative and quantitative approaches to data collection and analysis in this study allows for comparisons over time and provides a useful collection of evidence for interpretation. For policy makers the findings of this study will provide a useful resource for understanding the motivations for adopting resource self-determination and the circumstances under which it may be a robust property rights system.

Aligning with other studies of institutions which look at institutional change following static analysis (Aoki 2001; Greif 2006; Ostrom 1990), the next two chapters provide a comparative analysis of the existing institutional arrangement governing the Whanganui River and evaluate how the adoption of resource self-determination is expected to affect peoples’ behaviour and CPR use. This is followed in chapter seven by a dynamic analysis of institutional change, examining the institutional components contributing to the adoption of resource self-determination. Chapter eight gathers all of these results and discusses them in light of Ostrom’s design principles and chapter nine concludes.
5 Exploring the institutional context

5.0 Introduction

From the outset, the adoption of resource self-determination presents a significant shift in the institutional arrangement governing the Whanganui River. From what is understood about how institutional arrangements can affect the distribution of wealth and decision-making power, the assignment of legal rights to the river could lead to marked changes in transaction costs and resource use outcomes. Subsequently, this chapter undertakes an exploratory comparative analysis of the existing and proposed institutional arrangements governing the Whanganui River guided by the IAD framework introduced in chapter three. Ultimately it aims to answer research question one, which asked about how the allocation of property rights will be affected by the application of resource self-determination to the river system.

In this chapter, section one identifies the key components of the existing institutional arrangement, highlighting the important linkages that connect the polycentric decision-making centres. Section two discusses details of the settlement in which the new framework was first outlined, as well as the Te Awa Tupua Act 2017, which formalises the new arrangement. Section three examines how the new Act is likely to affect the existing rules and actors. Section four analyses the effect this change will have on the bundle of property rights for the river and discusses the implications of these changes. This analysis and discussion generates the hypotheses for testing in chapter six. Section five concludes.
5.1 Whanganui River institutional arrangement under state ownership

Until the recent passing of the Te Awa Tupua (Whangnaui River Claims Settlement) Act 2017, the Whanganui River was managed through a fragmented freshwater governance system built on a model most similar to state ownership. The Crown (the state) owned a significant part of the riverbed in the main stem of river, which was administered by the Commissioner of Crown Lands. Other parts of the bed were administered by the Department of Conservation under conservation legislation. Parts of the banks were in private ownership, while other parts were owned by the Crown. Under common law water was owned by no-one, and was treated as a public good, however, the property rights to management, exclusion, and alienation were vested in the Crown.42

There were several centres of decision-making power within each level of the institutional arrangement, creating a system of polycentric governance. This was particularly evident at the policy level of the institutional arrangement as rules made at the national and local policy levels are of added importance in the New Zealand context due to the absence of a codified constitution43. Therefore, to analyse the governance system of the Whanganui River using the IAD framework, Ostrom’s multi-tier system was amended to divide the policy level into an upper and lower level (figure 5.1). In the amended framework, national level rules and actors are placed in the upper policy level, whilst local authorities and rules are identified at the lower policy level. At the operational level, remain those users of the river who are constrained and enabled by the rules made at the higher levels of the institutional arrangement.

42This position, which is held by the Crown, is highly contentious due to unresolved issues regarding Māori rights to freshwater. A 2003 ruling in the Court of Appeal (in Ngati Apa v Attorney General [2003] NZLR 643. Available at: http://www.nzlii.org/nz/cases/NZCA/2003/117.html) found that the introduction of common law to New Zealand from England did not extinguish Māori customary title. This means that whatever customary title Māori held to freshwater, prior to the assertion of British Sovereignty in 1840, continues to exist unless it has been lawfully extinguished. The matter was further examined by the Waitangi Tribunal in 2012, which agreed with the 2003 ruling and went on to say: “It does not matter that Māori did not think in terms of ownership in the same way as Europeans. What they possessed [in terms of water] is equated with ownership for the purposes of English or New Zealand law” (Waitangi Tribunal 2012, p. 89). Following each decision and ruling, very few recommendation have been put forward for navigating the issue and thus it remains an ongoing matter of contention for both Māori and the Crown (Duncan 2017).
43Important to emphasise here is that in saying New Zealand does not have a codified constitution is not equivalent to not having a constitution. It just means that the constitution is a collection of formal and informal rules that are able to be changed and adapted over time by actors at the constitutional level.
The following analysis of the current institutional arrangement governing the Whanganui River is organised by examining the actors and rules at each level of the institutional arrangement. Later this is compared with the expected changes to rules and actors under resource self-determination. A summary visualisation of the institutional arrangement under state ownership is given in figure 5.2 and explained in detail below.
Figure 5.2: This diagram offers a simplified depiction of the institutional arrangement governing the Whanganui River under state ownership, paying particular attention to the interaction of actors and rules. Guided by the IAD framework, it shows a top-down system of governance shaped by the European worldview. Under this arrangement the Māori worldview is largely relegated to the operational level, as shown by the dashed lines. Although not displayed in this diagram, the outcome of this interaction has been sustained conflict and contestation between Iwi and the Crown for over 140 years regarding ownership and control of the river. The outcomes of actors’ interactions are discussed further in section 5.4.

5.1.1 Metaconstitutional level
As shown in figure 5.2, under state ownership two competing worldviews shape the metaconstitutional level of decision-making in the Whanganui region. The European worldview predominates. It identifies a dichotomy between man and nature, which allows for the ‘ownership’ of goods and resources such as water. The set of beliefs translates to a system of rules that shapes the majority of formal institutions and actor interactions through each of the lower levels of the institutional arrangement governing the Whanganui River.
In contrast, the Māori worldview (te ao Māori, values), which sees nature as indistinct from man, has little influence on the formal and informal rules at any of the higher levels of the institutional arrangement. Driven by a belief that the Whanganui River is an ancestor, under the Māori worldview, nature is unable to be owned in an absolute sense. Instead a person’s relationship with a natural object, such as the river, is one of kaitiakitanga (guardianship or stewardship) (Roberts et al. 1995; Salmond 2014), allowing a person to hold usufruct rights, but not ownership as is accepted under the western worldview.44

Although, the basic tenets of Iwi’s beliefs and worldview have remained strong among Māori, influencing the way Iwi constructed tribal status and authority, endeavour to influence management of the river, and relate to other agencies and government, the Māori worldview is largely relegated to informal rules at the operational level of decision-making (Harmsworth et al. 2013; Waitangi Tribunal 2015). This experience is consistent with that of other Māori across New Zealand (Memon & Kirk 2012; Ruru 2009).

5.1.2 Constitutional level

Shaped principally by the western worldview, New Zealand's uncodified constitution consists of a sophisticated system of laws and legislation identified in formal legal documents, in decisions of the courts, and in practices. These include but are not limited to, the Treaty of Waitangi (New Zealand’s founding document), the Constitution Act 1986, a collection of statutes (Acts of Parliament), Orders in Council, letters patent, decisions of the courts, constitutional conventions, and, more recently, international law (Shaw & Eichbaum 2011). These rules specify the values of the working components of the action situation at the constitutional level of the arrangement and at every level below.

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44The concept of kaitiakitanga is not easily translated as it invokes much more than the notion of guardianship in the western sense. Literal interpretations of kaitiakitanga stem from the core word tiaki meaning ‘to care for, guard, protect, to keep watch over and shelter’ (Marsden & Henare 1992). In the spiritual world, kaitiaki are seen as the spiritual beings that protect and guard particular tribal taonga (treasures, which can include natural resources, like the Whanganui River). In the social world, kaumatua (elders) and rangatira (leaders) are the principal kaitiaki of the kin group.
The Treaty of Waitangi, for example, provides the foundational rules for the relationship between Māori and Pakeha (non-Māori) in New Zealand. Signed in 1840, the Treaty consists of three articles – the first two being in English and the third in Māori. Inconsistent translations of the articles have caused the nature of the relationship between Māori and Pakeha to be fraught and dynamic (Stokes 1992). Today, Māori and the Crown are formally acknowledged to be Treaty partners, but how this transpires into working rules-in-use is less clearly defined (Lennox et al. 2011; Ruru 2009).

The Constitution Act 1986 establishes the authority, boundary, and position rules of the institutional system. As with all Commonwealth states, the Queen is identified as Head of State and Governor-General as her representative. Following the Westminster System model, the executive and the legislature are the central groups of actors operating within the institutional arrangement. Each of these groups is guided by a set of position and authority rules that specify each actor’s role in developing the statutory law that guides decision-making at each of the lower levels of the institutional arrangement. Several Ministers in the executive have indirect effects on water governance in the Whanganui through their respective portfolios (Eppel 2014). These include the Ministers for Conservation, Environment, Primary Industries, Health, and the Minister of Treaty Settlements. The legislature is charged with passing rules, which guide decision-making at each level of the institutional arrangement. As all actors within the executive and legislature can be thought to be motivated by their reelection at the start of the next policy cycle, these actors can be viewed as reflections of particular interest groups (Alston 1996).

Although sitting outside the institutional arrangement itself, within the Westminster system a well-functioning and independent judiciary restricts the power of the legislature and executive to interfere with the administration of justice, whilst upholding the rights of individual citizens (Aghion et al. 2004). In New Zealand the judiciary has played an important role in the development of law relating to freshwater. However, the court’s role as the ‘enforcer’ places it
outside the institutional arrangement of the polity when considering the roles and responsibilities of actors involved with governing the Whanganui River.\footnote{As discussed in section 2.1, following the rules-of-the-game view, the enforcement of rules is treated as exogenous. In New Zealand, the judiciary system is made up of the Supreme Court which sits at the top of the judiciary system; the Court of Appeal which hears appeals from the High Court on points of law; the High Court which deals with serious criminal offences and civil matters, hearing appeals from the lower courts and sixty-three District Courts. There is also a separate Māori Land Court and Māori Appellate Court, which have jurisdiction over Māori land cases under the Te Ture Whenua Māori Act 1993.}

5.1.3 Upper policy level

At the upper policy level a number of national government agencies are responsible for some aspect of water governance affecting the Whanganui River. The Ministry for the Environment, Ministry for Primary Industries, Ministry of Health, and the Department for Internal Affairs each have some specific or general legal mandate that determines their role and responsibility within the regulatory regime governing use and management of the river system (Eppel 2014).

Two independent bodies - the Parliamentary Commissioner for the Environment and the Waitangi Tribunal - act as constraining mechanisms on ministries by providing independent reviews of matters of the environment and the Treaty of Waitangi respectively. New Zealand Fish and Game (Fish and Game), the Royal Forest and Bird Protection Society (Forest and Bird), and Federated Farmers all maintain strong advocacy positions at the upper policy level.\footnote{Fish and Game is a ‘user pays, user says’ non-profit organisation with legislative authority focused on managing, maintaining, and enhancing sports fish and game birds and their habitats. The Royal Forest and Bird Protection Society and Federated Farmers are lobbying organisations working on behalf of land and wildlife, and agriculturalists respectively.}

The Department of Conservation (DOC) promotes water health through the preservation and protection of natural resources under the Conservation Act 1987. The Conservation Act specifies that DOC’s role is to preserve indigenous biodiversity including freshwater fisheries and the habitats of freshwater fish species. To do so, DOC manages a substantial portion of land within the Whanganui catchment including the Tongariro National Park and the Whanganui National Park under the National Parks Act 1980, and land adjoining the Whanganui under the Reserves Act 1977. For this reason, under conservation
legislation, the Department of Conservation owns parts of the riverbed as well as land on the banks, although the river itself is not part of the park (Department of Conservation 2015). 47

A final actor influencing water governance decisions at the upper policy level is the Land and Water Forum. In 2009, the government brought together central ‘stakeholders’ in freshwater management, including hydropower generators, Federated Farmers, Fonterra (New Zealand’s largest dairy company), environmental NGOs and five major river iwi to negotiate agreed approaches to the management of freshwater through the ‘Land and Water Forum’ (Fisher & Russell 2011). As of early 2016, they had released four reports, which contained some 156 recommendations, some of which have been picked up by the respective ministries (Brower 2016). 48

There are over 26 pieces of upper policy legislation guiding use of the Whanganui River (Office of Treaty Settlements 2016). This creates a myriad of goals and objectives for policy makers and requires the river system to be broken up into components of beds, banks, and water for management purposes. As explained in the introduction of this section, the riverbed is owned by the Crown, except in sections which are held in private ownership. The Crown and private property owners hold the banks, while the current position held by the Crown is that water is owned by no-one.

Decisions over management of each section of the river are guided by an overarching management framework developed as part of the Resource Management Act (RMA) 1991. This is an effects-based piece of legislation that, at

47 In most national parks the declaration of land as national park includes the beds of all waterways within the park boundaries, however, as ownership of the river was under digresses at the time of the park’s creation, the bed of the main stem of the Whanganui River and its tributaries are not included in the Park. Instead, where the Park adjoins the river, the Whanganui National Park boundary is the riverbank.

48 The perceived ‘effectiveness’ of the Land and Water Forum as an alternative approach to freshwater governance has been mixed. As noted by chairperson, Alastair Bisley, the Land and Water Forum was ‘an exercise in collaborative governance – addressing complex and intractable issues by bringing together the principal stakeholders, including from the private sector and civil society, to seek agreement/consensus on a way forward.’ (Eppel 2013). Although this approach adopts several concepts heralded by proponents of collaborative governance, vocal criticisms of the Forum have included pronounced power asymmetries, low levels of transparency, and a cherry picking of recommendations by Ministers (Brower 2016; Stewart 2015). These issues led to questions about the Forum’s legitimacy and Fish and Game ultimately pulling out of the process in 2015 and Forest and Bird in 2017.
its conception, replaced 69 other pieces of legislation and 19 regulations (Memon & Gleeson 1995). In 1991 it was recognised as an internationally unique and forward-thinking piece of legislation with a single purpose “...to promote the sustainable management of natural and physical resources” [s.5.1]. The Act requires decision makers to balance inter-generational environmental and development outcomes, specifying that the cultural, social, and economic well being of communities must be balanced against the needs of future generations.50

The RMA requires that for every development project proposed, ‘matters of national importance’ must be recognised and provided for [s.6]. The National Policy Statement for Freshwater Management (NPS-FM) 2014 provides direction to local government at the lower policy level on how this is to be achieved. Thirteen national values and uses for freshwater are identified in the NPS with two of them deemed as compulsory: ecosystem health and human health for recreation. National bottom lines are set for the compulsory values and minimum acceptable states for the other national values.

In the NPS-FM 2014, the Treaty of Waitangi is referred to as the underlying foundation of Crown and iwi relationships for the management of freshwater resources. This builds on section eight of the RMA, which requires that principles of the Treaty be taken into account in decision-making. Similarly, sections 6(e) and 6(g) greatly influence key provisions of the lower policy level rules for governance of the Whanganui River. These sections require the acknowledgement of and provision for “[t]he relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu (sacred place), and other taonga” [s.6(e)]; and: “[t]he protection of protected customary rights” [s.6(g)].

49“Sustainable management” means the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety. This is to be balanced by the needs of future generations; the safeguarding of the life-supporting capacities of air, water, soil, and ecosystems; and the avoidance, remediation or mitigation of adverse effects of activities on the environment. [Appendix C: ‘Part II, Purpose and Principles’ [ss.5-8]].

50The Local Government Act 2002 empowers local authorities to develop the policy necessary to achieve these goals.
In addition, the Act specifies other aggregation and scope rules. ‘Other matters’ that those exercising functions under the Act shall have particular regard to include kaitiakitanga, the efficient use and development of natural and physical resources, the efficiency of the end use of energy, the maintenance and enhancement of amenity values; intrinsic values of ecosystems, the maintenance and enhancement of the quality of the environment, any finite characteristics of natural and physical resources, the protection of the habitat of trout and salmon, the effects of climate change, and the benefits to be derived from the use and development of renewable energy. As pointed out by the Parliamentary Commissioner for the Environment in 2012, these mandates can create further competition between environmental interests within the institutional arrangement for those managing freshwater (Parliamentary Commissioner for the Environment 2012).

For the Whanganui River, the Act specifies position, boundary, authority, and aggregation rules, providing links between national, regional, district and city authorities. Actors at the lower policy level have the responsibility of implementing the RMA and monitoring and enforcing the behaviour of actors at the operational level of the institutional arrangement. Although the RMA is designed to act as an overarching piece of management legislation that balances competing interests, its success in practice has been mixed (Brown et al. 2016; Harmsworth et al. 2016; Makgill 2010; Palmer 2015; Wright 2015). For the Whanganui specifically, it fails to provide an integrated approach to management of the Whanganui River. The way that upper level policy has transpired means that the Marine and Coastal Area (Takutai Moana) Act 2011 and the RMA apply to the Whanganui River up to the limits of the coastal marine area51; while, effectively the Land Act 1948 applies to the parts of the river owned by the Crown beyond the coastal zone. The Land Act 1948 itself provides no guidance on management objectives for Crown riverbeds, nor any restrictions on uses; instead vesting this responsibility in the RMA and its accompanying pieces of legislation. It states that riverbeds of navigable rivers, like the Whanganui River,

51 The Minister of Conservation, regional councils and territorial authorities all have responsibilities under the RMA for managing coastal development. Each is guided by the New Zealand Coastal Policy Statement 2010.
are to be administered by Crown Lands and Land Information New Zealand, while local government, private property holders, and DOC manage the water and riverbanks at the lower policy and operational levels. This creates a multiplicity of regimes operating along the length of the river, which cut across one another and challenge the notion of integrated water management.

5.1.4 Lower Policy Level

Under the RMA and the Local Government Act 2002, local authorities are empowered to achieve the objectives outlined in the NPS-FW 2014 and to develop rules that constrain actors at the operational level. These local authorities are divided into Regional and District Councils, each of which has its own jurisdictional responsibilities. In the Whanganui region, Horizons Regional Council (Horizons) is responsible for managing the Whanganui-Mānawatu region's natural resources, leading regional land transport planning, contracting passenger transport services and coordinating the region's response to natural disasters. Its jurisdiction covers 22,212 sq km of land, 8.1% of New Zealand's land area, and extends 12 nautical miles out to sea. The Council is made up of 12 elected Councilors who collectively decide on suitable plans and policies for the region. The Executive Management Team then decides how these plans and policies are to be implemented.

The regional plan, the One Plan, manages freshwater use through the allocation of 'consents' to use on a first-come, first-served basis. Horizons issues consents to actors at the operational level that authorise resource use (e.g. water takes or discharges to water) under specified conditions consent-by-consent. This means that the duration of the consent and activities permitted under each consent can vary (Horizons 2016a, s.6). This is the same approach used across New Zealand and has led many to argue that the consent system under the RMA has (a) been unable to address cumulative effects; (b) foreclosed integrated

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52 In 2017, Fish and Game and the Environmental Defence Society took Horizons to the Environment Court for failing to monitor and enforce issued resource consents, negatively impacting water quality. The Court ruled in favour of the plaintiffs, agreeing that the Council was not working within freshwater limits and that a change in practice was required to ensure that Horizons began working in conformity with the law (NZEnvC [2017] 37 Available here: http://www.nzlii.org/nz/cases/NZEnvC/2017/37.html).
catchment-based water planning; and (c) fostered too much time-consuming litigation in the Environment Court (Duncan 2017).

For the Whanganui River, 173 consents to use are currently allocated to actors at the operational level. The single largest user is the energy sector, however, the most rapidly increasing users are in the agriculture sector for which consented surface water takes more than doubled between 1997 and 2009 (Horizons Regional Council 2016a, pp.5–2). Mitigation of soil erosion and flood control is also provided for by the Plan and supplemented by the Whanganui River Catchment Strategy (WRCS). Unlike the One Plan, which specifies graduated sanctions in the way of fines for breaches and infringements, the WRCS aims to incentivise landowners to adopt erosion-minimising practices through subsidies and supporting partnerships.53

The Whanganui, Stratford, and Ruapehu District Councils have operational responsibilities associated with the urban areas within the Whanganui catchment. They are responsible for the provision of local infrastructure, for environmental health and safety, and for controlling the effects of land use and the surface of river systems. Each District Council must produce a District Plan and update it every ten years. The Resource Management Act 1991 requires that a District Plan must state: the objectives for the district; the policies to implement the objectives; and the rules (if any) to implement the policies. The District Plan must also give effect to any national policy statement or New Zealand coastal policy statement and is required to not be inconsistent with: a water conservation order; a regional policy statement; or a regional plan for any matter specified in s.30(1) of the Resource Management Act (functions, powers, and duties of local authorities).

The RMA also specifies the conditions under which local authorities must conduct relationships with iwi and other groups with interests in the river creating linkages across and within the institutional arrangement. Historically, iwi have been classified as stakeholders in legislation and practice (Ruru 2009),

53 No evaluation of the relative effectiveness of these approaches was found by the author.
however, more recently they are referred to as Treaty partners, as explained in section 5.1.2.\textsuperscript{54} Across New Zealand and in the Whanganui, the Treaty principles are being used to guide and structure relationships, with an emphasis given to incorporating iwi in decision-making from the outset of any process (Harmsworth et al. 2016). This is evident in the Whanganui region, where local authorities, such as Horizons, are steadily increasing the proportion of funding dedicated to building enduring relationships with hapū (sub-tribe) and iwi (Horizons Regional Council 2015, p.109).

Initiatives, like the Whanganui River Enhancement Trust (WRET), initiated to provide resources to mitigate effects of the ongoing operation of the TPDS, create linkages between the Whanganui and Ruapehu District Councils and Genesis Energy Limited, operators of the TPDS. To improve water quality in priority catchments of the Whanganui River, WRET partners with Horizons to help farmers manage erosion. In this way, relationships between different groups across various decision centres within the institutional arrangement are developed.

The local area office of the Department of Conservation is also involved with managing recreational use of the river. Over 5500 people canoe the 'Whanganui River Journey' each year, paying concessions to the Department of Conservation for access (Department of Conservation 2012a). Despite the river sitting outside the boundaries of the Whanganui National Park, the guiding management document for managing recreational users of the river is the Whanganui National Park Management Plan 2012-2022 (Department of Conservation 2012b). The Plan was prepared in accordance with sections 46 and 47 of the National Parks Act 1980. Led by the Tongariro Whanganui Taranaki Conservancy of the Department of Conservation, the Plan was developed in consultation with representatives from Whanganui Iwi, the public, the Taranaki/Whanganui Conservation Board and other interested groups and individuals. It

\textsuperscript{54}A good example of this change in the Whanganui region is shown in the evolving language of the Whanganui River Catchment Management Strategy. In 1997, iwi are identified as relevant stakeholders (Horizons Regional Council 2003, p.3), however, such language has been explicitly removed in the 2014-15 Strategy (Horizons Regional Council 2014).
acknowledges the special relationship Whanganui Iwi has with the Park, the river, and its catchment. It also makes concessions to Whanganui Iwi’s aspirations for a Māori National Park and aims to seek common values to inform and strengthen ‘collaborative management’. These objectives have been further formalised in three separate Memorandums of Understanding between DOC and different tribal groups associated with the river. In addition to Iwi, the local DOC office is also in consultation with statutory agencies, community groups, charitable organisations, individual actors, and the general public as required by the Conservation Act 1987. For these reasons, DOC has strong linkages with Iwi within the Whanganui region.

5.1.5 Operational level

Moving down to the operational level, several groups of actors have daily interactions with the river. These include local Māori, 49% of which are affiliated with Whanganui Iwi (Statistics New Zealand 2013), Genesis Energy Limited, residents of the small towns and communities, which grace the riverbank, farmers and agriculturalists, business owners which depend on and require access to the river, and recreationists. The choices available to these groups are determined by the rules constructed at the higher levels of the institutional arrangement – for the most part modeled on a property rights system of state ownership. For those wanting to use water from the river, a ‘resource consent’ for take must be granted by Horizons Regional Council through the consent process described above.

Māori make up a quarter of the population of the Whanganui district (Waitangi Tribunal 2015). Based on the 2013 census most have lower incomes, are more likely to work in low-skilled jobs, and are more likely to be unemployed than non-Māori. Like Māori throughout New Zealand, Māori in Whanganui are significantly less healthy than non-Māori, mortality rates are twice as high, and lifespans significantly shorter. Education levels and housing standards of Whanganui Māori are significantly lower than their non-Māori counterparts.

55 The National Parks Act 1980 specifically acknowledges Whanganui Iwi’s special relationship with the river and requires that in developing a management plan, particular regard must be given to “…the spiritual, historical, and cultural significance of the Wanganui River to the Whanganui Iwi” (s.30.2).
Although Whanganui Māori have made considerable efforts to preserve and nurture their language, the majority cannot speak or understand *te reo Māori* (Māori language). Efforts to preserve their culture are more universal and *tikanga* (behaviour, practices) and *te ao* Māori values continue to shape Māori’s interaction with the river. Within legislation, special dispensation is given for customary food gathering along the river and its tributaries and the continuation of cultural practices, although this dispensation does not give them a direct role in decision-making.

The Whanganui River Māori Trust Board (Trust Board) represents Iwi with interests in the river and administers its assets to the general benefit of Iwi. The Trust Board has the general functions set out in section 24 of the Māori Trust Boards Act 1955 as well as the specific statutory function, set out in section six of the Whanganui River Trust Board Act 1988, of negotiating:

“...with the Government, or any other body or authority concerned, for the settlement of all outstanding claims relating to the customary rights and usages of te iwi o Whanganui, or any particular hapu, whanau, or group, in respect of the Whanganui River, including the bed of the river, its minerals, its water, and its fish.”

The Whanganui River Māori Trust Board is responsible for negotiating with actors at the upper and lower policy levels of the institutional arrangement regarding all matters, which concern Iwi interests.

Members of the Whanganui River Māori Trust Board are also part of the Land and Water Forum and the Freshwater Iwi Leaders Group. The Freshwater Iwi Leaders Group is a broader consolidation of iwi across New Zealand representing those iwi with ancestral lakes and rivers that would be affected by any partial privatisation of power companies. It was established by iwi in 2007 and contributes to discussions around alternative approaches to freshwater
governance in New Zealand through the Land and Water Forum and by direct engagement with Ministers.56

Genesis Energy Limited is the largest consumer of water on the river, diverting 82% of the flow from the headwaters through the Tongariro Power Development Scheme. This diversion consent, granted by Horizons and upheld in the Environment Court until 203957, has been the cause of ongoing controversy over conflicting interests regarding water use. In an effort to reduce conflict with Iwi and conservation groups, such as Forest and Bird, measures have been taken by Genesis to identify areas of interest shared with other actors across all levels of the institutional arrangement. Over the past decade Genesis has invested in 14 partnerships with Horizons, iwi, DOC, the New Zealand Defence Force, and various environmental and recreational groups to improve environmental, social, cultural and recreational outcomes. Two key partnerships are the Whanganui River Enhancement Trust and the Central North Island Blue Duck Trust, both focused on improving river health.

In addition, Genesis signed a memorandum of understanding, Hei Whakaaro Tahi ki Te Mana o Te Awa, with Whanganui Iwi in 2010 agreeing to withhold from litigation. Although this improved relationships between Iwi and Genesis, Whanganui Iwi maintain that the development of the Tongariro Power Development Scheme damaged the mauri (life force) of the river and therefore the mana of the Iwi and the River (Office of Treaty Settlements 2016). As explained by Hikaia Amohia (Ngati Haua) in his submission to the Whanganui River Report hearing in 1994: “For our people ihi (power), tapu (restricted, sacred), and mana go together. Each one is dependent upon the others. Any interference with nature, including the River, breaks the law of tapu, breaks the ihi or sacred affinity of our Māori people with the River; and reduces the mana and soul of the Whanganui River...When you interfere with the flow of the River, you are interfering with nature” (Waitangi Tribunal 1999, p.56). Subsequently,
although Whanganui Iwi have agreed to abstain from further challenges against Genesis, Whanganui Iwi maintains firmly its objection to the continued operation of the Tongariro Power Development Scheme. As explained by the Minister of Treaty Settlements, Christopher Finlayson, in an interview: “...in my personal view - in 100 years time that [the TPDS] will all be undone, or it may even be earlier than that...they’re fiddling with nature in a really big way up there”.

For those living in towns adjoining the river, the Whanganui River plays a significant role in daily life. It is a source of pride for both Māori and Pākehā (non-Māori) in Whanganui. Several community groups have been established to celebrate the River and keep its history alive, such as the Whanganui River History Association. There are 12 small businesses that support recreation and tourism on the river, with jet boat operations and canoe trips. The river’s tributaries are also important recreational fishing grounds, for which people must buy concessions from Fish and Game. Many private property holders own land along the banks of the Whanganui and its tributaries, both in urban and rural settings and farming remains one of the region’s most important economic growth areas. Under law, private property holders who hold riparian title, have ownership of the riverbed up to the centre line.

5.2 Granting legal standing to the Whanganui River

The shift towards resource self-determination was an extended process in the case of the Whanganui River that was a response to longstanding grievances over ownership and control of the Whanganui River. In 2012, a High-Level Agreement - Tūtōhu Whakatupua - proposed a new framework for governing the Whanganui River based on the recognition of the Whanganui River as Te Awa Tupua, a whole and indivisible legal entity reaching from the mountains to the sea (Office of Treaty Settlements 2012). A more detailed governance framework was then outlined in a ‘Deed of Settlement’ agreement signed by Whanganui Iwi and the Crown, on 5 August 2014, which revealed how resource self-

58 Please refer to chapter seven for a detailed discussion of how and why the framework was proposed.
determination was proposed to be implemented for the case of the Whanganui River (Office of Treaty Settlements 2014a).

5.2.1 Ruruku Whakatupua

Ruruku Whakatupua, the Deed of Settlement, had two parts and comprised two documents: Ruruku Whakatupua – Te Mana o Te Iwi o Whanganui (Office of Treaty Settlements 2014b), which was primarily directed towards Whanganui Iwi and Ruruku Whakatupua – Te Mana o Te Awa Tupua (Office of Treaty Settlements 2014a), which outlined the formal framework proposed for the introduction of resource self-determination for the Whanganui River. As these documents were used as the primary source through the course of this research for understanding the institutional change, details of the agreement are provided in the following two sections and a visual representation of the agreement given in figure 5.3.

![Diagram](image)

**Figure 5.3:** Visual representation of the Te Pā Auroa nā Te Awa Tupua framework designed to support the application of resource self-determination to the Whanganui River. A summary of all actors and rules associated with the Te Pā Auroa framework is also given on page xvi.
i. Ruruku Whakatupua Te Mana o Te Awa Tupua

*Ruruku Whakatupua Te Mana o te Awa Tupua* was primarily directed towards establishing the new legal framework for governing the Whanganui River, *Te Pā Auroa nā Te Awa Tupua* (Te Pā Auroa – lit. the broad eel weir). Te Pā Auroa recognised *Te Awa Tupua* (lit. River with Ancestral Power) as an indivisible and living whole, comprising the river from the mountains to the sea, its tributaries, and all its physical and metaphysical elements. The settlement proposed to accord Te Awa Tupua full legal personality, enabling Te Awa Tupua to be a “legal person” [s.2.2] with the same “rights, powers, duties and liabilities” [s.2.3].

In the same way that a child requires representation in a court of law, the rights, powers, and duties of Te Awa Tupua were proposed to be exercised and performed by a guardian, *Te Pou Tupua* (Te Pou – lit. the sacred and revered station). Ruruku Whakatupua proposed that Te Pou be the human face of the river and comprise a singular role exercised jointly by two persons (symbolic of the Treaty of Waitangi partnership) – one appointed by the Crown and the other by Whanganui Iwi. Te Pou Tupua was expected to act in the interests of Te Awa Tupua and consistently with four intrinsic values - *Tupua te Kawa* (lit. the principles of natural law) - representing the essence of Te Awa Tupua and intending to capture the *te ao* values and beliefs of Whanganui Iwi:

1. *Ko te Awa te mātāpuna o te ora* - the River is the source of spiritual and physical sustenance;
2. *E rere kau mai te Awa nui mai te Kahui Maunga ki Tangaroa* – the great River flows from the mountains to the sea;
3. *Ko au te Awa ko te Awa ko au* – I am the River and the River is me

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59 All sections of legislation cited in this section come from *Ruruku Whakatupua Te Mana o Te Awa Tupua* (Office of Treaty Settlements 2014a) unless cited otherwise.
60 *Tupua* is something extraordinary, from the ancestral realm (for a discussion of *tupua* see (Tcherkezoff 2008, pp.141–44)).
61 In an institutional economics frame Te Awa Tupua represents the catchment including its biophysical and material characteristics and community attributes.
4. *Ngā manga iti, ngā manga nui e honohono kau ana, ka tupu hei Awa Tupua* – the small and the large streams that flow into one another and form one River.

As the human face of the river, the framework stated that Te Pou will be required to build relationships and form individual agreements with government agencies at each level of the institutional arrangement.\(^{62}\) Initially Te Pou’s role will be to act in an advisory capacity; however, over time, space is created in the framework for Te Pou to take on more decision-making responsibility [s.9.6].\(^{63}\) Te Pou will also exercise landowner functions and administer a NZD$30 million contestable fund - *Te Koretete au Te Awa Tupua* (lit. a storage basket for food from the river) - that will be made available by the Crown for initiatives affecting the health and wellbeing of Te Awa Tupua and for judicial purposes, if needed.

Te Pou is to be supported by an advisory group, *Te Karewao* (lit. the supplejack vine), which will advise the guardian in the exercise of its functions when necessary. When required by Te Pou, this group will convene and is to consist of one person appointed by *Ngā Tāngata Tiaki o Whanganui* (a trust arising from the consolidation of three existing entities\(^{64}\) that manage various assets and liability issues of Whanganui Iwi), one by other iwi with interests in the Whanganui River, and one person appointed by the relevant local authorities. Other people can also be invited to advise when necessary. In addition to the contestable fund, NZD$200,000 is to be paid annually by the Crown to Te Pou for 20 years as a contribution to the costs associated with the exercise of Te Pou Tupua’s functions.

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\(^{62}\) At the upper policy level, Te Pou Tupua will enter into a relationship document with the Commission of Crown Lands, the Director-General of Conservation, and the Chief Executive of the Ministry of Business Innovation and Employment. They are also required to engage with relevant local authorities – these include Horizons Regional Council, Whanganui District Council, Stratford District Council, and Ruapehu District Council.

\(^{63}\) Section 9.6 of Ruruku Whakatupua – Te Mana o Te Awa Tupua states: “The parties acknowledge that the position referred to in clause 9.5.2 may change in the future (including in the context of the freshwater policy review process referred to in clause 9.2) and this settlement does not preclude any such change.” When questioned about the meaning of this, the Minister of Treaty Settlements, Christopher Finlayson, agreed that the purpose was to create space for the guardians to be granted more decision-making power over use of the river in the future.

\(^{64}\) The existing entities are the Whanganui River Māori Trust Board, the Pakaitore Trust, and Te Whiringa Muka Trust.
The Deed of Settlement suggests that the development of the framework is to proceed in two stages. Initially decision-making responsibility will remain with local authorities, however, over time, greater decision-making power and responsibility will be transferred to Te Pou. The framework stated that the appointers of Te Pou (the Crown and Iwi) will have oversight of the guardians and are able to ultimately revoke Te Pou’s privileges should either appointed actor be seen as acting counter to the mandate.

To bring together actors with interests in the Whanganui River, a strategy group, *Te Kōpuka nā Te Awa Tupua* (Te Kōpuka - lit. white *mānuka*, the timber from which eel weirs across the river were built), will also be established. Its role is to identify issues relating to the environmental, social, cultural, and economic health and wellbeing of Te Awa Tupua, to establish a Te Awa Tupua strategy to address those issues, and to provide recommended actions to address those issues. The strategy document, *Te Heke Ngahuru ki Te Awa Tupua* (Te Heke - lit. the autumn migration of eels), will be reviewed every ten years. It must be considered by all government agencies making decisions that impact Te Awa Tupua and is thus to be the principle document guiding decision-making for the Whanganui River catchment.

Te Kōpuka is to have up to 17 members that represent persons and organisations with interests in the Whanganui River, including iwi, local and central government, commercial and recreational users and environmental groups. The membership is to be as follows:

- one member appointed by Ngā Tāngata Tiaki o Whanganui;
- up to five members appointed by iwi with interests in the Whanganui River;
- up to four members appointed by the relevant local authorities;
- one member appointed by Fish and Game New Zealand;
- one member appointed by the Director-General of Conservation;
- one member appointed by Genesis Energy Limited;
- one member appointed to represent environmental and conservation interests;
- one member appointed to represent tourism interests;
- one member appointed to represent recreational interests; and
- one member appointed to represent the primary sector.65

Capacity in terms of administrative and technical support for establishing Te Köpuka and developing the strategy document is to be provided for by Horizons Regional Council. The Crown will provide Horizons with NZD$430,000 to aid this process. In the long-term, Te Köpuka will be responsible for the monitoring the implementation of the strategy and reviewing its progress and success. It is to provide a forum for discussion of issues relating to the health and wellbeing of Te Awa Tupua and to exercise any function that may be delegated to it by a local authority.

By affording Te Awa Tupua “legal standing” and an “independent voice” the river and its tributaries will be considered “a living entity in its own right...incapable of being ‘owned’ in an absolute sense” [s.2.6-7] (Office of Treaty Settlements 2012). Ownership of parts of the riverbed is to be vested away from the Crown and placed in the name of the river itself, providing for the “protection and promotion of the health and wellbeing of Te Awa Tupua” [s.1.3]. In undertaking this action, private property is to remain unaffected as are existing rights, structures, and consents. The vesting of the riverbed does not create or transfer proprietary interests in water.

**ii. Ruruku Whakatupua Te Mana o Te Iwi o Whanganui**66

*Ruruku Whakatupua te Mana o te Iwi o Whanganui* is the overarching settlement document within which *Te Ruruku Whakatupua te Mana o te Awa Tupua* rests. It recognises the special relationship of Whanganui Iwi and the Whanganui River and gives “an apology in respect of the Whanganui River to the iwi and hapū of Whanganui, their *tupuna* (ancestors) and their *uri* (future descendants)” [s.3.20]

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65 Each appointing entity is an “appointer”.

66 All sections of legislation cited in this section come from Ruruku Whakatupua Te Mana o Te Iwi o Whanganui (Office of Treaty Settlements 2014b) unless cited otherwise.
for past grievances caused by the Crown. In essence, *Ruruku Whakatupua Te Mana o te Iwi o Whanganui* seeks to atone for Crown actions in which it failed to respect Whanganui Iwi’s relationship with Te Awa Tupua and to begin the process of healing. As acknowledged in sections 3.25 and 4.1:

“...*this settlement marks the beginning of a renewed and enduring relationship between Whanganui Iwi and the Crown that has Te Awa Tupua at its centre and is based on mutual trust and cooperation, good faith and respect...*” [s.3.25 and s.4.1]

The settlement provides for authorised customary activities [s.7], such as fishery activities and customary practices, and gives cultural [s.8] and financial redress [s.9]. Cultural redress includes the recognition of the importance of *ripo* (rapids) to Whanganui Iwi, the alteration of existing geographic names that are considered by Whanganui Iwi to be incorrect, and the development of a “social services project” which aims to improve social services in the Whanganui region through enhancing delivery by government agencies.

Financial redress amounts to NZD$80 million with an additional NZD$1 million allocated for transitional and implementation purposes related to the establishment of the River framework to be managed by Ngā Tāngata Tiaki o Whanganui [s.10]. Finally, in order to ensure that a relationship between the Crown and Whanganui Iwi remains strong, an express commitment to work together to implement the settlement is also given [s.11].

5.2.2 *Te Awa Tupua (Whanganui River Claims Settlement) Act 2017*

The *Te Awa Tupua (Whanganui River Claims Settlement) Act 2017*, which was passed into law in March 2017, formalises the Deed of Settlement without adding any additional elements to the framework. The Act is divided into five parts. The first part provides preliminary provisions, including guidelines for interpretation. Part two is the main body of the framework and is divided into seven subparts. Subpart one outlines the Act’s scope and effect – detailing in section 11.3 that:
“This part must be interpreted in a manner that best furthers:

(a) the intent of Te Pā Auroa set out in clause 1.4 of Ruruku Whakatupua – Te Mana o Te Awa Tupua; and

(b) the agreements expressed in the deed of settlement in relation to Te Pā Auroa.”

The purpose of the Act outlined in section 1.3 states that the Act is:

“(a) to record the acknowledgements and apology given by the Crown to Whanganui Iwi in Ruruku Whakatupua—Te Mana o Te Iwi o Whanganui; and

(b) to give effect to the provisions of the deed of settlement that establish Te Pā Auroa nā Te Awa Tupua; and

(c) to give effect to the provisions of the deed of settlement that settle the historical claims of Whanganui Iwi as those claims relate to the Whanganui River.”

Subpart two sets out how Te Awa Tupua will be declared and accorded legal recognition and identifies the intrinsic values, Tupua te Kawa. It also details limits to the effect of the Act and defines how it will be integrated with existing legislation. The purpose, functions, and powers of Te Pou Tupua and its advisory group, Te Karewao, are outlined in subpart three. Subpart four provides for the establishment of the strategy group, Te Kōpuka, its functions, and its powers. This group must develop and approve, review and monitor the implementation of the strategy document, Te Heke Ngahuru, for Te Awa Tupua. The purpose and contents of Te Heke Ngahuru, which are to give practical guidance for the integrated management of Te Awa Tupua, are also outlined in this section. In subpart five, parts of the bed of Whanganui River are vested in Te Awa Tupua. Land which is not to be alienated is identified, the integration of these new rules with existing legislation and rules of law, the status of certain rights and interests, future acquisitions and interests, and liabilities and responsibilities.
Subpart six establishes Te Korotete o Te Awa Tupua, the NZD$30 million Te Awa Tupua Fund.

Finally, subpart seven details ‘other arrangements’ relating to Te Awa Tupua namely the protection of the name Te Awa Tupua and the establishment of the Te Awa Tupua register. It also outlines the consequence of Te Pou Tupua being deemed an affected person under the RMA, establishes a process for managing activities on the surface of the Whanganui River, and outlines a framework for the collaboration of Whanganui Iwi, Horizons Regional Council, certain departments of State, and the New Zealand Fish and Game Council to co-ordinate the planning and management of fisheries and fish habitat in the Whanganui River catchment. It makes provisions for customary food gathering and the identification of taonga tuturu (physical treasures) found on the river.

Part three addresses the redress of Whanganui Iwi that was outlined in Ruruku Whakatupua Te Mana o te Iwi o Whanganui. It has four subparts. Subpart one sets out the acknowledgements and apology of the Crown to Whanganui Iwi. Subpart two acknowledges the relationship of Whanganui Iwi and Te Awa Tupua as well as the status of the trustees of Ngā Tāngata Tiaki o Whanganui. Subpart three sets out the authorised customary activities and subpart four makes provisions for other cultural redress.

Part four settles historical claims and other miscellaneous matters and part five is primarily concerned with the matters relevant to the reorganisation of various governance arrangements of Whanganui Iwi including the dissolution of various trusts and the creation of Ngā Tāngata Tiaki o Whanganui. It also sets out the transitional taxation provisions for governance reorganisation and the consequential repeal, revocations, and amendments to various bodies of existing legislation.
5.3 **Whanganui River institutional arrangement under resource self-determination**

The introduction of resource self-determination for governing the Whanganui River sees ownership of the riverbed vested in Te Awa Tupua and decision-making responsibility eventually transferred to Te Pou Tupua. Although the legislation is introduced by constitutional level actors, the legislation devolves the majority of decision-making responsibility to actors at the operational level, transforming the institutional arrangement from a top-down system to one that is driven by operational level decision-making.

As shown in figure 5.4, the new arrangement bridges the western and Māori worldviews at the metaconstitutional level and, as a result, identifies a new property rights system likely to influence decision-making at each level of the institutional arrangement. By approximating the Māori worldview in western law, the decision-making framework is shifted from a rules-based to value-based system (Morris & Ruru 2010). The principle changes to the rules and actors at each level are explained in detail below. Because the process transforms the institutional arrangement into a community-based system, analysis of this section begins at the operational level.
Guided by the IAD framework, this diagram offers a simplified depiction of the new institutional arrangement proposed to be implemented for governance of the Whanganui River. By approximating the Māori worldview in a western legal framework, a new system of property rights is developed – resource self-determination. The broader framework transforms governance into a bottom-up system, with operational level actors making decisions likely to affect policy at higher levels. The full arrows represent the dominant transfer of rules, whilst the dashed arrows show a weaker transfer of rules. Under the new framework all decisions regarding Te Awa Tupua are to be guided by the Tupua te Kawa values at each level of decision-making. These are considered to capture the essence of Te Awa Tupua.

5.3.1 Operational level
As discussed in the preceding sections, the Te Awa Tupua Act introduces several new actors to the operational level of the institutional arrangement governing the Whanganui River. These include the new legal entity, Te Awa Tupua, and its guardian, Te Pou Tupua. Helping guide Te Pou, will be an advisory group, Te Karewao, which crosses the operational and lower policy levels. Te Kopuka, made up of representative users and policy level actors, will develop the strategy document, Te Heke, and ensure that it is implemented accordingly.
By according Te Awa Tupua legal standing and vesting ownership of the riverbed in its name, the river is shifted from a resource unit to an actor (Ostrom & Cox 2010). At the policy level, no longer can the river be considered a good that is consumable and is talked ‘about’, instead it must be talked ‘to’ and interacted ‘with’. As the human face of Te Awa Tupua, Te Pou Tupua is situated at the operational level, yet has the legitimacy to move between levels of the institutional arrangement. Te Pou Tupua is mandated with the responsibility to inform and guide decision-making at the lower and upper policy levels supported by Te Karewao. As discussed in section 5.2.1, space is made in the Deed of Settlement for Te Pou’s role to change over time – a commitment upheld in the Act, by deeming that the Act upholds the Deed.

The Act nests ideas of community governance within the institutional arrangement (Bowles & Gintis 2002; Robinson et al. 2015). Under the new framework, responsibility for developing a management strategy for the river and its catchment will be transferred from the lower policy level to the strategy group, Te Kōpuka, located predominantly at the operational level. The intention of legislating for Te Kōpuka, the strategy group, is to bring together operational level actors including Genesis and Iwi to discuss and outline their various interests and priorities. The objective of this is to develop ‘whole river strategy’ based on a management approach that is inclusive rather than exclusive. It will also potentially minimise conflicts between competing actors. The goal of the resulting management strategy, Te Heke, is to outline a catchment-level strategy, which considers Te Awa Tupua as a whole with a view to addressing the institutional fragmentation currently affecting governance of the river and its broader catchment. Overall, these changes at the operational level will shape each higher level of decision-making within the institutional arrangement.

5.3.2 Lower policy level
At the lower policy level, existing frameworks and decision-making structures will remain in place. Through the first stage of implementation, the local authorities will retain decision-making responsibility, however, the Act states that the intrinsic values of Tupua te Kawa must be considered and accounted for
whenever a decision is made which affects Te Awa Tupua. Depending on how these values are interpreted, this could affect how local authorities make their decisions and the priorities placed on use. For instance, as pointed out by a Crown official at Ministry for the Environment, “I don't really think of Te Awa Tupua as an environmental concept, as such...I think it will help make better decisions for the river and the community, but I don’t think it will be driven through an environmental perspective”. She went on to say that the most important element of the concept is the integration of community into decision-making and recognition of the interrelatedness of the river and the Iwi.67

Although Te Pou will not initially have direct decision-making authority under the new arrangement, the interviews revealed that Te Pou may be considered an affected party under the RMA when Horizons Regional Council is assessing new consents concerning use of the river. This status will indirectly grant Te Pou authority to object to proposals concerning use of the Whanganui River and its catchment. Over time, Te Pou’s authority may be extended if it is granted greater decision-making responsibility. Such a development will transfer day-to-day decision-making responsibility from the lower policy level to the operational level.

5.3.3 Upper policy level
The interviews revealed that introducing the Te Awa Tupua legislation at the upper policy level by constitutional level actors was necessary for creating institutional legitimacy and for ensuring that the newly imposed rules have impetus across all levels of the institutional arrangement. The advent of the new Act will affect 26 pieces of legislation, which have working rules-in-use at the upper policy level [s.2.10]. The Act requires that any person exercising functions, duties or powers under any one of these statues must recognise and provide for the status of Te Awa Tupua and Tupua te Kawa as well as give particular regard to the strategy document. The Te Awa Tupua Act is to be given

67 In the case of Te Urewera, which was granted legal standing in 2014, recognising this interconnectedness between local Iwi and the land meant that some actions prohibited under legislation, like the Conservation Act 1987, had to be re-examined. Similar steps may need to be taken in the case of the Whanganui River, changing the management focus of the river in some ways.
different ‘weightings’ under each piece of affected legislation. The majority of actors exercising duties, functions, or powers affecting Te Awa Tupua will be required to ‘recognise and provide for’ the status of Te Awa Tupua and the values of Tupua te Kawa.

Under New Zealand legislation, the requirement for a decision-maker to ‘recognise and provide for’ a matter is a strong directive for an agency or a local authority to consider and provide for the relevant factor when reaching its final decision. Often (as in s.6 of the RMA), ‘recognise and provide for’ leaves it to the discretion of the decision-maker as to how to 'provide for' particular matters, although the rules stipulate that the matter must be addressed and not ignored. As a result of the Te Awa Tupua Act, other actors operating under affected legislation will be required ‘to have particular regard’ for the status and values of Te Awa Tupua and Tupua te Kawa. This means that the decision-making actor will have to be satisfied that the decision he or she is making meets the purposes that are relevant, to the extent that can be achieved in partnership with other considerations relevant to the decision. In such cases, the decision-making actor can retain flexibility as to whether other relevant factors predominate only after the matters for which they must have particular regard for have been fully considered.

These various legal weightings will redefine how statutory authorities at the upper and lower policy levels, including the Ministry for the Environment, the Ministry of Primary Industries, the Department of Conservation, and various local authorities, interact and arrive at particular decisions. Te Pou Tupua is required to enter into formal relationships with the Commissioner of Crown Lands, the Director General of Conservation, and the Chief Executive of the Ministry of Business Innovation and Employment as well as with actors within local and central government thereby creating linkages across each level of the institutional arrangement [s.19(f)].
5.3.4 Constitutional level

Initially, Te Pou Tupua is to have no direct role in making decisions over use of the river, however, as mentioned, the original Deed of Settlement and subsequent Act creates space for the responsibilities of Te Pou Tupua to change over time. The Minister of Treaty Settlements agreed that the motivation for this is to potentially vest greater decision-making power in Te Pou Tupua. Should this happen, the responsibility of decision-making and enforcement will be transferred from the legislature to the judiciary under resource self-determination.

Elsewhere the transfer of power from the legislature to the judiciary has resulted in an increase in costs for resolving social-cost problems in some cases (Komesar 2001). Litigation costs can be high (Johnson 1992) and the discretion of judges to rule on issues set by precedent limits the scope of decision-making (Binks & Forbath 2011). For example, the concept of “value” is not explicitly employed in law in a sense equivalent to the economics usage. This can cause some decisions to be made in the courts which are “fair” in a legal sense, but may not be efficient from an economic perspective, and may impose costs on different sectors of society (Pemberton & Kerr 2013).

As the principle of the rule of law is one of New Zealand’s central constitutional principles, the likely transfer in decision-making power from the Crown to Te Pou Tupua has direct relevance to constitutional level actors and the level’s associated rules. Yet, in the case of the Whanganui River, the interviews suggested that actors developing the framework have not explored the implications of this transfer of power and change in decision-making process in detail. Some of the implications of this are therefore discussed in section 5.4 and in the final conclusions in chapter nine.

5.3.5 Metaconstitutional level

The Te Awa Tupua Act integrates Māori te ao values into a western legal framework. As shown in figure 5.4, to do so, requires bridging the two sets of worldviews, so that the Māori worldview can be approximated and formalised in
law. Although many have highlighted the complexity of changing or affecting peoples’ views about how the world works, others have drawn attention to the fact that, when worldviews are conceptualised as ‘mental models’ (Denzau & North 1994), the worldview can be unpacked as a framework and set of beliefs and values, and incentives developed to facilitate a change (Biggs et al. 2011; North 2005). As North (2005) explains, actors have mental models, which reflect their understanding of the world. As they learn more about the world, actors revise their mental models, changing their views about how the world works. As these experiences are often shared (Aoki 2007), truncated, individual mental models move closer together over time until they eventually arrive at a state of equilibrium. This process can be reinforced through the formalisation of rules (Aoki 2015). For these reasons, in the case of the Whanganui River, reinforcing the integration of worldviews through formal rules should theoretically facilitate the integration of worldviews as actors, guided by the new set of formal rules, collectively grope towards a new institutional equilibrium.

5.4 Discussion of outcomes and the development of general hypotheses for evaluation

Currently the Whanganui River is governed using a top-down multi-level decision-making process (Hooghe & Marks 2003). As shown in table 5.1 the bundle of property rights are held by the Crown with decision-making responsibility for management, exclusion, and alienation devolved to actors at the lower policy level. The rules specifying who is able to extract and use water and under what conditions are outlined in the various regional and district plans and granted to actors at the operational level through a ‘consent’ or permit process on a case-by-case basis (Eppel 2014).

The interaction of actors in this institutional arrangement affects environmental, social, and economic outcomes. As discussed in section 4.1, although there is

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68 For a discussion of competing theories of worldviews see (Hiebert 2008, pp.13–30). Within economics, worldviews and the metaconstitutional level of decision-making has rarely been analysed outside of the concept of mental models.
variation along the length of the river, overall water quality in the Whanganui River is rated as 'fair' from an environmental perspective, (Horizons Regional Council 2016, s.5), however, the river suffers from high levels of silt, a problem exacerbated by the reduced flow (Department of Conservation 2012b; McLachlan 2017). From a cultural perspective, local Iwi consider the health of the river unsatisfactory (Office of Treaty Settlements 2011). The mixing of the waters of the Whanganui River by the TPDS is an affront to the river's and Iwi's mana (Young 1998). This causes conflict within the institutional arrangement at each level of decision-making. Further, governing the Whanganui River under a state ownership model does not sufficiently capture Whanganui Iwi's relationship with the river, creating additional tension between actors at all levels of the institutional arrangement. Ensuing disagreements (outlined in detail in chapter seven) raise the costs of the institutional arrangement significantly.

Table 5.1: How legal and economic property rights are allocated to actors at each level of the institutional arrangement under state ownership and resource self-determination in the case of the Whanganui River/Te Awa Tupua.

<table>
<thead>
<tr>
<th>State ownership</th>
<th>Entry</th>
<th>Withdrawal</th>
<th>Management</th>
<th>Exclusion</th>
<th>Alienation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource self-determination (Stage I)</td>
<td>Users</td>
<td>Users</td>
<td>Te Awa Tupua (admin. by local govt)</td>
<td>Te Awa Tupua (admin. by local govt)</td>
<td>Te Awa Tupua (admin. by local govt)</td>
</tr>
<tr>
<td>Resource self-determination (Stage II)</td>
<td>Users</td>
<td>Users</td>
<td>Te Awa Tupua (admin. by Te Pou Tupua)</td>
<td>Te Awa Tupua (admin. by Te Pou Tupua)</td>
<td>Te Awa Tupua (admin. by Te Pou Tupua)</td>
</tr>
</tbody>
</table>

Under resource self-determination, legal rights have been vested in Te Awa Tupua by recognising Te Awa Tupua as a legal entity. Legal property rights have also been vested in Te Awa Tupua, through vesting ownership of the riverbed in the new legal entity. The interviews made clear that under the Te Pā Auroa framework, the assignment of economic property rights is to advance in two
First, rights to management, exclusion, and alienation will remain with local government. Then, over time they will shift to Te Pou Tupua. This will cause a transfer of daily decision-making responsibility from the lower policy level to the operational level, and the responsibility for settling disputes to be transferred from the legislature to the judiciary.

In both stages of development, the management strategy developed by Te Kōpuka is likely to influence how decisions are made. Because the new Act states that any action undertaken by a decision-maker must be undertaken in consultation with Te Pou Tupua and follow the management strategy prepared by Te Kōpuka, the power held by the economic rights holders (Horizons and then Te Pou Tupua) may be constrained by the legal rights granted to Te Awa Tupua and the rules developed as part of the strategy. It is reasonable to hypothesise that this may place constraints on the management, exclusion, and alienation rights held by the economic property rights holder and affect to whom entry and withdrawal rights can be granted.

In turn such a change may affect the distribution and allocation of consents, during both stage one and two of implementation of the new framework. Although, the Act specifically precludes the creation or transfer of proprietary rights to water, under common law title to the surface of land entails proprietary authority to the space occupied by the water column (Gray and Gray 2011). This suggests that the holder of the riverbed will also be granted implicit decision-making rights over the water column above the bed, potentially affecting the bargaining process between users and managers over time. When guided by the Tupua te Kawa values and the strategy document developed by Te Kōpuka, the new decision-makers may be legally bound to make decisions with different priorities to those held by decision-makers operating under state ownership.

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69 ‘Legal property rights’ are one’s rights under the law to freely exercise a choice, whereas ‘economic property rights’ are the ‘ability to freely exercise a choice’ (Allen 2015). There is some discussion about whether a distinction between legal and economic property exists (Hodgson 2015). This research makes the assumption that a distinction does exist.
For instance, should Te Pou be granted economic property rights in stage two of implementation, users interested in procuring water rights may have to enter into a bargaining process with Te Pou directly. In such a case, Te Pou Tupua’s decision-making mandate will be to enhance Te Awa Tupua’s health and wellbeing. This will shift the priorities of the primary decision-maker within the institutional arrangement from one focused on balancing environmental and development outcomes, as required under the RMA, to one concerned with delivering outcomes to the benefit of Te Awa Tupua. It can be hypothesised that such a change will affect environmental outcomes for the river and potentially economic outcomes at both local and national levels.

Such a scenario will also cause enforcement responsibility to be transferred from the legislature to the judiciary as the responsibility for determining whether a user has violated terms of contract between two ‘citizens’ at the operational level of decision-making is the duty of the judiciary. If agreement over entry and withdrawal cannot be reached between Te Pou and the user, determining whether Te Pou or the user requires compensation will be at the discretion of the courts. This has the potential to raise the costs of the new institutional arrangement as litigation becomes counter to transaction efficiency (Johnson 1992).

Further, as touched on in section 5.3.4, the outcomes reached by the courts may not consider the wider implications their judgments have on the net benefits of society as a whole. Take, for example, the extraction of water from the Whanganui River. Although it may be agreed that the most efficient use of the river is to use a certain portion of the water that flows through it for extractive purposes, under resource self-determination, this outcome may not be achieved because extraction is deemed to damage the health and wellbeing of the river. Instead, in correctly applying the law, the court may rule that no water is to be taken. From a legal point of view, this may be the correct application of the law, but it fails to consider potentially detrimental impacts on society.70

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70 Important to note here is that the law will not, of course, always shape inefficient outcomes – there is no necessary tension between the rule of law and principles of economic efficiency. However, this example
Another factor important to consider from an economic perspective is the potential opportunities that may arise for rent-seeking from implementing resource self-determination. In the case of the Whanganui River, significant decision-making responsibility may end up concentrated in the hands of the guardians. To mitigate this, the new Te Awa Tupua Act states that at any point, should the appointers consider Te Pou Tupua to be acting in a manner counter to the contract, the appointers are granted authority to revoke Te Pou Tupua’s privilege. This creates guards for the guardians, namely Whanganui Iwi and the Crown, or more specifically Ngā Tāngata Tiaki o Whanganui and the Minister of Conservation. In the spirit of the Roman poet, Juvenal, the appointment of these two overseers could be considered superfluous to the delivery of a desirable outcome, as neither the guardians nor the guards can be trusted. A more optimistic outlook, however, is to question the extent oversight will, or even can be, necessary in the case of the Whanganui following the implementation of resource self-determination.

In any situation, oversight and enforcement is only necessary if an ‘illegal’ strategy available to a guardian, such as rent-seeking, is more attractive than a ‘legal’ strategy (Hurwicz 2008). In the case of the Whanganui River, if the new framework and strategy document is able to create an institutional environment in which every illegal strategy is dominated by (that is, is less attractive than) some legal strategy, oversight by Iwi and the Crown will be unnecessary. However, should an illegal strategy be more attractive to Te Pou than a legal one, or if an illegal strategy is only weakly dominated by a legal strategy, oversight by the Crown and Ngā Tāngata Tiaki o Whanganui will be necessary to achieve the

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demonstrates potential complexities that could arise under some circumstances when overarching decision-making responsibility is placed with the courts as a result of the bargaining process being transferred to actors at the operational level under resource self-determination.

71 The consequences of this are interesting to consider in light of recent DOC strategies, for which the Minister of Conservation is the respective minister. In 2015, DOC released a strategy for the management of all environmental goods and resources, including freshwater. As part of this DOC outlined seven strategic stretch goals, of which the second goal stated that by 2025 “50 freshwater ecosystems are restored from ‘mountains to the sea’” (Department of Conservation 2015, p.6). When the Deputy Director-General of Partnerships at DOC, Dr Kay Booth, was asked about this, she said: “if the Whanganui River wasn’t right at the top of the list of rivers that we would want New Zealand to have restored from the mountains to the sea, I don’t know what would be”. This suggests that both of the overseers could have a preference for restoring the river and potentially reducing the current levels of diversion.

72 Illegal strategies could be considered those in which the guardian engages in rent-seeking or acts in a manner counter to the legislative mandate.
legislative objectives set out in the Act. In light of this, this analysis suggests that significant emphasis must be put on the strategy document, Te Heke, to articulate the strategies available to Te Pou and to design a system of payoffs that ensure that the guardians are incentivised to make decisions which align with the purposes of the Te Awa Tupua Act and discourage any rent-seeking or ‘illegal’ activities.

Whether one strategy dominates another could also be affected by the level of associated transaction costs: in most cases less costly strategies are going to be preferred to more costly strategies (Williamson 2000). For the institutional arrangement as a whole, it will be more robust if the costs of implementation and running the new framework are minimised. A proxy of the expected costs of changing, establishing, and enforcing these new sets of property rights is given by the financial support promised by the Crown to support the establishment and implementation of the new framework. It can be assumed that the Crown views these costs as long-term investments with the purpose of minimising future litigation costs, although no cost benefit analyses have been carried out ex ante.

Transaction costs could also be affected by the introduction of new actors to the governance structure (Rasmussen & Toshkov 2013), the uncertainty associated with making decisions based on a values-based system rather than a rules-based system (Kerr 2007; Pemberton & Kerr 2013), long-lasting effects of previous decisions that may be transferred across the institutional settings (Bednar et al. 2015; Mantzavinos et al. 2004), and incomplete and asymmetric information (Gagliardi 2008; Hodgson 2006; Libecap 2014). However, as Saleth and Dinar (2004) suggest, water reform only occurs when the aggregated transaction costs are less than the opportunity costs (ie foregone net benefits) of maintaining the status quo. This implies that the new arrangement must also be expected to create significant benefits for users and managers.

Given that the new institutional arrangement develops more of a community-based system, many of the well-documented benefits of collective property
rights systems could be captured by the implementation of the new framework. These could include increased levels of social capital within the community (Bowles & Gintis 2002), increased opportunities for face-to-face communication and trust building which could lead to socially optimal outcomes (Bowles 2004; Cole & Grossman 2010), and a more robust property rights system overall (Ostrom 2008a). These characteristics are evaluated in closer detail in chapter eight.

This discussion generates several testable hypotheses that can be tested to evaluate the effects of the new institutional arrangement and to answer the second general research question outlined in chapter three. The discussion shows that as a result of implementing resource self-determination there will be a change in property rights with legal property rights to the riverbed transferred from the Crown to Te Awa Tupua. Over time economic property rights may also be transferred to Te Awa Tupua through Te Pou Tupua, potentially impacting how rights to water may be allocated. As the allocation of property rights can impact rents and wealth distribution, there can also be long-term effects on environmental and economic outcomes. Therefore, it is hypothesised that:

**Hypothesis One:** The level of transaction costs is likely to be different under the two property rights settings.

**Hypothesis Two:** The assignment of property rights will affect the distribution of water allocation in the Whanganui River.

**Hypothesis Three:** Past experiences under one property rights setting are likely to affect actors' behaviour in a new setting.

The first two hypotheses are generated directly from the comparative analysis undertaken using the IAD for which assessing economic and environmental outcomes from the two property rights settings are a useful form of evaluation. The third general hypotheses is influenced by a recognition that context matters to any analysis. It also provides a preliminary examination of institutional change that is examined in greater detail in chapter seven. In this study, these
hypotheses are tested in the laboratory by approximating the institutional setting in game form and quantifying actors’ strategic behaviour.

5.5 Conclusions

This chapter has detailed the rule changes legislated to occur under the Te Awa Tupua (Whanganui River Settlement Claims) Act 2017. The results of this comparative analysis show that decision-making for the Whanganui River currently uses a top-down approach to decision-making modeled on a state ownership property rights system. Although rights to exclusion, alienation, and management are devolved to lower policy actors, ownership of the riverbed is vested in the Crown and all of the operational level actors remain stakeholders in decision-making. Under the new arrangement of resource self-determination, ownership of the riverbed is vested in an operational level actor, Te Awa Tupua, and the rights to decision-making proposed to be eventually transferred to Te Awa Tupua’s guardian, Te Pou Tupua.

The effects of progressing to stage two of the institutional arrangement are the most useful to examine to evaluate the long-term environmental and economic impacts of the change in property rights. Under such a scenario, it can be hypothesised that both resource use outcomes and transaction costs are likely to change as the new property rights holder (Te Pou Tupua) takes over the responsibility of negotiating with users over use of the river. Further, it can be hypothesised that the change in property rights is likely to be affected by past events that may influence actors’ choices in the new setting. These hypotheses can be tested by modeling the institutional structure governing the Whanganui River as a game and then testing the game theory predictions in the lab. In the game, the institutional setting can be approximated by specifying the sequence of moves available to actors, and, the actors’ preferences, by the payoff each player receives from making a choice. The number of rounds it takes to reach agreement in a repeated game can represent transaction costs. In chapter six, such a game is modeled and tested under experimental conditions to determine
the possible impacts on environmental and economic outcomes of granting a river legal standing.
6 Evaluating the play of the game*

6.0 Introduction

To establish internal validity for chapter five, chapter six evaluates some of the observations made in the institutional analysis and tests the hypotheses developed. In doing so, chapter six also addresses the second research question, which asked about the economic and environmental effects of granting resource self-determination to a river system. The methodological approach used to answer the research question and test the hypotheses is a combination of game theory and a laboratory experiment. First, the complex institutional settings governing the Whanganui River are approximated as a simple game, and then the game theoretical predictions tested under controlled conditions in the laboratory. As a reminder, the three general hypotheses generated by the institutional analysis stated: (1) transaction costs for actors negotiating under the two arrangements will change as a result of implementing resource self-determination; (2) resource self-determination will impact the use and provision of water in the river; and (3) actors’ experiences under one property rights system will affect how they behave under a new system.

The chapter thus proceeds as follows. In section one the institutional governance system of the Whanganui River is modelled using non-cooperative game theory. This game is then translated into a testable experiment for which the experimental design is outlined in section two. Section two is then subdivided into subsections, which outline the procedure, experimental design, treatments, testable hypotheses, and results. Section three discusses implications of the findings, and section four draws conclusions from the chapter.

* The experiment reported in this chapter was conducted in partnership with Dr. Joe Vecci. The results of the chapter can be found in the working paper: Talbot-Jones, J. & Vecci, J., 2016. Normalising property rights: A new approach to resource management? Available on request. Both authors contributed equally to the paper.
6.1 A normative approach to evaluation: Game theory

Based on the analysis undertaken in chapter five, the most pertinent scenario to evaluate in the case of the Whanganui River is the bargaining process between the property rights holder and a water user under different property rights settings. Although the Act states that the new arrangement does not create or transfer proprietary rights in water, under common law, title to the surface of land entails proprietary authority to the space occupied by the water column, the superjacent air space to a reasonable height, and the space comprising the soils beneath the bed of the river (Gray & Gray 2011). For this reason, effects of the change in ownership of the riverbed will result in changes in decision-making over water use.

As operators of the Tongariro Power Development Scheme (TPDS), Genesis Energy Limited, a public-private partnership, has the largest impact on the river, diverting 82% of flow from the river’s headwaters. Under the existing state ownership arrangement for the Whanganui River, when Genesis’ consent for water take comes up for renewal, Genesis negotiates with the Crown to determine how much flow it is to be allocated. As explained in section 5.2, a first-come, first-served consent based system determines how water is distributed among users of water. Under the consent system, Horizons, representing the Crown, can offer Genesis a proportion of available flow and, if needed, can readjust its offer repeatedly until agreement is reached. Each time a new offer is made, the transaction costs are assumed to increase. Each decision made by Horizons is understood to affect the ‘river’, in ways that may, or may not, be accounted for.

Based on the findings of the institutional analysis, it is anticipated that under resource self-determination decision-making authority will eventually be transferred from the Crown, represented by Horizons, to Te Awa Tupua, as represented by Te Pou Tupua. As discussed in the previous chapter, this may

73 Ibid. Footnote 52. Until 2013, Genesis Energy Limited was a state-owned enterprise. At the time of writing, the government retained the majority share (51%) in company ownership.
result in users such as Genesis engaging directly with the river to negotiate water use, relegating the Crown to a position of observer. In such situations, the bargaining process is assumed to play out in the same manner as under the state ownership system where the property rights holder makes an offer to the user, who can accept or reject such an offer. If offers by the river are rejected, the bargaining process will be repeated at a cost, continuing until agreement is reached or costs of continued negotiation are considered to outweigh the benefits.

One way to illustrate the bargaining process occurring over use of the Whanganui River is to modify the basic repeated bargaining game discussed in chapter three. In the repeated bargaining game with alternating offers one player (the proposer) is able to make an offer to another player (the receiver) who can then choose to accept or reject the proposer’s offer (Rubinstein 1982; Stahl 1971). If the receiver accepts, the game ends with each player receiving a payoff determined by the number of tokens he or she received. If he or she rejects, the game continues to another round, with a reduced pie and the two players swapping roles, so that the receiver now becomes the proposer and vice versa ad infinitum.

It is assumed that there is no communication between the players although all players have complete information, implying that all players know the structure of the game and the payoffs attached to outcomes. Players either know or do not know the current moves of other players depending on whether or not they are observable. It is assumed that both players want a larger slice of the pie and that they both dislike delay, due to their positive time preference and the cost of repeated transactions.74

Figure 6.1 depicts this setting showing two periods of a bargaining game of alternating offers with a finite horizon (Stahl 1971). In period 1 of the game, P1 is the proposer and makes an offer to P2, the receiver, dividing a pie of size one.

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74 Both the finite (Stahl 1971) and infinite (Rubinstein 1982) version of the bargaining game with alternating offers can be solved for the subgame perfect equilibrium.
If $P_2$ accepts (A) $P_1$’s offer of $o_1$ the players receive their respective payoffs of $\pi_2$ and $\pi_1$ and the game ends. However, if $P_2$ rejects (R) $P_1$’s offer, the game moves onto period 2 and repeats with $P_2$ acting as the proposer and $P_1$, the receiver. With each subsequent round, the overall pie decreases in size by a designated discount factor $\delta \in (0, 1)$. In the finite bargaining game depicted here, this means that in period 3, $P_1$ will be able to make a final take-it-or-leave-it offer. Given that the game is about to end, $P_2$ will accept any offer made by $P_1$, so $P_2$ can offer $o_3=0$. Using backward induction, this means that in the sequential finite bargaining game depicted in figure 6.1, the unique subgame perfect equilibrium is that $P_1$ offers an immediate split of $(\delta^2(1-o_3), \delta^2o_3)$ in period 1 and that $P_2$ will accept.

![Figure 6.1: A finite horizon bargaining game with alternating offers (Stahl 1971). In this three period game, backward induction shows that in period 1 $P_1$ will offer $P_2$ $o_1 \geq o_3 \delta^2$ and keep the remaining surplus for him or herself.](image)

To represent the institutional structure governing the Whanganui River the repeated bargaining game with alternating offers is adjusted to more closely resemble the simple one-sided models of Cramton (1984) and Sobel and
Takahashi (1983) (figure 6.2). In these one-sided models one player makes all of the offers and another remains the receiver throughout the game rather than alternating sequentially. The number of tokens to be split between $P_1$ and $P_2$ is non-negative and adds up to the positive total of $z$ (ie $x + y = z$).

To approximate the institutional arrangement governing the Whanganui River, this single offer game is adjusted to introduce a third player ($P_3$). $P_3$ can observe the exchange of the proposer and receiver but has no say in the decision-making and therefore has his or her payoff determined by the two bargaining parties. This represents the institutional arrangement governing the Whanganui River in which three key actors interact: the Crown, the user (Genesis), and the river/Te Awa Tupua. In this game, if player $P_2$ accepts $P_1$'s offer, the game ends, and

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75 This game can be adjusted to represent the governance arrangement of the Whanganui River under state ownership and resource self-determination. Under state ownership, the Crown is treated as $P_1$, $P_2$ is Genesis or the dam, and the third party i.e. $P_3$ – the river/Te Awa Tupua. Under resource self-determination, the river/Te Awa Tupua becomes $P_1$, Genesis Energy remains $P_2$, and the Crown becomes the third party. It can
each player will receive their payoffs of \( \pi_1, \pi_2, \) and \( \pi_3 \)(payoffs for \( P_1 \), \( P_2 \), and \( P_3 \) respectively). If player \( P_2 \) rejects the offer, play moves into period 2 and play is repeated with all players’ payoffs discounted by \( \delta \). If players reach the final period without reaching agreement, all players receive zero. For this reason, the proposer’s dominant strategy in period 1 is to choose a choice set that optimises his or her own payoffs, even if player \( P_2 \) is to receive zero. Because the final answer is weakly dominated by zero, backward induction shows that the receiver (\( P_2 \)) is better off to accept than reject the proposer’s first offer as the proposer has no incentive to change his or her offer in each repeated round. Further, the rejection of \( P_1 \)’s initial offer will cause \( P_2 \)’s payoffs to decrease by \( \delta \), making them worse off in each subsequent round. When players are self-regarding it is assumed they will make decisions which are profit maximising and that they will not take the effects of their choices on the third player into account in their decision-making.

6.2  A descriptive approach to evaluation: Laboratory experiment

As explained in section 3.4, the predictions made by game theory do not always hold up when tested empirically. Subsequently, this section outlines an experiment, which was designed to test the predictions of the game in the laboratory.

6.2.1  Procedure

All sessions of the experiment were computerised and carried out using Z-tree (Fischbacher 2007) at the Monash Laboratory for Experimental Economics, Monash University, Australia, between October and November 2015. All players were recruited using the Online Recruitment System for Economic Experiments (ORSEE) (Greiner 2004). A total of 144 undergraduate students from various disciplines participated in at most one session. Before the experiment officially began, players’ consent was sought (see appendix iv.) and all players received
written instructions (see appendix v.). These instructions were also read aloud by the experimenter to establish common knowledge. To ensure players understood how the allocation of tokens would affect each player’s payoffs, detailed examples were given in the instructions. The opportunity to ask clarifying questions privately was given. To minimise any potential demand effect resulting from the choice of examples given by the experimenter, the experimenter gave a range of examples highlighting the payoffs resulting from each corner solution as well as an interior solution (Zizzo 2009).

Although players only required a few minutes to make their decisions, the extensive instructions caused each session to last almost an hour. Players earned on average 14 AUD including a show-up fee of 5 AUD. In total six sessions were undertaken which each consisted of eight three-person groups. All players participated in two phases but were paid for one phase decided at the end of the experiment by a coin toss. A randomly chosen participant administered the coin toss in full view of all other participants. All earnings were collected from the experimenter privately at the end of the experiment.

6.2.2 Experimental design
To compare the choices made by players under the two property rights settings and test the general hypotheses outlined in chapter five, a within and between subject variation of the one-sided finitely repeated bargaining game described in section 6.1 was played in the laboratory. Players were initially put into groups of three. Each group consisted of Players P_1, P_2, and P_3 who represented the Crown, Genesis, and the river/Te Awa Tupua respectively but remained blind to the institutional context, as is standard experimental procedure. These blind titles (P_1, P_2, and P_3) and groups were randomly assigned to players at the start of the experiment and were retained by the players through the course of the experiment.

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76 All subjects had participated in other economics experiments, but none had previously participated in a bargaining game.
77 In the experiment Players P_1, P_2, and P_3 were called Players A, B, and C respectively.
Players P₁, P₂, and P₃ each had a different set of payoffs of which all players were informed (table 6.1). In the game, each player’s payoff aimed to capture the preferences of the Crown, Genesis, and the river/Te Awa Tupua, as revealed by their respective legislative mandate and observable choices.⁷⁸ As shown in the table below, Player P₁’s payoff was optimised when it allocated 83 tokens to P₂, namely Genesis. This optimisation was derived from the fact that under the existing institutional arrangement 82% of the flow from the headwaters of the Whanganui River has been allocated to Genesis by the Crown leaving 18% for the river. Player P₂, representing Genesis, was assumed to optimise its returns when it received all the tokens. This is equivalent to all water being allocated to the dam. Similarly, P₃, the river/Te Awa Tupua was assumed best off when it received all tokens or all water is left instream, as this was assumed to optimise Te Awa Tupua’s health and wellbeing. This means P₂’s payoff is greatest when he/she was offered all 100 tokens and P₃’s payoff was greatest when zero tokens were given to P₂.

The initial payoffs can be interpreted in the following way: For those subjects who selected choice set F, it is reasonable to assume they were seeking to optimise aggregate social utility. Self-regarding P₃’s were aiming to maximise their own earnings by selecting choice set A. P₃’s who cared both about their monetary earnings as well as what constitutes socially appropriate behaviour were those that selected a choice set other than A. Lastly, subjects that value equal payoffs for all players were expected to have selected choice set D.

⁷⁸The payoffs are only approximations of the payoffs available to the Crown, Genesis, and the river/Te Awa Tupua.
Table 6.1: Payoff table detailing the payoffs received by Players P₁, P₂, and P₃ according to how many tokens allocated to the receiver and proposer.

<table>
<thead>
<tr>
<th>Choice Set</th>
<th>Quantity of tokens for proposer (x)</th>
<th>Quantity of tokens for receiver (y)</th>
<th>Payoff of P₁</th>
<th>Payoff of P₂</th>
<th>Payoff of P₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100</td>
<td>0</td>
<td>$3</td>
<td>$0</td>
<td>$15</td>
</tr>
<tr>
<td>B</td>
<td>83</td>
<td>17</td>
<td>$4.50</td>
<td>$4.50</td>
<td>$13.50</td>
</tr>
<tr>
<td>C</td>
<td>67</td>
<td>33</td>
<td>$6</td>
<td>$6.80</td>
<td>$12</td>
</tr>
<tr>
<td>D</td>
<td>50</td>
<td>50</td>
<td>$9</td>
<td>$9</td>
<td>$9</td>
</tr>
<tr>
<td>E</td>
<td>33</td>
<td>67</td>
<td>$13.50</td>
<td>$11.30</td>
<td>$6</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>83</td>
<td>$15</td>
<td>$13.50</td>
<td>$3</td>
</tr>
<tr>
<td>G</td>
<td>0</td>
<td>100</td>
<td>$3</td>
<td>$15</td>
<td>$0</td>
</tr>
</tbody>
</table>

In line with standard bargaining game procedure, each game involved a proposer making an offer of between 0 and 100 tokens to a receiver who could then accept or reject this offer. If the receiver accepted the proposer’s offer, the game ended and the respective monetary payoffs made in accordance with the conversion rates detailed in table 6.1. If the receiver rejected the offer, the game continued to the next round of bargaining with payoffs for all players discounted by 10%.79 In each treatment, the inactive third player was present for each exchange and could observe all decisions made by the proposer and receiver, but not engage in any decision-making.

Each game consisted of two phases: phase 1 and phase 2. Players were informed of this at the start of the experiment, but were not told the details of the second phase until the completion of the first. Subject group and player titles remained

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79 This discount rate of $\delta = 0.9$ was chosen to encourage players to be more (rather than less) patient in their decision-making and to ensure that after ten repeated rounds, the payoffs of all players would fall to zero.
unchanged between phase 1 and phase 2. Players could engage in a maximum of ten repeated rounds in each phase.⁸⁰

The use of the bargaining game to test the effects of property right rules on peoples’ choices builds on an established body of literature reviewed in section 3.4 (Croson & Johnston 2000; Dreber et al. 2012; Hoffman et al. 2008; Leliveld et al. 2008; Oxoby & Spraggon 2008). In each of these papers the experimenter in the lab constructed property rights differently, although all found similar results, showing that players display more self-regarding behaviour when granted rights.⁸¹ In this game, the assignment of property rights was emphasised in a style similar to Leliveld et al (2008). Thus, in the instructions a graphical depiction of the game was provided which showed a pile of tokens heaped on the proposer’s side of the table, and nothing on the receiver’s side (figure 6.3).⁸²

![Figure 6.3: Graphic representation of the property rights setting and each player's role that was given to players in the instructions at the start of the experiment.](image)

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⁸⁰ The reason for including two phases is that to understand what happens to peoples’ choices when property rights arrangements change, a within subject analysis had to be undertaken, which required looking at the changes in players’ choices over time.

⁸¹ It should be noted that studies, which required players to ‘earn’ their property right tended to produce stronger results than those who simply used randomly allocated rights.

⁸² It was made clear to players that this was a hypothetical depiction and that in reality players would be in booths with identities anonymised.
6.2.3 Treatments

Subjects participated in one of three treatments: (i) the ‘State Ownership’ (SO) treatment; (ii) the ‘Resource Self-Determination’ (RSD) treatment; or (iii) the ‘Changing’ (C) treatment. The ‘State Ownership’ and ‘Resource Self-Determination’ treatments simulated the property rights systems of state ownership and resource self-determination respectively, while the ‘Changing’ treatment simulated a property rights shift from one arrangement to another. A single treatment was tested at each experimental session.

The State Ownership treatment

The ‘State Ownership’ treatment acted as a baseline control for the experiment representing the current property rights arrangement governing the Whanganui River. As discussed, under the RMA, the decision-maker is required to balance consumptive and instream water use, preferring some water to be allocated to each use (interior solution) rather than to either extreme (corner solution). To represent this, P₁ (the Crown) was assigned the role of proposer and was endowed with 100 tokens. P₁’s task was to decide how many tokens he or she wished to give P₂ (Genesis). P₂ was assigned the role of the receiver and could either accept P₁’s offer, at which point the phase ended and the respective payoffs made. Alternatively, P₂ could reject P₁’s offer in which case all players’ payoffs were reduced by 10% (δ = 0.9) and the game proceeded to the next round. For each subsequent round, the process was repeated, so that P₁ could make an offer to P₂, which could be accepted or rejected.

Throughout this process P₃ (the Whanganui River) remained an inactive third player who was able to observe proceedings but not make any decisions. All players knew of P₃’s role and that each rejection by P₂ would decrease their total payoffs by a fixed discount factor. All players also knew that P₁’s payoffs were optimised when he or she kept only some of the tokens for him or herself and offered the rest to P₂; that P₂ optimised his or her payoffs when he or she received all of the tokens; and that the inactive P₃ would optimise his or her payoffs if zero tokens were given to P₂. If an agreement was not reached after
ten repeated rounds, all subjects earned zero for phase 1. In the SO treatment, phase 2 was a repeat of phase 1. Instructions were repeated in full and all subjects retained the same groups, roles, and optimal payoffs.

**The Resource Self-Determination treatment**

The 'Resource Self-Determination' treatment represents the new property rights setting proposed for the Whanganui River. In stage two of the new institutional arrangement the power to make decisions over use are to be vested in the river itself, with a mandate instructing the guardian, Te Pou Tupua, to have a self-regarding preference for environmental health and wellbeing. It is assumed therefore that the river’s total benefits will be optimised when there is zero consumptive use of the river. In line with demand theory it is also assumed that marginal benefits will decrease with each additional unit of water allocated to instream use. Resource Self-Determination also means that any bargaining over use will occur between Te Awa Tupua, represented by Te Pou Tupua, and the user. In this setting, the central planner will only be able to observe any exchange, having been devolved of decision-making power.

Subsequently, in this treatment, P₃ was identified as the proposer whose task was to decide how many tokens he/she wished to give P₂. The receiver, P₂ could then accept or reject, with any acceptance ending the phase and any rejection taking all players onto the next round with reduced payoffs (δ = 0.9). In this treatment P₁ was the inactive third player who observed all exchanges without any power to partake in decision-making. Phase 1 and 2 in this treatment were kept constant and once again instructions were repeated in full at the start of phase 2. Subjects retained the same groups, roles, and optimal payoffs through each phase.

**The Changing treatment**

The ‘Changing’ treatment is akin to the change in property right control occurring for the Whanganui River, where the property rights are being transferred from the Crown whose payoffs are optimised when some water is

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83 After ten repeated rounds all players’ payoffs have fallen to zero.
left in the river and some extracted for hydropower use, to a third party, namely Te Awa Tupua, whose payoffs are greatest when all water is left in the system. In both settings the property rights holder must decide how much water he or she wishes to allocate to Genesis, whose payoffs will be optimised if the property rights holder decides to allocate all water to consumptive uses.

As such, phase 1 of this treatment was identical to phase 1 of the SO treatment. This meant that in this treatment $P_1$ was given the role of proposer, endowed with 100 tokens, and asked to decide how many he/she wished to allocate to $P_2$, the receiver. $P_2$ could either accept or reject $P_1$’s offer. If he/she accepted, the phase ended, whereas if he/she rejected, play continued to the next round with reduced payoffs for all players. Again, all players knew that for each subsequent round their total payoffs would decrease by a fixed discount factor of 10% ($\delta = 0.9$). If agreement was not reached after ten repeated rounds all players received zero. In this treatment $P_3$ was identified as the inactive third player.

After completion of phase 1, players moved onto phase 2. In phase 2, a new set of instructions was distributed and all players informed that $P_3$’s role was to change and he/she became the proposer. $P_3$ was then tasked with deciding how many tokens to give $P_2$, who remained the receiver. If $P_2$ accepted $P_3$’s offer, the phase ended, however, if the offer was rejected, play continued to the next round with reduced payoffs for all players ($\delta = 0.9$). In this phase, $P_1$ (who had been the proposer in phase 1) became the inactive third player. Phase 2 of the C treatment was thus identical to phase 1 of the RSD treatment.

### 6.2.4 Testable hypotheses

The experiment was designed to address three general hypotheses developed in chapter five. The first two hypotheses directly address the second research question developed in chapter three which asked about the economic and environmental effects of implementing resource self-determination. The third hypothesis sets up a preliminary analysis of research question three and the analysis of institutional change, which is explored further in chapter seven. As a reminder, the first hypothesis stated that there will be a difference in transaction
costs between the two settings, essentially asking whether the new arrangement will be more, or less, costly as a property rights mechanism than the more traditional state ownership arrangement. The second hypothesis stated that resource self-determination will impact the use and provision of water in the case of the Whanganui River. From the experimental design, two testable hypotheses were developed which aimed to test these general hypotheses by comparing players’ behaviour in the RSD and SO treatments.

The first null hypothesis tested in the experiment compares the possible costs of bargaining under resource self-determination with the costs of bargaining under state ownership. To test this, the number of bargaining rounds to reach agreement in each treatment is compared. The first testable hypothesis therefore states:

**Null Hypothesis 1:** If the transaction costs for RSD are the same as SO, then the number of bargaining rounds to reach agreement should be the same under each treatment.

The alternative hypothesis therefore states that the number of repeated rounds of negotiation entered into before reaching agreement will be different under the two settings.

The second testable hypothesis aimed to examine whether resource self-determination is likely to deliver different resource outcomes to state ownership in the case of the Whanganui River. This hypothesis was tested by comparing the number of tokens offered by the proposer to the receiver under each treatment. The null hypothesis states that there will be no difference in the number of tokens offered to the receiver under SO and under RSD, while the alternative hypothesis is that there will be a difference in the number of tokens offered to the receiver in the two treatments. It states:
**Null Hypothesis 2:** If RSD has no impact on resource allocation, then $P_3$ will offer the same number of tokens in the first period of phase 1 of the RSD treatment as $P_1$ in the first period of phase 1 of the SO treatment.$^{84}$

The third general hypothesis stated in chapter five asked whether previous property rights arrangements affect behaviour when stakeholders are forced into a new property rights setting. Self-regarding players who prioritise profit maximisation are expected to make choices, which optimise their individual payoffs. In light of this, players who are motivated by pecuniary interests would be expected to select their payoff-maximising choice, even following a property rights change. Players’ choices would also be expected to remain constant if they optimised their utility by incorporating non-pecuniary concerns into their calculations. For instance, if players were to display a ‘social preference’ for equality, they would be inclined to choose a choice set which allowed for equal payoffs for all players, irrespective of the institutional setting (Güth & Kocher 2014; Huang 2000). However, if players displayed a social preference for ‘fairness’, players’ choices could be expected to change under different property rights settings based on their experience in the previous arrangement (Herz & Taubinsky 2014; Hoffman & Spitzer 1982). Some experimental findings do suggest that players carry their experiences with them into a new institutional setting, suggesting that some players’ choices can be influenced by experience and learning, as well as personal incentives (Bednar et al. 2015). In these cases, existing institutional settings could be expected to impact peoples’ future choices.

To understand how the behaviour of subjects in one institutional setting may affect their choices in another, players’ behaviour in phase 1 of the RSD treatment was compared with players’ behaviour in phase 2 of the C treatment. This means that the behaviour of $P_3$ before (phase 1 of RSD) and after an institutional change (phase 2 of C) was compared.

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$^{84}$ Period 1 of phase one is focused on here to ensure a clean estimate is made.
To address the third general hypothesis, testable null hypotheses three and four therefore state:

**Null Hypothesis 3:** If past property rights arrangements have no effect on current property rights arrangements, players’ choices in phase 1 of the RSD treatment will have no effect on players’ choices in phase 2 of the C treatment.

**Null Hypothesis 4:** Similarly, if past property rights arrangements have no effect on current behaviour, the number of bargaining rounds will be unchanged in phase 1 of the RSD treatment and in phase 2 of the C treatment.

The alternative hypotheses state the opposite to the null in each case.

### 6.2.5 Results

*Hypothesis One*

To measure the transaction cost impacts of each property rights arrangement in terms of bargaining; the number of bargaining rounds entered into by players in the SO and RSD treatments was examined. It was assumed that each additional round of bargaining reflected an increase in transaction costs due to the inherent costs of repeated negotiations, and the subsequent decrease in payoffs. Comparing figures 6.4(a) and (b) shows that players bargain for a longer period of time before reaching agreement in the first phase of the RSD treatment than they do in the first phase of the C treatment.85

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85 Again there was no significant difference between the number of rounds of bargaining in phase 1 of the C and SO treatments. There was also no significant difference in the number of bargaining rounds in phase 1 and 2 in each of the RSD and SO treatments.
Figure 6.4:  
(a) Proportion of each choice set offered by $P_1$ to $P_2$ in each round of phase 1 of the State Ownership treatment and the number of rounds of bargaining taken to reach agreement; (b) Proportion of each choice set offered by $P_3$ to $P_2$ in each round of phase 1 of the Resource Self-Determination treatment and the number of rounds of bargaining taken to reach agreement; (c) Proportion of each choice set offered by $P_3$ to $P_2$ in each round of phase 2 of the Changing treatment and the number of rounds of bargaining taken to reach agreement.
Table 6.2 analyses this in detail, comparing phase 1 of the C treatment with phase 1 of the RSD treatment. A Wilcoxon Rank Sum test is used to determine whether there is a significant difference between the number of bargaining rounds in the two treatments. The z-stat value of 2.54 is significant at \( p < 0.01 \). That this result is highly significant suggests that resource self-determination may be a more costly arrangement than state ownership for governing the Whanganui River when considering the costs of ongoing negotiations between users and managers.\(^{86}\)

**Table 6.2:** Between treatment comparison of the number of periods of bargaining taken to reach agreement in the C and RSD treatments.

<table>
<thead>
<tr>
<th>Number of bargaining periods</th>
<th>Phase 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Treatment</td>
<td>1.21</td>
</tr>
<tr>
<td>RSD Treatment</td>
<td>1.61</td>
</tr>
<tr>
<td>Z-stat</td>
<td>2.54***</td>
</tr>
</tbody>
</table>

Note: Tests which examined different offers between treatments used a Wilcoxon rank sum test. *** \( p < 0.01 \), ** \( p < 0.05 \), * \( p < 0.1 \)

**Hypothesis Two**

To test null Hypothesis Two proposers’ offers in the first phase of the C treatment were compared with proposers’ offers in the first phase of the RSD treatment.\(^{87}\) The results are graphically displayed in figures 6.4(a) and (b) and show the proportion of each choice set selected in each repeated period by the proposers in phase 1 of the C treatment and phase 1 of the RSD treatment.

To get the cleanest measure of players’ true preferences and to be consistent with the literature, players’ choices in the first period were the focus of the analysis. Table 6.3 breaks down the proportion of tokens offered by the proposer to the receiver in the first period of phase 1 under each treatment. On

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\(^{86}\) Due to the nature of the incentive structure this result is not unexpected, making the findings of Hypotheses Three and Four especially useful.

\(^{87}\) Phase 1 of the C treatment was used for comparison with phase 1 of the RSD treatment because there was no difference found between the choices made by players in phase 1 of the SO treatment and phase 1 of the C treatment.
average 72.7% of subjects selected the socially optimal choice-set F in phase 1 of the C treatment, allocating 17 tokens to P₁ and 83 tokens to P₂. This is a choice that zero players made in phase 1 of the RSD treatment. A two sided Wilcoxon rank sum test was used to determine whether the difference in offers by the proposers in the two treatments is significant and finds the z-stat value of 4.21 is significant at $p<0.01$. Hence, it is concluded that there is a significant difference in the choices made by proposers in the two treatments.

This is further supported by the observation that 64% of P₁'s in period 1 of RSD selected the ‘fairer’ choice-set C instead of choice-set F, thereby choosing to divide the allocation of tokens more evenly between themselves (67 tokens) and P₂ (33 tokens) than players did under SO. The two-sided Wilcoxon rank sum test found that the z-stat value of 4.28 is significant at $p<0.01$. Hence it can again be concluded that there is a significant difference in the choices made by players in the RSD treatment and the SO treatment and that players divide tokens more evenly between themselves and the proposer under RSD than they do under SO.

From a welfare perspective, the selection of choice set C by players in the RSD treatment is a comparatively worse outcome in terms of aggregate social utility, having an especially marked impact on the payoffs of P₁ and P₂. However, this result does lend itself to a more equitable distribution of resources – whether this result holds in the face of institutional change is addressed by the next hypothesis.

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88The Wilcoxon rank sum test was used to measure between subject variation, as is the case when RSD is being compared with SO. It provides a nonparametric test of the null hypothesis that states that it is equally likely that a randomly selected value from one sample will be less than or greater than a randomly selected value from a second sample. The Wilcoxon signed rank test was used to measure within subject variation as occurs when phase 1 of RSD is being compared with phase 2 of C. It is useful for understanding the change occurring within a particular setting because it compares two related groups over time to assess whether their population mean ranks differ.
Table 6.3: The proportion of each choice-set offered by the proposers in phase 1 of the Changing treatment and phase 1 of the Resource Self-Determination treatment during period 1 and 2 of each treatment.

<table>
<thead>
<tr>
<th>Proposers’ offers by choice-set</th>
<th>C</th>
<th>RSD</th>
<th>Z-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Period 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice set A</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0</td>
<td>0.642</td>
<td>4.28***</td>
</tr>
<tr>
<td>Choice set D</td>
<td>0.136</td>
<td>0.357</td>
<td>1.53</td>
</tr>
<tr>
<td>Choice set E</td>
<td>0.136</td>
<td>0</td>
<td>1.42</td>
</tr>
<tr>
<td>Choice set F</td>
<td>0.727</td>
<td>0</td>
<td>4.21***</td>
</tr>
<tr>
<td>Choice set G</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Period 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice set A</td>
<td>0</td>
<td>0.071</td>
<td>1.25</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0</td>
<td>0.214</td>
<td>2.24**</td>
</tr>
<tr>
<td>Choice set D</td>
<td>0</td>
<td>0.286</td>
<td>2.62***</td>
</tr>
<tr>
<td>Choice set E</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set F</td>
<td>0.091</td>
<td>0</td>
<td>1.14</td>
</tr>
<tr>
<td>Choice set G</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: All tests are two sided Wilcoxon rank sum tests. *** p<0.01, ** p<0.05, * p<0.1

Hypothesis Three

To test whether actors take their experiences under one property rights setting with them into a new setting, Phase 1 of the RSD treatment was compared with Phase 2 of the C treatment. This compared the behaviour of P_3 before (phase 1 of RSD) and after (phase 2 of C) an institutional change. The proportion of each choice set selected by the proposer (P_3) in each repeated round of phase 1 of the RSD treatment was shown in figure 6.4(b). When compared with phase 2 of the C treatment, shown in figure 6.4(c) it appears that there is a change in the behaviour of players before and after the property rights change.

Figure 6.4(b) shows that in the first round of the RSD treatment, P_3 selected either choice set C or choice set D only, offering P_2 either 33 or 50 tokens respectively. However, figure 6.4(c) shows that when P_3 is suddenly granted decision-making power, having previously been the inactive third player, fewer
players offer the more ‘equitable’ choice-set C in period 1. Instead, the choice-sets selected by P₃ in phase 2 of the C treatments are more self-regarding than those selected by P₃ in phase 1 of the RSD treatment. As well, the figures show that after having been an inactive third player in phase 1 of the C treatment, P₃’s offer a greater range of choice-sets to P₂’s than when they had not been exposed to an alternative property rights arrangement.

The statistical significance of these observations is confirmed in table 6.4. The first period is again the primary focus of this analysis, however, periods 2 and 3 are also discussed as 97% of offers are accepted prior to the commencement of period 4 in each treatment. Two key findings emerge from the analysis of period 1. Firstly, on average P₃ is less likely to select choice set B in the first round of phase 1 of the RSD treatment than he or she is in the first round of phase 2 of the C treatment. Using the Wilcoxon signed rank test, the z-stat value of 2.52 is significant at the p<0.05. Hence it is concluded that when power is suddenly vested in players who previously had no decision-making authority, such players act in a manner that is more self-regarding than if they had not been exposed to an alternative arrangement. Secondly, on average P₃ is more likely to select choice set C in phase 1 of the RSD treatment compared with phase 2 of the C treatment. Again, using the Wilcoxon rank sum test, the z-stat value of 1.84 is significant at p<0.01, suggesting that players are more willing to distribute the number of tokens more evenly when they hadn’t previously been operating under an alternative property rights arrangement.

In periods 2 and 3, P₃ is shown to continue to be more self-regarding in phase 2 of the C treatment than he or she is in phase 1 of RSD. In period 2 of the RSD treatment P₃ selects the ‘fairer’ choice sets C and D 21% and 29% of the time respectively, as opposed to 19% and 13% in phase 2 of the C treatment. Using the Wilcoxon Rank Sum test, the z-stat value is 0.090 with a significance level of p>0.70. This difference was not shown to be statistically significant, however, it indicates that the behavioural patterns continue beyond the first round. Similar results were found in period 3 in which there is a difference between phase 1 of the RSD treatment and phase 2 of the C treatment, however, again the results
were not shown to be significant. Together, these results suggest that there is some reason to suggest that peoples’ behaviour is not independent of their experience, instead suggesting that players become more self-regarding when given the power to make decisions having previously been excluded from the decision-making process.

To further examine how changing property rights affect behaviour, the rate at which offers are accepted over time was investigated. As P₂’s role as a proposer stays constant over phase 1 and phase 2 of each treatment, P₂’s behaviour is examined in phase 1 and 2 of the C treatment to see if exposure to P₁ in phase 1 of the C treatment affects his or her responses to P₃ in phase 2.
Figure 6.5 presents the cumulative acceptance rates by round. The figure shows that $P_2$’s accept the offers of the proposer more quickly in phase 1 than in phase 2 of the C treatment. It also shows that $P_2$’s reach agreement more quickly in phase 2 of the RSD treatment than they do in phase 2 of the C treatment. The significance of these results is shown in table 6.5. The null hypothesis of equality of distributions between the probability of acceptance in phase 1 and phase 2 of the RSD and C treatments is tested using a two-sided Kolmogorov-Smirnov test. Because the mass of the distribution of acceptance for $P_2$ in phase 2 of the C treatment lies to the right of the acceptance rates of phase 1 of the RSD treatment and the probability of acceptance is found to be higher in phase 1 of the C treatment than in phase 2, the null hypothesis can be rejected. This result is significant at $p<0.05$. Hence, we can conclude that $P_2$’s are also affected by their experiences under one property rights arrangement and this affects their choices in another. A similar rate of acceptance is found between the two phases of the RSD treatment, although this result is not significant.

Figure 6.5: Comparing cumulative acceptance rates of $P_2$’s in each phase of the Resource Self-Determination and Changing treatments.

89 The Kolmogorov-Smirnov test (Chakravarti et al. 1967) was used to decide if the sample comes from a population with a specific distribution.
90 This was expected due to the lower payoff earned by $P_3$ in the second phase of the changing treatment.
91 Similar rates of acceptance were also found in phase 1 and 2 of the SO treatment.
Table 6.5: Rate of acceptance by P₂ in phases 1 and 2 of the Changing and Resource Self-Determination treatments.

<table>
<thead>
<tr>
<th>Period and treatment</th>
<th>Acceptance rates</th>
<th>Z-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Period 1: Changing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 1</td>
<td>Phase 2</td>
<td></td>
</tr>
<tr>
<td>0.909</td>
<td>0.363</td>
<td>3.46***</td>
</tr>
<tr>
<td><strong>Period 1: RSD</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 1</td>
<td>Phase 2</td>
<td></td>
</tr>
<tr>
<td>0.428</td>
<td>0.571</td>
<td>0.707</td>
</tr>
<tr>
<td><strong>Period 1: RSD + C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 1RSD</td>
<td>Phase 2C</td>
<td></td>
</tr>
<tr>
<td>0.428</td>
<td>0.363</td>
<td>0.384**</td>
</tr>
<tr>
<td><strong>Panel D: RSD + C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 2RSD</td>
<td>Phase 2C</td>
<td></td>
</tr>
<tr>
<td>0.571</td>
<td>0.363</td>
<td>1.206</td>
</tr>
</tbody>
</table>

Note: Tests which examined different acceptance rates within each treatment used a Wilcoxon signed rank test while those examining rates of acceptance between treatments used a Wilcoxon rank sum test. *** p<0.01, ** p<0.05, * p<0.1

**Hypothesis Four**

To measure whether the level of transaction costs are also affected by players’ previous experience, the number of bargaining rounds entered into by players before and after exposure to a new property rights arrangements was examined. Again, it was assumed that each additional round of bargaining reflects an increase in transaction costs due to the inherent costs of repeated negotiations, and the subsequent decrease in available payoffs. When phase 1 of the RSD treatment was compared with phase 2 of the C treatment a Wilcoxon signed Rank test produced a z-stat value of 1.89, which was not found to be significant. Hence, it cannot be concluded that the bargaining process took significantly longer to reach agreement when P₂’s had been exposed to the previous property rights arrangement than in situations when they had not.
6.3 Discussion

This experiment provides an exploratory quantification of how resource self-determination may affect resource management outcomes for the Whanganui River. By comparing players’ choices under state ownership with those making choices under resource self-determination, levels of resource allocation and relative transaction costs were estimated. This experiment also investigated the effects of transferring property rights to a third party and explored how past property rights arrangements affect peoples’ future choices.

The results suggest that resource self-determination may change the proportion of flow allocated to consumptive use for the Whanganui River. This reassignment of flow could help address concerns over levels of take persisting under the current institutional arrangement. Yet, the results also suggest that resource self-determination is likely to increase transaction costs for users and managers when they are negotiating over use, reducing the potential net benefit of the new arrangement.

These results also suggest that players’ choices in a new property rights setting are not independent of their experience; rather the transfer of decision-making power to someone who has previously been powerless, causes that player to become more self-regarding affecting the levels of transaction costs and the final resource allocation. Drawing links from existing studies, two possible explanations are offered to explain this result: retaliation and/or learning. Players who have a social preference for fairness could retaliate in phase 2 of the changing treatment after being treated ‘unfairly’ in phase 1 (Herz & Taubinsky 2014). Alternatively, akin to a learning or experience effect, players could be gathering information about appropriate behaviour from the old institutional environment, causing them to readjust their choices in the new setting (Bednar et al. 2015). These propositions are left open to future research but could have important implications for how smoothly a new group or

\[92\text{It should be noted again that it is acknowledged that the transaction costs associated with designing, implementing, and operating resource self-determination for the Whanganui River are significantly more extensive than the bargaining costs explored in this experiment.}\]
community is able to transition into a new property rights setting following a transfer of decision-making power.

Important to note is that in this experiment, that the first two null hypotheses are able to be rejected is unsurprising due to the divergence of the optimal private interests of $P_3$ and $P_2$ being greater than that of $P_1$ and $P_2$. This is because in real life, the allocation of water for consumptive use benefits the Crown more so than it will Te Awa Tupua (assuming health and wellbeing equates with ecosystem health as defined by ecological process). In contrast, for Te Awa Tupua and the TPDS, use of the water is a zero sum game. This means that if economic property rights are transferred to Te Pou in stage two of implementing the new Te Pā Auroa framework it is likely that extended periods of bargaining may lead to a more equal split of water between instream and extractive uses than occurs under state ownership.

The experiment also showed that the extreme predictions by the game outlined in section 6.1 that the property rights holder would offer nothing to the receiver in period one are not supported. Instead property rights holders are much more generous than theory would predict, while receivers appear unwilling to accept offers made by the proposer, which disadvantage them too greatly. Although not explicitly teased out in this analysis, it does appear that the game’s predictions that the third player's payoffs will be ignored by the bargaining parties does hold. Determining whether this actually is the case is also an opportunity for future research.

6.4 Conclusions

This experiment evaluated the central findings of the comparative institutional analysis. The results suggested that resource self-determination could reduce levels of water extraction in the Whanganui River, which could, in turn improve water quality. The results also suggested that arriving at agreement over use of the river under resource self-determination will be more costly than under state
ownership. This could mean that resource self-determination is a less efficient arrangement than the existing state ownership arrangement. Further, given the underrepresentation of the river's interests in previous decision-making arrangements the transfer of power to Te Awa Tupua through resource self-determination may cause actors speaking on the river's behalf to act in a more self-regarding manner than policy makers would expect. These results suggest that this could not only reduce extractive uses still further, but also result in even greater transaction costs.

A key limitation of game theory and experiments is their inability to capture the complexity in a real institutional setting. In this case the experiment, does not address many of the nuances of the current institutional arrangement governing the Whanganui River, or the future arrangement. Subsequently, in chapter eight, these experimental results are complemented by an assessment of the likely robustness of the new institutional arrangement to get a deeper understanding of the possible institutional economic effects of granting a river legal standing.
Analysing institutional change using the dynamic IAD framework

7.0 Introduction

Chapter seven moves into the second strand of this research focusing on institutional change. In this chapter, a dynamic analysis of the changing institutional arrangement governing the Whanganui River is undertaken using the dynamic IAD framework outlined in chapter three. The results of this chapter aim to answer research question three, which asked how and why resource self-determination was identified as an alternative property rights arrangement for the Whanganui River.

The chapter proceeds as follows. Taking the consequence function as a starting unit for analysis, section one identifies the outcomes of the first institutional equilibrium governing the Whanganui River pre-European settlement. Section two considers stage two of institutional evolution starting with the arrival of Europeans to New Zealand in the 1830’s. Included in this section is an analysis of the first significant exogenous shock that triggered the beginning of the institutional change, the transition period, and the new institutional equilibrium. Two sets of ongoing disruptions are identified over stage two that puncture the equilibrium path and help explain why the institutional equilibrium of state ownership failed to be stable. Section three outlines the second major shock that triggered the transition to RSD and the next stage of institutional development. Section four discusses these findings and section five concludes.
7.1. Stage one: The Whanganui River under collective ownership

The starting unit of analysis for understanding the evolution of Whanganui River governance is the outcomes of the institutional arrangement coordinating behaviour prior to European settlement of New Zealand and the Whanganui region. Preceding European settlement the Iwi of Whanganui, Te Atihaunui a Paparangi or Te Atihau, had control of the Whanganui River (Waitangi Tribunal 1999). For Te Atihau, the Whanganui River was a powerful source of mana. Te Atihau believed that before the arrival of the ancestral canoes from Hawaiiki, the ancient ones resided in Aotearoa (New Zealand). One day, at the request of one of the brothers of Maui-tikitiki, Ranginui (the Sky Father) created Matua te Mana (Mt Ruapehu), which stands in the middle of the North Island. According to Te Atihau, Matua te Mana’s obvious loneliness made Ranginui cry. Two of his tears fell at the feet of Matua te Mana and one of these became the Whanganui River. Paerangi and Ruatipua, Te-Atihauaunui-a-Paparangi’s primary ancestors, then lived at one with the Whanganui River for many years.

Ruatipua, is believed to draw mauri (life force) from the headwaters of the Whanganui River on Mount Tongariro, and from its tributaries. The connection of the tributaries which form the Whanganui River mirror the interconnection through whakapapa (genealogy) of the descendents of Ruatipua and Paerangi, the Whanganui Iwi. Because the river is a tupuna awa (a river that is an ancestor) Whanganui Iwi had a responsibility towards it: Ko te awa; ko te awa ko au (I am the river, and the river is me).

The te ao value-based system of tikanga coordinated individual beliefs and guided the social interactions of Whanganui Iwi. Iwi’s beliefs about their relationship with the river were shaped around the notion of kaitiakitanga. This meant that although the identification of usufruct rights was possible, the

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93 This is selected as the starting unit as this is the earliest record of a stable equilibrium of collective action determining use of the Whanganui River. This can be considered the initial consequence function for the starting unit of analysis (Aoki 2001).
94 Te-Atihaunui-a-Paparangi or Te Atihau were a loose and sometimes fractious confederation of hapu who would later be recognised as Whanganui Iwi. They are sometimes also referred to also as Ngati Hau.
95 This is still the case today.
96 This represents just one of the creation stories of the Whanganui River.
alienation of land or other environmental resources was a foreign concept. Tribal lands and resources were held in common, and ‘ownership’ existed only as far as the ethic of kaitiakitanga permitted.\textsuperscript{97}

Tikanga and kaitiakitanga were upheld and maintained by a system of sanctions and rewards, which regulated relationships between hapū, the environment, and within the kin group itself (Roberts et al. 1995). The institutional equilibrium coordinated the behaviour of more than 2000 Māori who lived along the length of the river (Waitangi Tribunal 1999). Rangatira and kaitiaki with mana and upholding rangatiratanga (chieftainship) were accountable to, and tempered by, the wider kin group who, together, upheld the values pertaining to tapu, mana, and reciprocity.\textsuperscript{98} These three values were central tenets of Māori custom, guiding activities such as trade (where goods were ‘gifted’ rather than traded with no expectation of an immediate rejoinder), and solidifying whanaungatanga (relationships) between iwi members. Reciprocity and an emphasis on relationships, which were ongoing, enhanced the political strength of the kin group by maintaining relations between people, their ancestors, the spirit world, and the natural environment.\textsuperscript{99}

Māori in the Whanganui region operated in collectivist societies built around the iwi, hapū, and whanau (family group) (Salmond 2014)\textsuperscript{100} Although Te Atihau predominantly interacted with those of their familial group, each member was also closely involved in the lives of other members of their hapū and iwi. Non-cooperation principally characterised relations with other iwi, although gift
exchange of localised goods did occur between tribes and iwi as they travelled up and down the river (Cumberland 1949).

Passage up and down the river was controlled by hapū that were descended from three related ancestors: Hinengakau, who was associated with the river’s upper reaches, Tama Upoko, who settled in the middle, and Tupoho, who was known for the lower half. Although the individuals of the hapū or individual families had the primary right of river user through their particular sections, hapū or individuals used parts of the river at widely different places and were highly mobile (Waitangi Tribunal 1999). When travelling along the river, the mana of each hapū would need to be respected and social norms upheld, which was possible due to the interconnectedness of all river hapū and the ancient sentiment of unity that bound all members of the iwi.

7.2 Stage two: A new institutional equilibrium of state ownership

Stage two of the institutional development of the governance system for the Whanganui River encompasses the period when the Whanganui River governance arrangement was structured around a state ownership system. This is most similar to the institutional system governing the Whanganui River examined in detail in chapter five. This section covers the period from European arrival in the 1830’s until the 1980’s when a second exogenous shock reshaped the institutional arrangement and created a path to resource self-determination.

7.2.1 The first exogenous shock: The European arrival

The first exogenous shock affecting the institutional arrangement governing the Whanganui River was the arrival of Europeans from the 1830’s and the “legal transplant” of European systems, rules, and beliefs into the Whanganui region (Berkowitz et al. 2003b; Chapple & Barton 1930). The European individualist society and its attitude to property were profoundly different to Māori’s
collectivist approach to resource management and property rights. \footnote{See Greif (1994) for a comparative analysis of individualist and collectivist societies} As White (1967) comments “Christianity is the most anthropocentric religion the world has seen. [It] not only established a dualism of man and nature but...by destroying pagan animism, Christianity made it possible to exploit nature in a mood of indifference to the feelings of natural objects” (Roberts et al. 1995).

Early Europeans viewed the Whanganui River as a resource to be used and a good that could be owned, albeit initially in the public domain. Although Māori were argued to be “...the most interesting savages on the globe” (Anonymous 1833, p.333; cited in Hickford 2006), many of their ideas of property and resources were considered in need of being ‘civilised’ into ‘improved’ British conceptions of property (Hickford 2011). English common law rested on the notion that property could be owned and made excludable, that property could be divested, and relationships could be contractual and terminated. European thinking was future oriented with a bias towards new discoveries and approaches (Sunde 2003), rewarding the individual rather than the group for optimising utility through trade and exchange of property.

As summarised in table 7.1, this contrasted strongly with Māori lore, which accepted the interrelatedness and interconnectedness of all phenomena by way of whakapapa (genealogy). Relationships to place and people were ongoing, revealed by the value placed on the act of reciprocity. People were encouraged to ‘walk backwards into the future’; always conscious of what had gone before. Contracts and trades were not finite, instead accepting that an action by one group would require a reciprocal act at some stage in the future by the other, whether in thanks or retribution. Further, it was the collective rather than the individual that was important (Durie 1993).
Table 7.1: Comparison of Māori and European societal structures.

<table>
<thead>
<tr>
<th>Institutional constraints</th>
<th>Māori</th>
<th>European</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worldview</strong></td>
<td>Tikanga (values based)</td>
<td>Anthropocentric (rules based)</td>
</tr>
<tr>
<td><strong>Social structure</strong></td>
<td>Collectivist</td>
<td>Individualist</td>
</tr>
<tr>
<td><strong>Resource management philosophy</strong></td>
<td>Kaitiakitanga</td>
<td>Ownership</td>
</tr>
<tr>
<td><strong>Contracts and relationships</strong></td>
<td>Unbounded transactions</td>
<td>Bounded transactions</td>
</tr>
</tbody>
</table>

Although these contrasting worldviews caused some initial frictions, the region was initially able to accommodate the beliefs and informal rules guiding behaviour in the two groups. A system of de facto property rights emerged along the length of the river, with new settlers and Māori adapting their beliefs and rules to accommodate the other group when required (Waitangi Tribunal 2015). This period can be viewed as an extended period of transition before the new institutional equilibrium for the Whanganui River was formalised in the mirror image of European’s collective beliefs.102

### 7.2.2 A period of transition

After the initial shock of European arrival, patterns of interaction emerged along the length of the river that enabled Māori and the British to establish adjacent action situations. These reflected each group’s respective sets of collective beliefs. There was no certainty over ownership of the river, and little pressure to formalise it. This relaxed attitude was for a number of reasons – both economic and political. First, until the mid-late 19th century resources such as land were in sufficient supply and the number of settlers in the small township of Whanganui remained low, creating little competition for resources (Downes 1915). Second, representatives of the British Crown and 539 Māori Chiefs had signed the Treaty

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102 It is for this reason that Berkowitz et al. (2003a) argues that when European law was imposed on New Zealand Māori they were not totally unaccustomed to the colonial legal order and were largely ‘receptive’. Although this might be true for some Māori, it certainly wasn’t the case in Whanganui, as this analysis demonstrates.
of Waitangi in 1840. To Māori, this had been presented in such a way that it appeared as if the relationship of the British Crown to Māori was one of a ‘protectorate’ between two sovereign nations. Article I of the Māori version of the Treaty states that Māori ceded ‘kawanatanga’ (governance) of their lands, rather than annexation and sovereignty in the western sense.

In a similar vein, Article II of the Māori version translates literally as: the Queen of England consents to Māori “...the full chieftainship of their lands, their villages, and all their possessions...”. For this reason, even several decades after the signing of the Treaty, it was clear that Whanganui Iwi still believed they held title and authority over the river. In 1864, for instance, two Whanganui Iwi hapū fought over the river being used as a highway for upriver Māori to attack Europeans at Wanganui. The fight was less about the subject of aggression, but more about whether the river could be used to transport guns through the lower reaches for which Ngati Hau still felt they held usufruct rights (Young 1998).

Through the 1840’s-50’s Europeans who continued to respect Māori custom and settle on land that Māori knew they had sold, had relations with Whanganui Iwi that were generally positive; only souring when those relationships were not maintained as custom dictated (Downes 1921). Thus, until the 1870’s de facto rights informally upheld property rights to use and management of various sections of the river. The institutional equilibrium of the upper section of the river remained shaped by the individual beliefs of the Whanganui Iwi, while the

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103 The Treaty was brought to the Whanganui on May 23 1840 by Rev. O Hadfield and Rev. H Williams. The terms of the Treaty were “carefully explained to the Natives” and it was subsequently signed by 14 of the Whanganui Chiefs, five of whom were principal chiefs (Chapple & Barton 1930).

104 Kawanatanga was a term coined by missionaries and first used in early biblical translations to represent the concept of governance (Sunde 2003). Why this term was chosen remains a source of debate, however, the most likely reason is that any other term such as mana been used, Māori Chiefs would have been unlikely to sign the Treaty as they would have been unwilling to cede their mana to the Crown.

105 Mana had been used five years earlier in the Declaration of Independence (1835), which had proposed a Māori independent state of “United Tribes of New Zealand” with powers to frame laws and dispense justice. This recognition of Māori sovereignty and independence ended up being of concern to the British and dispelling this was a key motivator of the British to draft an alternate agreement in 1840 (Durie 1993). There appear several possible reasons for this. Firstly, although 14 Whanganui chiefs had signed the Treaty, all had signed the Māori version, rather than the English version, suggesting that their interpretation of the promises of the Treaty differed from the expectations of the British. Likewise, several land deals between the New Zealand Company had failed to be honoured, creating uncertainty around ownership and rights through this period (Waitangi Tribunal 1999).
lower sections were governed according to coordinated European beliefs (Downes 1915).

This changed as the number of European settlers increased (Downes 1915). By the 1860’s over 2000 people were living in Whanganui. In the view of the newly arriving settlers, the English version of the Treaty said that Māori had few formal rights to control of the river or surrounding land in situations where ownership rights were uncertain (Waitangi Tribunal 2015). The English version of the Treaty had stated that upon signing Māori were to cede sovereignty or ‘ownership’ to the Crown in return for protection over those “properties” they did not wish to sell.

It became clear that as new actors arrived in the Whanganui region, the de facto rules that had initially guided cordial Māori and European relations could no longer be effectively enforced by the informal arrangements upon which the early relationships had been founded (Alston et al. 2012; Waitangi Tribunal 2015). As the number of settlers increased, external enforcement mechanisms, such as the military, became a more efficient mechanism of constraining and enabling actors’ behaviour than the complex system of established informal rules and customs (Downes 1921). Māori dependence on their kinship groups was weakened by reducing communication between actors, imposing a vertical social structure in the region, and increasing the levels of economic and social integration. The consequence of this was the emergence of a new institutional equilibrium centred around legal, political, and external economic organisations designed to enforce the British worldview and coordinate peoples’ behaviour.

7.2.3 Formalising the new equilibrium
Securing control of water for agricultural, industrial, drainage, access, domestic, and tourism purposes quickly became one of the newly established federal government’s utmost priorities following the end of the New Zealand wars in 1872 (Young 1998). Rivers were important trade routes and offered strategic access inland for new settlers. They also presented valuable tourist and recreational opportunities, incentivising new settlers and travellers to New
Zealand. Subsequently, actors at the upper levels of the institutional arrangement coordinated the systemic deconstruction of Māori control of the Whanganui through both judicial and legislative channels (Waitangi Tribunal 1999). As early as 1873, the de facto rules that had long-governed use of the river were formally overridden by the Timber Floating Bill 1873, which permitted the Whanganui River to be used for transporting felled timber to the coast from the central North Island without Māori consent. In 1876, the Wanganui106 Harbour and River Conservators Board Act 1876 was passed which enabled the construction of a port in Whanganui, the vesting of control of the harbour in the Crown, and permitted the clearance of obstacles, such as eel weirs and rapids, for ease of navigation. No consideration was given to the impact these actions would have on local Iwi customs or beliefs.

As the national interest became more clearly defined, shared individual beliefs held by the decision-makers at the upper levels of the institutional arrangement were further articulated through law.107 The Wanganui River Trust Act 1891 introduced the Wanganui River Trust at the period’s equivalent of the lower policy level. The Trust’s initial mandate was to conserve natural scenery along the banks of the upper Whanganui River and do “all things necessary for opening up or improving the navigation...of the Wanganui River...” [s5(1)], largely for the purpose of improving the river’s desirability as a tourist attraction. To achieve this, the River Trust, which initially comprised of seven Pākehā (non-Māori) members only, was given wide ranging powers, which were increased through the Wanganui River Trust Act Amendment Act 1893. The Amendment Act stipulated that: “[a]t any time and without giving any notice”, the Trust was authorised:

106 Note the different spelling of ‘Whanganui’ here. See the ‘acknowledgements at the start of this thesis’ for an editorial note on the spelling of Whanganui.
107 At this time, the decision-makers principally represented European interest groups. Although Māori were granted voting rights in 1852 through the New Zealand Constitution Act 1852 which made them eligible to vote in New Zealand’s first election in 1853, people had to be male, aged 21 or over, and British subjects who either owned or rented property worth a moderate amount of money. This restricted the majority of Māori from voting as most Māori land was owned collectively. When the government created four Māori electorates that covered the whole country, all Māori men aged 21 or over became eligible to vote for these Māori seats. However, this was a poor concession toward a liberal franchise – at the time Pākehā (non-Māori) had 72 seats, meaning that on a per-capita basis, Māori deserved around 15 seats. The outcome of this bias was that the majority of decisions made in the parliament were to the benefit of Europeans, with little consideration or power given to Māori.
(1) To remove any earth, stone, boulders, or sand off, from, or out of the channel or any land upon the banks of the river,...
(2) To deposit the same in any other part of the district:
(3) and for any of the purposes of the trust to make use of any such earth, stone, boulders, or sand, notwithstanding anything contained in the said Act, and notwithstanding any such earth, stone, boulders, or sand shall be removed from or used upon land which is owned by Natives under their customs or usages, which the ownership of the same has or has not been defined by the Native Land Court [s.2].

Māori claiming an interest in land from which any such materials were taken could apply to the newly established Native Land Court for compensation. The court was given powers to make orders as it saw fit, given provisions of the Public Works Act 1882. This made the court highly politicised in some cases, blurring the lines between the responsibility and jurisdiction of the polity and judiciary in the case of the Whanganui (Gilling 1994).

In 1903, the government passed a final amended version of the Crown-mines Act 1891, formalising the long-held official assumption that the bed of the Whanganui River was, or should be, vested in the Crown. This was considered to be of national importance by Seddon, the then New Zealand Prime Minister (Waitangi Tribunal 1999). Section 14 of the Crown-mines Act Amendment Act 1903 granted the Crown formal control over the river’s resources. The Wanganui River Trust Board was thus immediately granted concession to extract gravel,

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108 The Native Land Court (later the Māori Land Court) was part of the judicial system established under the Native Lands Act 1865 to hear matters relating to Māori land. Through the 1850’s and 1860’s collective land ownership by Māori and proprietary customs were hindering the availability of land for settlement by Pākehā settlers. Subsequently, government policy sought to introduce a rapid individualisation of Māori land through initiatives, which, amongst others, limited to ten the number of owners able to be issued a Certificate of Title (Gilling 1994). The Native Land Court was then employed to hear all subsequent claims and grievances.

109 The Public Works Act 1882 had guaranteed the Crown principal rights to use of land and resources when needed for ‘public works’. Such rights were considered important for the national interest and would greatly assist in the acquisition of land for the Tongariro Power Development Scheme almost eighty years later.
shingle, and stones for road and railway construction.\textsuperscript{110} Steamers carried tourists and trade items up and down the river and boats moved in and out of the busy Whanganui Harbour. Saw and paper mills operated on the riverbanks and the bustling township of Whanganui played a key role in the ongoing growth and development of New Zealand (Downes 1921).

Through the early 20\textsuperscript{th} century, the Wanganui River Trust continued to administer use and management of the river. They were also responsible for administering 30,000 acres of proclaimed domain land adjoining the river, broadening their regional power and influence (Waitangi Tribunal 2015). The primary mandate remained to provide for the scenic quality of the area for the riverboat industry, but they were also charged with ensuring that resources were kept available for the Crown’s use, should they be required (Waitangi Tribunal 2015). In time, management of the land passed to the Wanganui River Reserves Commission, a three-man Pākehā team, which oversaw the reserves and heard Māori grievances over land that had been taken and allegations of undue pressure from the government to sell. Overseen by the Department of Lands and Survey, they also considered evidence of the growing need to reduce land clearance for catchment purposes, although little was done to constrain clearance for agricultural purposes.

Until sweeping reforms in the late 1980’s there were few further changes to the formal rules governing the Whanganui River for several decades – just occasional insignificant changes at the upper policy level. However, throughout this period, repeated exogenous disruptions destabilised the institutional equilibrium, and, although it remained intact, these disruptions can be viewed as contributing to the resulting instability of the institutional arrangement.

\footnote{\textsuperscript{110}As the Crown now had ownership of the bed, no provision was made in the Wanganui River Trust Amendment Act 1920 or 1922 to compensate Māori for gravel and shingle extraction.}
7.2.4 Institutional disruptions

The discussions in sections 2.2 and 3.2 showed that exogenous disruptions can puncture the institutional equilibrium path and cause institutional actors to update their beliefs. If the actors affected are at a higher level of the institutional arrangement, they may change formal rules within the institutional arrangement that affect actors positioned at lower levels of the institutional arrangement. In the Whanganui, from the 1870’s onwards, two sets of variables exogenous to the institution itself repeatedly disrupted the institutional equilibrium of state ownership. First, Whanganui Iwi strenuously opposed the consolidation and formalisation of European beliefs, which failed to acknowledge their proprietary interests in the river and largely excluded them from decision-making. The consequence of this is that from 1873 Iwi repeatedly challenged decisions of the Crown pertaining to ownership, use, and management of the river through the courts.111 Second, following World War II (WWII) the set of individual beliefs defining New Zealand’s national identity and the national interest emerged more clearly (Kelsey 2015). Among other things, this quest for independence motivated the construction of new hydropower projects, such as the TPDS, which diverted the headwaters of the Whanganui River. Subsequent conflict over diversion imposed another set of repeated disruptions to the evolving equilibrium governing the Whanganui from the 1960’s onwards. Together these two sets of disruptions destabilised the equilibrium and imposed costs on actors involved with management of the river. Each of these sets of institutional disruptions are now described in turn.

i. Judicial challenges over ownership of the river and its bed

Disagreement between the Crown and Iwi over ownership and control of the Whanganui River can be identified as the primary driver behind the shift to resource self-determination in the case of the Whanganui River. Because the formal rules governing use of the river reflected European beliefs, Māori were constrained by a formal set of rules, which did not support their own worldview and tikanga (Greif 2006). Subsequently, as a minority party with no power to

111 Both of these sets of variables are considered exogenous because they are principally judicial challenges to the institutional equilibrium, a process, which, as discussed in previous sections, is considered exogenous to the ‘evolution’ of the institutional arrangement itself (Commons 1968; Hodgson 2004).
change the formal rules, Māori expressed their objection to the subjugation of their beliefs and lack of control over the river through the courts, imposing significant litigation costs on the Crown. This began in 1873, immediately following the enactment of the first piece of legislation directly affecting the Whanganui River, namely the Timber Floating Bill 1873. It would continue through the full period of state ownership imposing high costs on the Crown and causing the matter of ownership and control of the Whanganui River to be the longest running litigation case in New Zealand’s history.\textsuperscript{112}

Whanganui Iwi registered their opposition to the Timber Floating Act 1873 by petitioning the Government over ‘interference’ with their activities on the river (Kawepo Tama-Ki-Hikurangi 1873).\textsuperscript{113} In 1887, two different Whanganui groups petitioned parliament over destruction of pā tuna (eel weirs) (Young 1998). The government took no responding action in any instance. In 1895, the Ladies Committee of the Whanganui people wrote a letter to the Premier and petitioned parliament after an unsuccessful bid to pursue Supreme Court proceedings over the damage to the constructions of their ancestors, namely eel weirs, lamprey weirs, and whitebait dams on the river, the sides of the river, and its banks (Young 1998). At the time, referring to river structures and their kaitiaki as ancestors was not only foreign to the Crown and the individual beliefs of the decision-making actors at the upper level of the institutional arrangement, but threatened economic development of the river. For this reason, although the government granted Māori the retention of one of their eel weirs, the other was removed.

Whanganui Iwi’s subsequent dissatisfaction with the ruling was then channeled into prohibiting the sale of liquor in the area. Not wanting liquor in the region, Māori used proprietary rights in the river as a line of argument in the Supreme

\textsuperscript{112}The court case regarding ownership of the Whanganui riverbed ran from 1938-1962 and passed through the Native Land Court, Native Appellate Court, and the Supreme Court. The matter then went back to the Court of Appeal, the Māori Appellate Court, and then back to the Court of Appeal. See main body of text for further explanation of how events unfolded.

\textsuperscript{113}Evidence of broader concerns can also be found in the petition of Te Keepa Rangihivinui, in which he expressed fears of the Crown’s quiet assumption of what he saw as Māori waterways: see ‘Report on Petition of Major Kemp and Others’, LE1/1873/10, NA Wellington, pp.9 (Waitangi Tribunal 1999).
Court in 1903.\textsuperscript{114} The appeal was dismissed, however, and the English common law presumption of Crown ownership of navigable rivers reinforced in line with s.14 of the then recently legislated Coal-mines Amendment Act 1903.

Petitions over land and river rights continued with little or no governmental response or recompense for Māori over the first several decades of the 20\textsuperscript{th} century until, in 1938, legal proceedings seeking investigation of the title to the bed of the river formally began in the Native Land Court. This case, which focused on vesting legal rights to ownership of the river in Iwi, was to run until 1962, passing through the Native Land Court (1938-1939), the Native Appellate Court (1944, 1958), the Supreme Court (1949), and the Court of Appeal (1955, 1960-62).

Through the Native Land Court and the Appellate Court, the majority judgment ruled that, prior to 1840, Whanganui Iwi had owned the riverbed and that it had been unlawfully taken from them through statutory rulings, principally the Coal-mines Act Amendment Act 1903.\textsuperscript{115} In the Supreme Court, however, Justice Hay presented a dissenting opinion, ruling that the Crown had not acted in a confiscatory manner in acquiring the bed of the river.\textsuperscript{116} Because of this, the matter was then referred to a royal commission with the mandate to:

\begin{itemize}
  \item[a)] advise whether, but for the Coal-mines Act Amendment Act 1903 provision, Māori were owners of the Whanganui River according to their custom and usage;
  \item[b)] inquire whether Māori had suffered any loss in respect of the riverbed as a result of the 1903 provision that ‘in equity and good conscience’ entitled them to compensation;
  \item[c)] recommend the amount, to whom, and on what terms any such compensation should be paid; and
\end{itemize}


d) report whether any rights should be abandoned or surrendered in return for compensation.\textsuperscript{117}

The commissioner ultimately rejected the proposition advanced by the Crown that Whanganui Māori had abandoned their rights to the river and Iwi were subsequently compensated for gravel extraction.\textsuperscript{118}

The final judgment had ruled that Iwi were owners of the river prior to 1840, however, the Crown, unhappy with the final decision, decided to refer certain questions to the Court of Appeal for determination. The Court of Appeal (1953-54) again found that Māori owned the riverbed at the time of the Treaty of Waitangi (although one judge dissented).\textsuperscript{119} The matters then went on to the Māori Appellate Court (1958) and then back to the Court of Appeal (1960-62).\textsuperscript{120} The final ruling in 1962 stated that the riverbed had passed to the Crown when it acquired adjoining Māori land due to a presumption of English law that the owners of land abutting on a river own the riverbed to the river’s centre line. This was the position held by the Crown until the next major exogenous shock, which triggered the transition to resource self-determination.\textsuperscript{121}

\textbf{ii} \hspace{1em} \textit{Electricity and the national interest}

The second exogenous variable influencing the evolution of the institutional equilibrium was the design, construction, and operation of the Tongariro Power Development Scheme. In 1955, under s.306 of the Public Works Act 1928, the government commissioned a technical appraisal for a hydro scheme, which aimed to harness headwaters of the Whanganui, Whangaehu, and Tongariro River systems to generate power at power stations at Tokaanu and Rangipo (map 7.1). The scheme also planned to increase the flow of water into Lake


\textsuperscript{118} It should be noted that the commissioner ruled that no compensation was due for loss of fishery resource to Māori, namely eel weirs.

\textsuperscript{119} In re the Bed of the Wanganui River [1955] NZLR 419.

\textsuperscript{120} In re the Bed of the Wanganui River [1962] NZLR 600.

\textsuperscript{121} Important to note is that challenges also continued through the 1970’s and 80’s. The Iwi of Whanganui petitioned the Queen over interference with religious freedoms in 1977, and then Parliament, once more in 1979. This led to select committee hearings and eventually the Whanganui River Māori Trust Board Act 1988, which established the Whanganui River Māori Trust Board to speak with the Crown on Iwi’s behalf.
Taupo and boost the energy generated by a further nine power stations on the Waikato River.\textsuperscript{122} The Water Power Act 1903 had vested the sole right to use waters for electrical purposes in the Crown\textsuperscript{123} and thus Cabinet was able to approve the project with limited public consultation and without notifying Whanganui Māori (Waitangi Tribunal 1999). Construction of the scheme began in 1964 and operation of the Western diversion began in 1966 (Waitangi Tribunal 2015). 97% of the Whanganui headwaters were initially allocated to the state-owned enterprise Electricorp (later Genesis Energy Limited) for diversion (Waitangi Tribunal 2015).

In 1983, Electricorp's right to use came up for renewal and was subsequently extended for five years by the Crown. Iwi were unhappy with the continued diversions, and an announcement by the local Rangitikei-Wanganui Catchment Board\textsuperscript{124} in March 1987 that the new minimum flow regime was to be decided by 31 October 1988 gave them time to prepare a case against Electricorp's right to use. A resulting seven-day hearing in July 1988 saw one of the first blending of cultures in the history of the Whanganui. At this tribunal both Māori and the newly established Department of Conservation argued that the river needed to be treated as a totality and that the current level of water extraction was prohibitive of this.\textsuperscript{125} It was suggested that the reduced flow was causing an increase of silt, which was negatively impacting the ecological and cultural values of the river and a recommendation that 100% of flow be returned to the Whanganui was subsequently made by the Catchment Board. Electricorp immediately appealed this decision, to which the newly established Whanganui Māori Trust Board and the Department of Conservation responded by appealing.

\textsuperscript{122}As early as 1903, a visiting Californian electrical engineer had noted the electricity-generating potential of the nearby Waikato watershed: “In this region, which is quite unusual in many ways, immense quantities of power can be developed and, though somewhat distant from the centres of industry, it will some day prove of wonderful value to the colony…” (Hancock 1904, p.2).

\textsuperscript{123}This vesting was made subject to any rights lawfully held, a caveat, which was intended to provide for existing Māori interests. The intersection between customary rights and British law remained unclear and unaddressed, however. In 1905, this Act was repealed, yet the Crown’s right to waters used for power generation was retained in public works legislation, namely the Public Works Act 1894, 1905, and its amendment in 1906, which enabled the Minister of Public Works to construct the necessary works; to raise or lower the level of any lake, river, or stream; and to impound or divert waters. The 1928 amendment excluded Māori customary land from exemptions on compulsory takings and from other requirements such as the requirement to notify owners (s.311).

\textsuperscript{124}The Rangitikei-Wanganui Catchment Board was succeeded by the Manawatu-Wanganui Regional Council in 1989. It is now known as Horizons Regional Council for trading purposes.

\textsuperscript{125}In Electricity Corporation of New Zealand Limited v Manawatu-Wanganui Regional Council, Planning Tribunal decision W70/90 [1990]. Available at: http://www.nzlii.org/nz/cases/NZPT/1990/122.html.
also. The result of these appeals was one of the longest Planning Tribunals in New Zealand’s history, the cost of which has been estimated at between NZD$5 and NZD$10 million (Young 1998).126

**Map 7.1:** The Tongariro Power Development Scheme – power stations and diversions. Sourced from Waitangi Tribunal (2013, p.1078).

126 Ibid.
Working under the Water and Soil Conservation Act 1967 and the Water Act 1953, the tribunal eventually ruled in 1990 that they could not give effect to Treaty or ownership claims, however, the tribunal did discuss several other points in its ruling which differentiated the case from earlier decisions regarding use of the river. The key points of the report concerned questions of flow affecting water quality, the river’s trout and other aquatic life, the transport of sediment in the river, and the impacts on recreation and tourism. However, as a differentiating feature the discussion also considered intergenerational uses, right-holders’ priorities, lack of initial consultation, government policy on energy conservation, and national versus regional interests.

This meant that although a cost-benefit analysis commissioned by Electricorp concluded that the net economic cost to the New Zealand public of the catchment board’s 1988 decision would be almost NZD$72 million over a 28 year period in March 1989 dollar terms, the tribunal noted that no attempt had been made to quantify the majority of non-market values. These included other community benefits, Māori spiritual and cultural benefits, or intrinsic values. On balance the tribunal decided, “…the present adverse effects are so substantial...that the present regime should not be permitted to continue, even at the expense of the competing claim to the water which is backed by the perpetual entitlement...”. It concluded that too much weighting had been attached to national interests over regional interests and that Māori interests were such that, were there no competing claims, they would justify fixing the minimum flow “as the whole of the natural flow”. The Planning Tribunal ended up ruling that in light of the range of competing claims, a significant proportion of take should be returned to the river, an amount more than what was offered under the 1983 ruling, but less than the natural flow recommended in the previous tribunal ruling.

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127 Ibid., p. 165.
128 Ibid., p.182.
129 Ibid., p.183.
130 The Tribunal ruled that from 1 June 1991 the new minimum flows would be 3 cumecs at the Whakapapa footbridge throughout the year (the Whakapapa River is a tributary of the Whanganui) and 29 cumecs at Te Maire on the Whanganui River from 1 December to 31 May each year. As a point of comparison, the 1983 ruling that was extended until 1988 ruled that the minimum acceptable flow at Te Maire was 22 cumecs from 1 December to 14 February and at Easter, and 16 cumecs for the rest of the year. The Whakapapa minimum flows were 0.6 cumecs.
Electricorp then appealed to the High Court, who upheld the Planning Tribunal's decision.

This case was significant, not because it addressed the ongoing ownership claims, but because, for the first time, Whanganui Iwi and the Crown (albeit one of its departments) found a common language and cause. It also acknowledged the absence of non-market values in the presented evidence, and tried to account for them in its ruling, weighing up both types of values even in the absence of non-market estimates. Reasons for this change can be attributed to a growing shift in social attitudes in recognition of environmental interests and tangata whenua (first people of the land) rights taking place across New Zealand from the 1970’s onwards. These are discussed below.

7.3 Stage three: A new institutional equilibrium of resource self-determination

Throughout the early years of European settlement, New Zealand developed a deep dependence on, and expectation of, major power paternalism. It clung closely to the skirt strings of Britain, proudly describing itself as “more English than England itself” (Dodwell 1932, p.3). As the British settler population grew, successive governments came to regard British traditions and culture as dominant. There was an expectation that all non-British cultures were to be assimilated into the dominant Pākehā culture resulting in a general cultural ambivalence towards bi-culturalism (Visal 2000).

Although World War II triggered the delineation of a distinct ‘Kiwi’ identity, it wasn’t until the 1960’s, that the entrenched feelings of paternalism really started to change as a result of exogenous factors abroad. Economically, Britain’s interest in building stronger trade relationships with the then European Economic Community set New Zealand adrift and forced it to turn away from traditional allegiances and patterns of association (Kelsey 2015). External international crises and a changing international economy increased demand for
domestic and trade liberalisation still further through the 1970's. Socially, there was a worldwide shift towards liberalisation that was also embraced in New Zealand (King 2003). Battles over the environment and human rights came to the fore and there was a resurgence of Māori activism centered on the Treaty as Māori across New Zealand began to challenge the monocultural status quo and assert their *tangata whenua* rights over land and water (Visal 2000).

This resulted in actors at the constitutional level changing the formal rules and making choices, which would directly influence the Whanganui River. For instance, the introduction of the Treaty of Waitangi Act 1975, was able to reshape the way Whanganui Iwi would challenge legal property rights over the Whanganui River and shift the discussion from the judiciary to the legislature.

### 7.3.1 The second exogenous shock: Shifting global forces

Across New Zealand, broad political and economic changes stemmed from this shift in social attitudes. Most importantly the shift provided a launching pad for a major political transformation, inspired by the Washington Consensus (Williamson 2009). This transformation, known as the Rogernomics era, is recognised in this analysis as the second exogenous shock affecting the institutional equilibrium (Kelsey 2015).

Grounded in trickle-down economics Rogernomics reshaped New Zealand’s political structure and formal rules governing the constitutional and upper policy levels (Easton 1989). Trade barriers were relaxed and most state assets were privatised, resulting in significant social, political, and macroeconomic structural change (Evans et al. 1996).

Four important pieces of legislation were also introduced over this period, which directly impacted the institutional arrangement governing the Whanganui River. First, the Treaty of Waitangi Act was extended in 1985 to consider all breaches of the Treaty of Waitangi post-1840.¹¹³¹ This opened up a new avenue for Māori

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¹¹³¹ The Treaty of Waitangi Act’s extension in 1985 to consider all breaches post 1840 would have one of the most pervasive influences on Māori-Crown relations and general Māori-Pākehā relations (King 2003). One of the most important rulings of the Tribunal was its formal voiding of the “nullity claim” in the Motunui...
such as Whanganui Iwi who wished to challenge actions taken by the Crown. Supporting this was the Waitangi Tribunal Act 1989 which created the Waitangi Tribunal - a permanent commission of inquiry, required to investigate claims made by Māori against the Crown, and make recommendations on claims relating to the practical applications of the principles of the treaty (Stokes 1992).

Second, the Conservation Act 1987 was passed to promote the conservation of New Zealand’s natural and historic resources. The Act consolidated five different government conservation agencies as the Department of Conservation, thereby establishing DOC as the strong environmental advocate in the Whanganui River institutional arrangement. Initially the Department upheld its position as shown by the Department’s joint challenge over minimum flows in the Whanganui River, however, a departmental restructuring in 1989 purposefully diluted this power and mandate. As a result, DOC’s management mission became more aligned with other government agencies and its beliefs more like other constitutional level actors – leaving the responsibility of advocacy to NGOs like Fish and Game and Forest and Bird. The statute also created the Whanganui-Manawatu Conservation District, which rested at the lower policy level and was charged with developing the Whanganui National Park strategy following its establishment in 1986.132

Third, this shift led to the introduction of the Resource Management Act (RMA) 1991. Operating as New Zealand’s principal piece of environmental legislation it provided a new framework for managing the environment and resources through the identification of clear environmental bottom lines.133 As discussed

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132 That the Whanganui National Park was also established around this time helps explain why so many concessions were made in the Act for tangata whenua – something absent from all other National Park strategies and legislation.

133 In Environmental Defence Society Inc v New Zealand King Salmon Co Ltd & Ors[2014] NZSC 38 (Available at: http://www.nzlii.org/cgi-bin/sinodisp/nz/cases/NZSC/2014/38.html). This Supreme Court ruling will be instrumental in creating precedent around environmental decision-making in New Zealand.
in chapter five, the RMA aimed to build linkages between actors at different levels of the institutional arrangement, thus establishing a system of polycentric multi-level environmental governance for the Whanganui region built around the model of state ownership of the river.

Finally, this led to, in 2002, the Local Government Act (LGA) 2002 being introduced and reshaping the role and responsibilities of local government. One of the objectives of the LGA 2002 was to empower communities to participate in decision-making through the devolution of power to local authorities (Thomas et al. 2007). The Manawatu-Wanganui (later Horizons) Regional Council had taken over responsibility of the river from the Wanganui River Reserves Commission in the 1970’s and under the LGA 2002 was granted overarching responsibility to manage resources in the Whanganui region, including the Whanganui River and its catchment. The Whanganui, Stratford, and Ohakune District Councils were in turn charged with the management of infrastructure and land use in their respective districts, all of which included part of the Whanganui River catchment. Together these four councils coordinated local management of the Whanganui Region through their respective Regional and District Plans.

As outlined in chapter five, under state ownership, property rights to use, management, and excludability of the Whanganui River remained with the Crown. The river was viewed as ‘property’ and decision-making was guided by a belief in a distinct dichotomy between man and nature. As the minority group, Māori were largely excluded from decision-making and their beliefs and shared rules cut out of the institutional equilibrium (Waitangi Tribunal 1999).

(Palmer 2015). Since the RMA’s inception there has been weak implementation of environmental bottom-lines, which was a principle component of the original Act (Palmer QC 2014; 2015). The King Salmon decision endorses the environmental bottom line approach and prohibits the use of the purpose section of the RMA when making operative decisions. This has the potential to reduce uncertainty within the system caused by the lack of central government direction and the inconsistencies often observed between different local government decisions (Brown et al. 2016).
7.3.2 A period of transition

The changes in rules through this period reflected the changing beliefs of actors operating within the institutional arrangement of the Whanganui River. Legislation such as the Waitangi Tribunal Act provided new avenues for Whanganui Iwi to pursue their interest claims in the Whanganui River within the domain of the institutional equilibrium itself. As a result, the battle over ownership shifted from the judiciary to the legislature to become internalised within the equilibrium and start the transition to resource self-determination. This occurred in the following way.\textsuperscript{134}

In 1994, Whanganui Iwi lodged a claim with the Waitangi Tribunal over the Whanganui River. The essence of the claim was (again) that Atihaunui, for many hundreds of years, possessed and controlled the Whanganui River and its tributaries, and they have never, since 1840, freely and knowingly relinquished their rights and interests in the river.\textsuperscript{135} In its final report, the Tribunal supported Atihaunui’s claim and proposed several matters to be considered for future negotiation under the conditions of the Treaty of Waitangi Act (Waitangi Tribunal 1999, p.343). These included:

1) legislative recognition of Atihaunui (Whanganui Iwi) authority in, and ownership of, the Whanganui River in its entirety as an entity and a resource;

2) that any final settlement assure continued public access and maintain existing use rights for current terms; and

3) that national planning under the RMA 1991 would be maintained as far as is appropriate; and

\textsuperscript{134} Please note that this next section moves into a chronological record of events. Although not highly analytical, it provides a valuable record that does not seem to be collated elsewhere.

\textsuperscript{135} In 1995, frustrated with inaction over their claim, Te Runanga Pakaitore began a 79-day protest at Moutua Gardens in Whanganui. Iwi saw the occupation of Moutua and its location (Whanganui Iwi’s traditional meeting and trading grounds, on, or near, the original Pakaitore pa site) as symbolic of their grievances in terms of confiscated land and lost ownership rights. The protest ended quietly and peacefully, on the morning of 18 May 1995, however, the issues that prompted the occupation remained unresolved (Moon 1996).
4) that Atihaunui and the Crown collaborate in future water management.

To accomplish this in future planning or decision-making, two possible avenues were recommended. The first proposed that the river in its entirety be vested in an ancestor or ancestors representative of Atihaunui, with the Whanganui River Māori Trust Board delegated the role of trustee. The second option suggested the Whanganui River Māori Trust Board be added as a ‘consent authority’ and act severally and jointly with local authorities to approve use and management decisions.\textsuperscript{136}

These recommendations guided the negotiations between the Crown and the Whanganui Māori Trust Board, which opened in 2002 and ended two years later without agreement. Reasons for failure were multi-faceted. Firstly, negotiations opened following extended protests by local Māori and reoccupation of Moutoa Gardens in Whanganui over the ineffectual address of claims (NZPA 2002; Wilson 2002). These protests set the tone of negotiations, which were factious and ineffectual. Many Pākehā were concerned the Crown had been pushed into negotiations by “Ken Mair’s mob” at Moutua (Hansard Reports 2002; Turia 2002), whilst Iwi were highly resentful the Crown had appeared so reluctant to address the findings of the Waitangi Tribunal decision (TVNZ 2002).

Secondly, the negotiations coincided with legal deliberations over proprietary rights to the foreshore and seabed, which the Court of Appeal ruled as being held by Māori in June 2003 (Boast 2013; Charters & Erueti 2007).\textsuperscript{137} The then Labour Government’s response was to threaten to legislate against the Court’s ruling. (Charters & Erueti 2007). On a national level, this caused fractures within the Labour Party culminating in the departure of Dame Tariana Turia of Whanganui from the Labour Party to form the Māori Party. At a local Whanganui level, Archie Tairoa, then chair of the Whanganui River Māori Trust Board, responded...

\textsuperscript{136} One member of the Tribunal, John Kneebone, provided a dissenting opinion, unable to support any proposal that Atihaunui should own natural water or be designated a consent authority in respect of the river under the RMA 1991 (Waitangi Tribunal 1999, pp.345-347).

to the government’s threat by instructing Counsel to file an effect in the Māori Land Court for claims to the ownership of the foreshore and seabed adjacent to Whanganui Iwi territory and the riverbed itself, the main stem and its catchment, as a tactical keeping position.

This move by Iwi was inconsistent with the Terms of Negotiation signed by the Crown and Whanganui Iwi on 6 March 2003, in which both parties agreed not to pursue before a court or tribunal redress over any areas subject to negotiations (Wilson 2004). It also meant that, when Genesis’ 35 year resource consent for the western diversion of the TPDS came up for renewal in 2004, the focus of the river negotiations for both Iwi and the Crown shifted from addressing property rights claims of the Whanganui River to matters of ordinary litigation relating to the filed effect. Negotiations with the Crown over the Whanganui River subsequently broke down and Iwi ended up following the matter of Genesis’ diversion consent through the Environment Court (2004)138, the High Court (2006, 2007)139, and the Court of Appeal (2007)140.

The most recent round of negotiations for the Whanganui then reopened in 2009 under a conservative National led Government. Broader advances made through Treaty settlements over the previous decade in exogenous domains contributed to these negotiations reaching a successful resolution in 2014. Since 1985, actors at all levels of the institutional arrangement governing the Whanganui River had watched closely the progression of settlements and the rules used to redistribute property rights over water bodies across New Zealand. As a result, exogenous legislation can be considered the final set of disruptions occurring through the

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140 The final decision by the Court of Appeal in Ngati Rangi Trust and others v Manawatu-Wanganui Regional Council [2007] NZCA 378 (available at: http://www.nzlili.org.nz/cases/NZCA/2007/378.html) upheld the initial consent granted to Genesis to divert 82% of the headwaters. In March 2011 Whanganui Iwi and Genesis Energy entered into a relationship agreement, Hei Whakaaro Tahi ki Te Mana o Te Awa, in which the parties agreed to bring an end to the litigation between them and to progress the resolution of any outstanding issues in a non-adversarial environment outside of the Courts. Unfortunately a copy of this agreement was not able to be sourced.
period 1980-2014 which nudged both actors and rules closer to the adoption of resource self-determination.

7.3.3 Institutional disruptions
The final set of disruptions impacting the slowly evolving institutional arrangement governing the Whanganui River through its period of transition from the 1980’s onwards was the institutional equilibria evolving in adjacent domains. Following the growth of Māori activism in the 1970’s and the introduction of legislation such as the Treaty of Waitangi Act 1975 and the Waitangi Tribunal Act 1989, policy decisions pertaining to freshwater and Māori interests created precedents for resource self-determination. These adjacent equilibria influenced the individual beliefs of actors interacting within the Whanganui River governance arrangement and provided actors with new ideas for developing a suitable institutional arrangement for governing the Whanganui River.

i. Institutional equilibria in adjacent domains
The establishment of the Waitangi Tribunal enabled iwi across New Zealand to reach settlement with the Crown over historic Treaty grievances affecting the use and management of freshwater bodies. In each case a settlement resulted in new formal legislation, which would create precedent for future settlements. The first major settlement affecting freshwater was for Te Waihora/Lake Ellesmere in Canterbury in the South Island. Ngāi Tahu (the claimant) were, and had always been, adamant that they had not relinquished rights to the lake, which was a valuable asset to iwi prior to European settlement. During the negotiation process, Ngāi Tahu expressed their desire to reclaim ownership and

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141 Although not relating to freshwater directly, important to mention here is the Manukau Harbour claim (Waitangi Tribunal 1985), which laid the basis for new relationships between Māori living near the harbour, local government bodies, businesses, and the wider community. Although the Tribunal made no findings in relation to the Waikato River, which runs into the harbor, in its recommendations it acknowledged the need to reconcile ‘Māori sensibilities’ regarding the ownership of the river, with state ownership (Waitangi Tribunal 1985, p.129). The report informed the resulting legislation and set a precedent for future decisions concerning freshwater across New Zealand.
governance of Te Waihora in order to restore the lake as source of mahinga kai (food gathering sites and practices). 142

The resulting Ngāi Tahu Claims Settlement Act 1998 granted ownership of the lakebed (the Crown refused to grant property rights to the lake’s water) and some surrounding lakeshore properties, which were to be formerly managed by the Department of Conservation with consideration given to mahinga kai values. The governance of the lake has subsequently relied on a fragmented institutional arrangement involving the local territorial authority, the regional council, DOC and Ngāi Tahu (Hughey & Taylor 2008). More recently there has been an increased focus on integrated catchment management with partnerships formed between Ngāi Tahu, DOC, Fonterra (New Zealand’s largest dairy company), local authorities, and community organisations. In 2011, the government announced a new NZD$11.6 million package for restoring and rejuvenating the mauri and ecosystem health of the lake, a process expected to take over 35 years (Te Waihora Co-Governance Group 2011).

In 2004 the Te Arawa Lakes Settlement Act 2006 established a co-management framework for the Te Arawa Lakes, located near Rotorua. Similarly to Te Waihora, it brought together local government and the tribal confederation of Te Arawa to improve governance outcomes for the lakes. A Strategy Group was formed to contribute to the sustainable management of the Lakes, while recognising and providing for the traditional relationship Te Arawa with their ancestral lakes (s.49). Recently, the Te Arawa Lakes Trust developed a cultural values framework, which identifies, organises, and describes key Māori values as a basis for guiding and determining management for the lakes (Te Arawa Lakes Trust 2015). In terms of property rights, the fee simple estate in each of the twelve Te Arawa lakebeds was vested in the Trustees of the Te Arawa Lakes Trust, which was made up of Te Arawa Iwi. 143

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142 In the Ngai Tahu Claims Settlement Act 1998, mahinga kai specifically refers to Ngai Tahu’s interests in traditional food and other resources, and the places where those resources are obtained.
143 It is explicitly stated in the Act that the lakebeds cannot be alienated from the rest of the lake [ss.23-24]: clause 23(2), for instance, states that the Crown retains ownership of the stratum under the Land Act 1948, thus retaining ownership of the space the water occupies and the air above it. The Act also states that the vesting of the lakebeds does not include any rights in relation to the water in the lakes, or the aquatic life.
These two cases paved the way for a more far-reaching co-management solution for the Waikato River. Similar to Whanganui Iwi, Waikato Iwi had long maintained the importance of their unique relationship with the river and the need to respect its *mana* and restore its wellbeing (Muru-Lanning 2010). By Deed of Settlement dated 22 August 2008, the Crown and Waikato-Tainui reached a settlement promising to recognise the relationship between Waikato-Tainui and the river and focus on achieving improved environmental and social outcomes through co-management. Four other local iwi subsequently also signed Deeds of Settlement with the Crown, formalising their future involvement in co-management arrangements.

The two founding pillars of the subsequent Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 recognised that to Waikato Iwi, the Waikato River is ‘a *tupuna*\(^{144}\) which has *mana* and in turn represents the *mana* and *mauri* of the tribe’ [Preamble]\(^{145}\). The second pillar, *mana whakahaere*, ‘embodies the authority that Waikato-Tainui and other river tribes have established in respect of the Waikato River over many generations to exercise control, access to, and management of, the Waikato River and its resources in accordance with *tikanga’ [Preamble]\(^{146}\). The subsequent institutional framework developed for the Waikato River consisted of five individual co-management agreements or Joint Management Plans signed between each river iwi and their respective local authority (Muru-Lanning 2012). Each plan was to be guided by statements of the Waikato River Authority, however, each had different objectives and approaches for improving ecosystem health and wellbeing, making the overall governance arrangement somewhat fragmented (Muru-Lanning 2012). The River Authority had five Crown-appointed members and one from each river iwi designated in section 22.1 to:

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\(^{144}\) Note that in the Waikato settlement, negotiators accepted a subtle change in the Waikato River’s definition as an “awa tupuna” or “ancestral river” rather than a “tupuna awa” (Muru-Lanning 2010). This diminished the metaphysical aspects of the river, something that the Whanganui River negotiators were not prepared to accept when they entered negotiations some years later.

\(^{145}\) This refers to the Preamble of the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010.

\(^{146}\) *Ibid.*
a) Set the primary direction through the vision and strategy to achieve the restoration and protection of the health and wellbeing of the Waikato River for future generations:

b) Promote an integrated, holistic, and coordinated approach to the implementation of the vision and strategy and the management of the Waikato River:

c) Fund rehabilitation initiatives for the Waikato River in its role as trustee for the Waikato River Clean-up Trust.

The Waikato River co-management agreements and co-governance framework represented a significant shift in the approach to freshwater management in New Zealand (Te Aho 2010). Firstly, the settlement acknowledged the strong connection Waikato Iwi had with the river and the interconnectedness of all things, physical and metaphysical. Secondly, the settlement stepped away from focusing on formalising ownership; instead emphasising the integration of governance approaches and incorporation of the tikanga of the Waikato Iwi into the decision-making framework. The development of co-management strategies across a range of agencies coupled with an overarching governance framework, aimed to achieve intergenerational outcomes and restore and protect the health and wellbeing of the River (Baker 2013).

Finally, although not related to freshwater, the recent Te Urewera settlement is important to mention. The initial signing of Ruruku Whakatupua between Whanganui Iwi and the Crown in 2012 sent a signal to other iwi of the length the Crown was now prepared to go to address Treaty grievances. As a result, in 2014, Tūhoe came to an agreement with the Crown over Te Urewera National Park, the largest national park in the North Island. Under the Tūhoe-Te Urewera Settlement Act 2014, Te Urewera was made a legal entity and granted legal standing, transferring legal title from the Crown to Te Urewera itself.
Although the supporting governance framework differs from that proposed for the Whanganui, the Te Urewera case provides some useful insights into some of the complexity and challenges that could be faced for those involved with governance of the Whanganui River. As explained by a member of Te Urewera’s Board, which as of November 2016 was made up of four members appointed by the Treaty of Waitangi Minister and Conservation Minister and four members appointed by Tūhoe Te Uru Taumatua (the Tūhoe governance entity)\(^{147}\), a key challenge has been how to convey the notion of legal personality into practical governance outcomes.\(^{148}\) Incorporating Tūhoe’s beliefs into the new sets of formal rules has required a different approach to management and use of Te Urewera. Under the new framework, rather than management being built around a philosophy of conservation, the new management approach is one of sustainable use. As a result, it supports the active harvest of traditional food sources, which could include currently threatened species. The guardians and supporting governance groups of Te Awa Tupua will likely face similar challenges when faced with implementing the Te Awa Tupua Act.

7.3.4 Integrating the Māori worldview with existing legal frameworks

Learning from the failure of the previous negotiations, as well as the broader advances made through Treaty settlements over the previous decade, the 2009 negotiations over the Whanganui River adopted a different approach to that taken in the 2002 negotiations. Entering negotiations, the interviews revealed that the Crown knew that any institutional solution created for governance would have to be innovative and potentially work outside the basic guiding principles of Cabinet’s own rules. Subsequently, rather than taking the Waitangi Tribunal Whanganui River Report as the baseline proposition, as was done in 2002, the second round of negotiations began by identifying the possible bounds of any potential settlement.

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\(^{147}\) The Board members are appointed for a three-year term. After the initial term, the Board’s membership will change to comprise six members appointed by Tūhoe and three appointed by the Minister of Conservation. The chair will be selected from among the Tūhoe appointees.

\(^{148}\) One approach used has been through the repeated use of metaphor on information panels, presenting Te Urewera as a *marae* (meeting house) in which all can gather and share rather than a ‘park’ or something similar.
As had occurred with Te Waihora, the Crown indicated that the then Prime Minister, John Key, would not support vesting full ownership of the river in Iwi or an iwi ancestor, so an alternative approach would be needed. Several interviewees explained that significant time was spent exploring Iwi’s relationship with the river system as a way to navigate the issue of ownership. Successive iterations of consultation revealed that ownership in the European sense would actually be derogatory of the river and it became clear to both sides, the very concept that Iwi could own the Whanganui River was corrosive of the river’s mana. As one interviewee stated explicitly, “it became further apparent that the core of the issue was, less that Iwi did not own the river, but more that the Crown did”.

Subsequently, drawing on Salmond’s (1930) work on legal fictions, as well as the work of Stone (1972), the negotiators developed the concept of resource self-determination as an alternative property rights arrangement to state or iwi ownership. By identifying Te Awa Tupua as a legal entity and vesting ownership of the riverbed in Te Awa Tupua itself, the Crown and Iwi were able to ensure that the Crown would no longer ‘own’ the river, but that neither would ownership be transferred to Whanganui Iwi. Resource self-determination was an appropriate middle path that met the needs of both negotiating parties and overcame roadblocks, which could have otherwise caused negotiations to falter.

As already explained in chapter five, the outcome of these negotiations meant that in 2011 a ‘Record of Understanding’ was signed between Iwi and the Crown, acknowledging the important relationship Whanganui Iwi have with the river (Office of Treaty Settlements 2011). In 2012 Iwi then signed a preliminary deed with the Crown that set out the conditions of resource self-determination that would shape the final Deed of Settlement signed in 2014 (Office of Treaty Settlements 2012; 2014a; 2014b). The Te Awa Tupua (Whanganui River Claims Settlement) Act 2017 outlined in chapter five was the conclusive piece of legislation formally granting the Whanganui River legal standing.
7.4 Discussion

This dynamic, historical analysis aimed to answer the question of how and why resource self-determination was applied to the Whanganui River. The analysis shows that the institutional arrangement formally introduced by the Crown was never stable due to the challenges mounted by Whanganui Iwi from 1873. Whanganui Iwi were not motivated to adhere to the formal rules which reflected a set of beliefs that were not their own. Subsequently, the state of institutional evolution mirrored a punctuated equilibrium path as Iwi repeatedly challenged the system of state ownership through the courts. It was these ongoing disruptions, which increased costs within the institutional arrangement and ultimately motivated constitutional level actors to change the rules and introduce a system of resource self-determination.

The analysis showed that, in the case of the Whanganui River, the transition process towards resource self-determination was evolutionary rather than revolutionary. It was driven by two primary factors: slowly evolving beliefs coupled with exogenous parameter shocks and disruptions which punctured the institutional equilibrium path and, over time, qualitatively shifted the property rights systems from one equilibrium state to another.

These shocks came in the form of two major exogenous events and a set of smaller disruptions, which were repeated over time. The first major shock was the arrival of Europeans in the 1830's, which resulted in the formalisation of state ownership of the Whanganui River in the 1870's. That the new ownership model failed to bridge the two competing worldviews and account for Māori's existing beliefs caused the arrangement to be inherently unstable. As explained by Aoki (2015) for an institutional arrangement to be stable, the working rules-in-use must reflect the majority of beliefs held by actors within the institutional arrangement. Although, in the case in the Whanganui River, Europeans were the dominant group with stronger bargaining power (Knight 1992), Māori consistently withdrew their consent by way of organised collective action (Levi 1990) and challenged the belief of the majority through the courts. This
repeatedly imposed costs on actors operating within the institutional arrangement across every level of decision-making.

Between the 1870’s-1980’s the exogenous disruptions to the institutional equilibrium were centred around Iwi establishing legal property rights or ownership over the river. Through the early-mid 20th century, claiming ownership of the river was the only avenue available to Māori wanting to assert their rights within the state ownership property rights system (Waitangi Tribunal 1999). The European belief system and the supporting formal rules could not accommodate the metaphysical and collectivist concepts central to the Iwi worldview149; while non-market values, such as cultural values, struggled to be incorporated into decision-making. This gave the more easily quantifiable market values, most notably the benefits of hydropower, greater influence in decision-making in some cases in the case of the Whanganui River.150

With the second major shock culminating in the 1980’s with significant political reform, a new pathway opened for Iwi to challenge the status quo from within the institutional arrangement. The growing acknowledgment of biculturalism across all levels of the institutional arrangement (Visal 2000) allowed the focus of Whanganui Iwi to turn away from questions about defining legal property rights and towards the designation of economic property rights. This shift is most evident in Iwi’s 1994 claim to the Waitangi Tribunal that focused on establishing Te Atihau’s rights and interests to the Whanganui River rather than reassigning ownership. Successive rounds of negotiations and discussions were then able to create a new property rights system that recognised these rights and interests by approximating Whanganui Iwi’s worldview in law.

Over the course of this analysis, a process of path dependence is clear (Mantzavinos et al. 2004; Van Bavel 2015). It was only because of existing rules, evolving community attributes and informal rules, and material conditions that a system able to support resource self-determination could be proposed in the

149 Later attempts by the RMA and within local government plans fell short of successfully incorporating either element (Ruru 2009).

150 Ibid. 115.
case of the Whanganui. In addition, formal rules in exogenous domains had a strong influence on the institutional arrangement governing the Whanganui River (McGinnis 2011c). Exogenous institutional equilibria played an important role in shifting the individual beliefs of actors operating under state ownership closer to resource self-determination. Actors interacting under the institutional equilibrium of state ownership in the Whanganui River arena were able to observe advances in parallel domains and re-strategise to try and optimise their net benefits given the new information available. Iterations of policy decisions affecting freshwater systems across New Zealand provided important signals about the type of system the broader New Zealand institutional framework could support and what it could not.

This analysis also showed that actors interacting within the institutional arrangement changed formal rules at the constitutional and policy levels of the institutional arrangement. Those actors at the policy and constitutional levels were able to craft rules that affected actors at lower levels of the institutional arrangement. Those actors who chose to change the formal rules at the upper levels of the institutional arrangement were motivated by their own utility and guided by their own sets of individual beliefs. For instance, the belief of former Prime Minister Richard Seddon that securing the Crown’s access to rivers and waterways was of primary importance to New Zealand’s economic development, motivated the identification of new sets of rules that deconstructed Whanganui Iwi’s control of the river at the turn of the 20th century (Young 1998). Similarly, in negotiating the Whanganui River claims settlement, much of the drive to reach agreement came from the Minister of Treaty Settlements, Christopher Finlayson, who was personally determined to see the settlement completed and believed that upholding Treaty principles and the recognition of Whanganui Iwi’s connection with the river was important.

Informal rules evolved gradually over time and reflected the majority view. Unlike formal rules, these informal rules were not able to be altered by a single individual, instead only changing gradually through critical mass or when exogenous events caused a qualitative shift in equilibrium (Greif 2006). In the
case of the Whanganui River, exogenous variables such as the global social and cultural liberalisation of the 1960’s and 1970’s catalyzed a mass change in behaviour across New Zealand and provided a platform for subsequent rule changes. These belief changes ultimately spurred the dramatic reforms of the 1980’s which led to a qualitative shift in equilibrium for the Whanganui River (Easton 1989).

Given that this qualitative shift in equilibrium occurred at the overarching constitutional and upper policy levels, it did not affect the governance arrangement of the Whanganui River alone. An important question then becomes why was this new system proposed for the Whanganui River but not other river systems? (Greif 1998). Other rivers in New Zealand experience similar challenges to the Whanganui River (Ministry of the Environment and Statistics New Zealand 2017; Ruru 2010), but remain under state ownership. Why was the Whanganui River different?

The dynamic analysis revealed that the deep connection Whanganui Iwi shares with the river and the Iwi’s long-standing claims over legal and economic rights differentiated the case of the Whanganui from other cases of water governance. Although this connection between Iwi and the river is not unique to Whanganui (Ruru 2010), the costs Whanganui Iwi imposed on the Crown from 1873 onwards is. The case over ownership of the Whanganui River, for instance, remains New Zealand’s longest running court case and imposed both a financial and political burden on the Crown. When it came to Settlement negotiations in 2009, this complex and extended history potentially granted Whanganui Iwi greater bargaining power than was held by other iwi who had previously negotiated with the Crown over Treaty claims. In addition, water institutions across New Zealand had been evolving rapidly since the advent of the Waitangi Tribunal in the 1980’s. Settlements, such as that for the Waikato River, set new precedents for property rights that could be advanced still further in the Whanganui River case. Although future comparative work will have to be undertaken to confirm these hypotheses, it can be surmised that the application
of resource self-determination to the Whanganui River was a unique case driven by exogenous events as well a complex history of costly institutional instability.

7.5 Conclusions

This chapter tested the dynamic version of the framework outlined in chapter three by applying an historical lens to the changing institutional arrangement governing the Whanganui River. It aimed to determine how and why resource self-determination was identified as an alternative property rights arrangement for governing the Whanganui River. The analysis showed that in the case of the Whanganui River, it was not environmental factors that motivated the search for an alternative property rights system, but diverging beliefs of actors interacting within the institution. From the beginning of European settlement, a clear divide existed between the enforced formal rules imposed for governance of the Whanganui River and Whanganui Iwi’s collective beliefs. The analysis showed that the institutional equilibrium that emerged for coordinating use of the river was not stable, as the transplant of British rules did not take into account the pre-existing institutional arrangements constructed from Māori beliefs (Kingston and Greif 2011). This created openings for exogenous disruptions to puncture the institutional equilibrium and nudge the evolutionary path closer towards resource self-determination.

Because those actors who were unhappy with the status quo were a minority group at the operational level of decision-making, the only avenue available to them to articulate change was through pathways outside of the institutional arrangement itself. Disruptions to the institutional equilibrium through the judicial system as well as rule changes that developed in domains parallel to the institution repeatedly punctured the equilibrium path. Eventually rules from exogenous domains were internalised within the institutional equilibrium, creating new pathways towards resource self-determination.
The findings show that, although the adoption of legal standing presents a dramatic shift from the existing property rights approach of state ownership, it was only through a process of incremental change and exogenous shocks that the fundamental transformation was able to happen. They also show that the institutional arrangement of resource self-determination was designed because available alternative property rights systems were not able to deliver a self-enforcing institutional equilibrium that suitably approximated the Māori worldview in law.

Given these insights, as well as those garnered from the previous chapters, the following chapter evaluates and discusses the likely robustness of the new institutional equilibrium for governing the Whanganui River over the long-term.
8 Evaluating resource self-determination using Ostrom’s design principles

8.0 Introduction

This chapter aims to bring together the results reported in chapters five, six, and seven to answer the fourth research question which asked how robust will resource self-determination be as an alternative property rights system for governing the Whanganui River. So far, the findings have highlighted the complexity of the institutional setting and the historical challenges associated with identifying a stable institutional arrangement for governing the Whanganui River. The institutional structure analysed in chapter five showed how the identification of resource self-determination will affect the allocation of property rights in the case of the Whanganui River, whilst some of the environmental and economic effects of granting a river legal standing were then analysed in chapter six.

This chapter examines how the broader institutional characteristics, not captured by the experiment, could influence the outcomes and relative long-term ‘success’ of the institutional arrangement. As well as transaction costs, variables such as the size and heterogeneity of the group involved, the linkages between actors, the type of production functions users are facing, how easy it is to get good information about the results of past actions, how valuable solving the problem is to participants, and the levels of social capital have all been shown to influence the relative robustness of property rights systems (Ostrom 2008b). Given this taxonomy of influences, this chapter evaluates resource self-determination using Ostrom’s design principles (Cox et al. 2010; Ostrom 1990) to determine the likely long-term robustness and resilience of the institution crafted to govern the Whanganui River.
The merits of using Ostrom’s design principles were discussed in section 3.2 and thus the chapter proceeds as follows. Section one considers the new property rights system in light of each of Ostrom’s eight design principles and compares the likely robustness of resource self-determination with state ownership arrangement in the case of the Whanganui River. Section two discusses the results and section three concludes.

8.1 Evaluating institutional robustness: Ostrom’s design principles

Faced with the complexity of institutional arrangements across resource systems, Ostrom’s design principles were delineated from a set of considerations that characterised robust common pool resource systems (Ostrom 1990; 2008a). They were identified as factors that were understood to affect incentives in such a way that users would be willing to commit themselves to conform to the institutional rules-in-use. When all of the design principles are met, actors’ best responses lead to outcomes that provide for cooperation and collective action.

In 2010, Ostrom’s (1990) original set of eight principles was extended to ten in an effort to discern more precisely the elements of an institution likely to affect its longevity and stability in equilibrium (Cox et al. 2010). As explained by Agrawal (2003), Ostrom’s (1990) original list of principles displayed gaps, particularly in terms of the effects of features of particular resources on collective outcomes. The list of ten principles does a satisfactory job in addressing some of these shortfalls and thus it is this extended list, which is used in this analysis to determine the likely robustness of resource self-determination in the case of the Whanganui River. A summary of how well each principle is met under each property rights system is provided in table 8.1 and then discussed in detail below.

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151 Ostrom focused on common pool resource systems specifically, rather than common property resource systems, which in this study have included systems for the governance of both common pool resources and public goods.
Table 8.1: A comparative summary of the degree to which each property rights arrangement governing the Whanganui River meets the requirements of Ostrom’s design principles. The arrows represent the degree to which the design principle is met under each property rights setting. An open circle symbolises a situation in which too little information is available to make an informed assessment.

<table>
<thead>
<tr>
<th>Design Principle</th>
<th>State ownership</th>
<th>Resource self-determination</th>
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<tbody>
<tr>
<td>1a. Clearly defined resource boundaries</td>
<td>↓</td>
<td>↑</td>
</tr>
<tr>
<td>1b. Clearly defined group boundaries</td>
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<tr>
<td>2a. Congruence between appropriation and provision rules and local conditions</td>
<td>→</td>
<td>↑</td>
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<tr>
<td>2b. Congruence between appropriation and provision rules</td>
<td>→</td>
<td>○</td>
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<tr>
<td>3. Collective choice arrangements</td>
<td>→</td>
<td>↑</td>
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<tr>
<td>4a. Monitors are present</td>
<td>→</td>
<td>→</td>
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<tr>
<td>4b. Monitors are members of the community and accountable to the members</td>
<td>→</td>
<td></td>
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<tr>
<td>5. Graduated sanctions</td>
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<td>6. Conflict-resolution mechanisms</td>
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<td>7. Minimal recognition of rights</td>
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<td>8. Nested enterprises</td>
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8.1.1 Principle 1A&B: Clearly defined resource and group boundaries.
The first design principle of clearly defined boundaries can be split into two components: the boundaries of a resource system and the individuals or households with property rights. When each component is well defined the positive and negative externalities produced by actors can be internalised so that the costs of appropriation and some of the benefits of resource provision accrue to the actors themselves rather than being imposed on a third party. As Hanna (1995, p.20) states: “It is important to ensure that a property rights regime has clearly defined boundaries, and that to the extent possible, those boundaries are consistent with the natural boundaries of the ecological system.”

As discussed in chapter five, the boundaries of the Whanganui River resource system were not clear under Crown ownership. Multiple working rules-in-use
and legislative mandates led to jurisdictional overlap and conflicting management priorities and incentives along the length of the river and within the river’s catchment. Although a catchment management plan was in use, it wasn’t a strong directive for integrated catchment management for actors across the various levels of the institutional arrangement.

Under state ownership, the bundle of property rights were clearly defined, however, they failed to acknowledge Whanganui Iwi’s proprietary rights and interests in the river. Further, although they were clearly defined, not all actors operating within the institutional system observed the rights – this caused the system to break down. For this reason, despite their demarcation, the rights failed to have legitimacy amongst actors at the operational level leading to the institutional equilibrium being unstable.

The new arrangement potentially addresses these shortfalls. First, by identifying Te Awa Tupua as an interconnected whole, it identifies the boundary of the catchment as the boundary of the resource system. All actors are required to refer to the proposed strategy document and the values of Tupua te Kawa when making decisions around use. This has the potential to create strong linkages between actors and identify a common focal unit for management that was lacking under the state ownership model.

Second, the new arrangement acknowledges Iwi’s relationship with the river and recognises that Iwi never willingly relinquished rights to control or ‘ownership’ of the riverbed. Subsequently, under resource self-determination property rights to ownership of the riverbed will be shifted away from the Crown and vested in the river itself. These legal property rights are quite clear; however, the economic property rights to management, exclusion, alienation, access, and withdrawal, are less clearly defined.

As discussed in chapter five, initially the rights to management, exclusion, and alienation are to remain with local authorities. Over time, however, it is expected that Te Pou Tupua will take on more decision-making responsibility,
making governance choices in the interests of Te Awa Tupua’s health and wellbeing. This variability in decision-making responsibility and lack of definition could potentially create some uncertainty around future property rights, ultimately transferring decision-making responsibility to the courts if agreement cannot be reached by negotiating parties. This could weaken the ability of the new arrangement to meet Principle 1B in the case of the Whanganui River.

8.1.2 Principle 2A&B: Congruence between appropriation and provision rules and local conditions

Ostrom’s (1990, p.92) second design principle refers to the “congruence between appropriation and provision rules and local conditions.” Appropriation rules are considered to be rules, which restrict the time, place, technology and/or quantity of resource units able to be used. Provision rules refer to the labour, materials and/or money needed to maintain resource systems over time. Like the first principle, this principle can be divided into two separate elements: first, that both appropriation and provision rules conform in some way to local conditions, and second, that congruence exists between appropriation and provision rules.

Under state ownership, the governance system was designed as a top-down arrangement where actors at the constitutional and policy levels made rules to shape the choices of actors at the operational level. Although efforts were made at the upper and lower policy levels to account for indigenous worldviews, Māori were traditionally considered stakeholders and not actively included in the decision-making process. In the case of the Whanganui, there was a poor fit between the formal rules that were imposed on users such as Iwi and Iwi’s collective beliefs.

The Whanganui River institutional arrangement isn’t unique in facing this issue of a lack of congruence between formal and informal rules. Other authors have highlighted the negative consequences that result when externally imposed rules do not match local customs and livelihood strategies (Gautam and Shivatoki 2005; Greif 2006). Compared with other cases across New Zealand, however, the
disparity between the demands of the operational level actors in the Whanganui and the state ownership rules imposed by actors at the upper levels of the institutional arrangement was more pronounced. Iwi’s contention over ownership and control of the river was relentless, and significantly more consistent than that displayed by other iwi across New Zealand who had similar property rights issues (Waitangi Tribunal 1999; 2012). As found in chapter eight, this continued disruption to the institutional arrangement was a major contributor to the eventual breakdown in the institutional equilibrium.

The new institutional arrangement has been specifically designed to accommodate local conditions. The objective of adopting resource self-determination in the case of the Whanganui River is to incorporate Whanganui Iwi’s beliefs into existing legal frameworks. Under the new property rights system, all decisions over use of Te Awa Tupua remain the responsibility of local authorities, yet are to be made in light of the new Te Awa Tupua strategy and Tupua te Kawa, which capture Māori tikanga and te ao values. This creates consistency between the two property rights settings and will smooth the transition to resource self-determination. Overall, the adoption of resource self-determination shifts the institutional arrangement from a top-down to a bottom-up system by principally transferring the responsibility of developing a catchment management strategy to actors at the operational level.

Congruence between appropriation and provision rules is frequently described in the literature as congruence between costs incurred by users and the benefits they receive from participating in the institutional arrangement (Fennell 2011; McGinnis 2011a). Under state ownership the cost of decisions made over use of the river by actors at the constitutional and policy levels were borne by actors at the operational level, while the benefits accrued to the upper level actors or actors outside of the institutional arrangement governing the Whanganui River. For instance, in the case of Genesis and the TPDS, policy and constitutional level actors made decisions over use, with benefits channeled back towards these
decision-making and wider society. Actors at the operational level, however, carried the cost burden of diversion and reduced flow.

Under resource self-determination, the distribution of costs and benefits is unclear. A risk assessment carried out on the new arrangement stated that preliminary work by Whanganui Iwi, Crown agencies, and local authorities is being undertaken to identify and assess costs associated with the framework, including who is likely to bear the cost burden (Office of Treaty Settlements 2016). The results found in this research suggest that the level of transaction costs may increase under resource self-determination, however, it is important to remember, that benefits may also increase and that it is the overall net benefits, which are most important (Krutilla & Krause 2011; McCann et al. 2005).

The Te Pā Auroa framework has emerged from a long period of negotiation between the Crown and Iwi and has been formalised through consultation with local government and relevant Crown agencies. As revealed in the interviews, Genesis Energy Limited, who could be viewed as a potential driver of increased future costs, has a well-established and ongoing relationship with Whanganui Iwi, and both it and local government have expressed their support for the settlement and what it seeks to achieve (Office of Treaty Settlements 2016).

Further, as one Ministry official stated, the Te Awa Tupua framework should be thought of as a community initiative rather than an environmental one so that the benefits of a community focused and collaborative approach could be captured by the new arrangement. Important to note, however, is that if resource self-determination is going to develop into a robust community based property rights system, actors at the operational level will need to receive the benefits of using Te Awa Tupua, as well as bearing the costs.

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152 These benefits can be viewed in two ways. First, because Genesis is a majority share state-owned enterprise, revenue from electricity sold by Genesis returns to the Crown enabling it to accrue benefits from Genesis diverting water from the Whanganui. Second, all New Zealanders who vote for actors at the policy and constitutional levels share the benefits of electricity production, thereby, lower electricity costs benefit actors at the upper levels of the institutional arrangement through voter preference and actors at lower levels directly through lower energy prices.

153 No details of the methodology proposed to be used for assessing the distribution of costs and benefits by the Office of Treaty Settlements is provided in the risk assessment.
8.1.3 Principle 3: Collective-choice arrangements

For principle three to be present in the institutional arrangement implies that “most individuals affected by the operational rules can participate in modifying the operational rules” (Ostrom 1990, p.90). That this condition was not met under state ownership was one of the key issues of the property rights arrangement in the case of the Whanganui. In contrast, resource self-determination and the supporting institutional framework should allow for representative users to engage in decision-making by contributing to the development of the strategy document and its ongoing review. That this document has to be referred to by all decision-makers at the upper levels of the institutional arrangement means that indirectly most individuals affected by the operational rules can participate in modifying such rules through their nominated representatives on the strategy group committee.

8.1.4 Principle 4A&B: Monitoring

The principle of monitoring also gets split into two components so that Principle 4A stipulates the presence of monitors, whereas 4B stipulates the condition that these monitors are members of the community or otherwise accountable to those members. As has been shown experimentally and in the field, the presence of monitors and monitoring can have a significant impact on levels of cooperation (Ostrom et al. 1994; Ostrom et al. 1992; Rudd 2004). Under the state ownership property rights system the responsibility of monitoring falls across multiple jurisdictions depending on the resource being monitored. For instance, monitoring of water quality is the responsibility of Horizons Regional Council under the RMA. Horizons has three monitoring sites along the river, all of which state water quality is satisfactory or better (Horizons Regional Council 2016a). Monitoring of customary food gathering is the responsibility of the Ministry of Primary Industries, which relies on users to disclose harvest; Fish and Game has staff monitoring hunters and fishers; and DOC staff monitor recreationists using the river.

In each case these monitors cannot be considered members of the community as they rest at the policy level of the institutional arrangement. This could help
explain why monitoring success is generally rated as poor in the Whanganui-Manawatu region (McBride et al. 2016).

Under resource self-determination, unless specified in the strategy document, there is unlikely to be a change in how resource use is monitored or who undertakes the monitoring, at least initially. Should Te Awa Tupua take over more decision-making responsibility over time, the fact that the existing legislative frameworks are expected to remain in place, implies that, even in the long-run, there should be few changes to those responsible for monitoring and whether or not they are members of the community.

8.1.5 Principle 5: Graduated sanctions

Principle five stipulates the efficacy of graduated sanctioning systems. Sanctioning deters actors from violating rules and imposing costs on others (Anderies et al. 2004; Cox et al. 2010; Dietz et al. 2003; Gürerk et al. 2006), but ensuring that the type and level of sanction suitably matches the violation is necessary to foster cooperation (Frey 1993; Gneezy & Rustichini 2000). For instance, when fines are set too low, actors often choose to continue to violate the rules in spite of the costs imposed (Gneezy & Rustichini 2000), similarly, when the sanctions are too high, actors can retaliate, increasing costs for the institutional arrangement as a whole (Cox et al. 2010; Guala 2012; Milinski & Rockenbach 2012; Tyran & Feld 2006). Further, in some instances the presence of a fine can crowd-out intrinsic motivations or social norms which may otherwise encourage cooperation (Bohnet et al. 2006; Bowles 2008; Bowles 2014; Cardenas et al. 2000; Reeson & Tisdell 2008). Subsequently, developing a graduated sanctioning system that matches the severity of encroachment and reinforces informal rules is central to the development of a robust property rights system.

In the case of the Whanganui River governance arrangement Horizons specifies graduated sanctions for rule violations in the One Plan, however, its enforcement record is poor (McBride et al. 2016). This is a common problem across New Zealand, with lack of capacity and rent-seeking often proffered as reasons for the
low levels of sanctioning by local authorities (Brown et al. 2016). Under resource self-determination, there is no evidence to suggest that the responsibility of monitoring and enforcement will shift away from local authorities, however, the strategies and guidelines they are to adopt and follow may change depending on what is stipulated in the strategy document, Te Heke. Therefore, much will again depend on the outcome of the strategy document to determine if any changes to sanctioning are likely to take place to allow for principle five to be met.

8.1.6 Principle 6: Conflict-resolution mechanisms

In line with transaction cost economics, low cost dispute resolution is preferred to high-cost processes. Successful institutional arrangements have rapid, low-cost mechanisms to resolve conflict among users or between users and officials (Johnson 1992; Ostrom 1990). Under state ownership conflict could be resolved through formal consultation avenues and then legislative adjustment. As demonstrated in chapter seven, when consultative mechanisms were incapable of resolving issues, formal challenges took place through the courts. Should decision-making authority be transferred to Te Pou Tupua under resource self-determination, bargaining over use will take place between Te Pou Tupua and potential users with conflicts resolved by the judiciary. The discussion in chapter five suggested that this has the potential to increase costs under some circumstances, which could reduce the robustness of the institutional arrangement in the long-run.

8.1.7 Principle 7: Minimum recognition of rights

Principle seven stipulates that external government agencies do not challenge the right of local users to create their own institutions. Under state ownership decision-making responsibility was devolved to local government under the RMA and Local Government Act 2002 with guidance provided by central government. Local users at the operational level had little influence over how the river was governed. The introduction of resource self-determination will shift the arrangement from a top-down to a bottom-up system. Through Te Heke representative users will contribute to the design of the new rules governing the
Whanganui River and its catchment. The legitimacy of Te Awa Tupua’s rights and in turn those of Te Pou Tupua will depend on whether or not other actors within the institutional arrangement and outside of it will observe those rights.

The time at which this will be tested is likely to be when Genesis Energy Ltd’s consent for water take comes up for renewal in 2039, if it is not challenged before. Assuming the dam is still diverting water from the Whanganui in 20 years, a bid for a renewal of Genesis’ right to take may pit the interests of the river against the interest of electricity consumers. As previously mentioned, the Whanganui River headwaters deliver 5% of New Zealand’s electricity (Office of Treaty Settlements 2016); however, the diversion and mixing of the waters is an affront to Whanganui Iwi and the river’s mana (Waitangi Tribunal 1999). Should the enforcement decision be transferred to the judiciary, the decision of the court to uphold Te Awa Tupua’s rights or otherwise will determine if this principle is met.

8.1.8 Principle 8: Nested enterprises

Principle eight captures the concept of polycentrism within the design principles suggesting that in successful systems “governance activities are organised in multiple layers of nested enterprises” (Ostrom 1990, p.90). Under both state ownership and resource self-determination, smaller-scale systems were, and are, designed to be nested in ever-larger systems. In the case of state ownership, linkages between actors within and across the institution were well established, although not always in-use.154 The implementation of resource self-determination is intended to complement, rather than override, existing legislation. This analysis has shown that existing institutional and statutory frameworks are to remain in place, but will be influenced by the Te Awa Tupua ‘lens’ provided by the new framework. That ‘lens’ is designed to change how decision-makers and others view and understand the river, rather than hardwire prescriptive change.

154 This was clear in the history of the interactions of local authorities and Iwi, for instance.
8.2 Discussion

The first five of Ostrom’s design principles form a coherent theoretical explanation of why these criteria are important for the development of robust property rights systems:

“When the users of a resource design their own rules (design principle 3) that are enforced by local users or accountable to them (design principle 4) using graduated sanctions (design principle 5) that clearly define who has rights to withdraw from a well-defined resource (design principle 1) and that effectively assign costs proportionate to benefits (design principle 2), collective action and monitoring problems tend to be solved in a reinforcing manner.” (Ostrom 2005, p.267).

Principle six is connected to principle five, while principles seven and eight were included as predictors of the likely success of an institutional arrangement in light of how it nests within broader frameworks (Ostrom 1990).

It is clear from the analysis above that the designation of resource self-determination will allow for many of the characteristics stipulated as necessary for sustained, long-term property rights institutions to be identified in the case of the Whanganui River. Some of the biggest changes occurring as a result of the institutional change relate to design principles one and three, which refer to the identification of boundaries and collective choice arrangements. That the new resource self-determination framework for the Whanganui River allows for the identification of a clear boundary around the catchment will allow for the development of a management strategy, which focuses on the catchment as a whole rather than on fragments of the river system at a time. This has the potential to improve conservation outcomes for the catchment due to catchment-style management being recognised as the most effective approach to

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155 That several of these principles were not met under centralised ownership is in some way no surprise given that the design principles were identified to help explain robust community based collective action arrangements. However, as evidenced by the broader governance literature, these principles are characteristics of a broad range of long-lasting property rights systems – not just community based initiatives (Huntjens et al. 2012).
river management in most cases (Ching & Mukherjee 2015; Davis & Threlfall 2009; Kemper et al. 2007; McNeill 2016; Schiele 2015).

Likewise, that the local community is able to contribute to decisions over management under the new institutional arrangement presents an opportunity for the governance system to transform into a bottom-up arrangement in which the users are able to develop a sense of ownership over the river and its catchment. Inextricably linked to this is principle seven, however, which requires that upper level actors do not interfere with decisions made at the lower levels of the institutional arrangement. This factor is critical factor in determining whether resource self-determination is able to become something more than a paper policy in the case of the Whanganui River.

Tying in the findings of chapter six, which found that levels of transaction costs are likely to increase under resource self-determination in situations where negotiations occur over use. The analysis here suggests that in the case of the Whanganui River, the broader institutional framework devised to support the new property rights arrangement could mitigate some of these effects. For instance, including existing and future users in the strategy group may allow a range of perspectives and preferences to be accounted for in early stages of decision-making – something which is recognised as contributing to improved outcomes in the long-term (Giest & Howlett 2014).

Much will depend on the guidelines provided in the strategy document, Te Heke, and the strength of the relationships created between different actors across and within different levels of the institutional arrangement (McNeill 2016). Te Heke must outline clear strategies through which different institutional actors can facilitate the development of social capital including the development of trust and reciprocity (Cox 2004; Fehr & Gachter 2000; Giest & Howlett 2014; Lejano et al. 2014). The strategy document must also provide clear guidelines for users and managers concerning use and management of Te Awa Tupua given its new status. Doing so will minimise the likelihood of future conflict when consents,
such as that held by Genesis, come up for renewal, and ensure the rights have legitimacy in front of the courts.

Should clear guidance be provided for by Te Heke for the management of the catchment and legitimacy granted to all rights holders (both legal and economic), resource self-determination has the potential to be a robust institutional arrangement for governance of the Whanganui River. The generalizability of these findings to other rivers, is discussed in the following chapter.

### 8.3 Conclusions

Ostrom’s design principles have been shown to be useful tools to help assess the robustness of various property rights systems (Cox et al. 2010). They can provide insights to policy makers about the likely efficacy of different regimes (Lejano et al. 2014) and help inform policy decisions ex ante (Huntjens et al. 2012). Initial indicators from this analysis suggest that more of Ostrom’s design principles could be met under the new framework than were met under the old framework in the case of the Whanganui River. This suggests that resource self-determination could be a more robust institutional arrangement for governing the Whanganui River over the long term than state ownership.

However, this analysis makes clear that some central areas of the framework remain uncertain and undetermined, particularly in terms of the congruence between appropriation and provision rules and the recognition of rights. Further, the transfer of decision-making from the jurisdiction of the legislature to the judiciary may have costs for society as a whole in the long-run, which could be detrimental to the robustness of the arrangement. Therefore, as actors within the institutional arrangement move to develop pragmatic strategies for implementing the new Te Pā Auroa framework, they’d do well to heed the necessary, but not sufficient conditions, of Ostrom’s principles (Agrawal 2001; Lejano et al. 2014; Ostrom 2007). Doing so will help ensure that the rules established as part of the framework support the development of a robust
property rights arrangement for governing the Whanganui River and its catchment communities.
9 Conclusions

9.0 Introduction

In this chapter the results presented in the preceding chapters are discussed in terms of policy significance, limitations, and future research. Recommendations for policy makers interested in using resource self-determination as an alternative property rights system for the governance of CPRs are offered in the final conclusions. The study’s findings, which consider the institutional economic effects of granting a river legal standing, are significant for the development of environmental policy and natural resource management generally. However, the conclusions drawn should be regarded with some caution due to the limitations associated with this research. In this chapter, these limitations are discussed in detail and suggestions offered for how some of these limitations can be addressed in future research. The findings offer many interesting, challenging, and exciting potential developments for further research – some of which are outlined in this chapter.

The chapter is structured as follows. Section one examines the policy implications of the thesis’s results for the governance of rivers and common property resources generally. Section two discusses the limitations of this research in terms of the research design, methodology, and general limitations. Section three outlines some potential directions for further research. A final conclusion to the thesis, which includes recommendations and gentle words of caution for policy makers interested in replicating the approach, is presented in section four.
9.1 Policy implications

The research has examined the institutional economics of granting a river legal standing. The first general research question outlined in chapter three posed the question of how resource self-determination will affect the distribution of property rights in an institutional arrangement designed to govern a river. The results of the institutional analysis showed that in the case of the Whanganui River, resource self-determination is being implemented through identifying Te Awa Tupua as a new legal entity and vesting legal property rights to the riverbed in it. The new arrangement is to be carefully integrated into existing frameworks in two stages. Initially, there are few changes in economic property rights with local authorities retaining daily decision-making authority. Over time, however, more decision-making responsibility and control may be transferred to the guardians, shifting the priorities and preference structure of the primary decision-maker.

If property rights are eventually transferred to Te Pou Tupua as is implied in the settlement document, *Ruruku Whakatupua* and the Te Awa Tupua (Whanganui River Claims Settlement) Act 2017, results from the evaluation of the institutional analysis in chapter six suggest that the redistribution of property rights could affect levels of transaction costs and resource allocation. The legislative mandate of Te Pou Tupua instructs the two appointed guardians to make choices to the benefit of Te Awa Tupua. That this mandate differs from that of the RMA could cause tension at a regional and national level as decision-making priorities shift. This is likely to be tested when major water extraction consents, like that held by Genesis Energy Limited, come up for renewal.

The findings of chapter six also highlighted that policy makers interested in changing property rights systems cannot estimate the likely economic and environmental effects independently of historical context. It was shown in chapter seven that Whanganui Iwi did not relinquish their beliefs despite being forced into the new institutional setting and the results of chapter six provided evidence to support this. In the case of the Whanganui River, it could mean that
actors who had previously been cut out of decision-making could become more self-regarding when suddenly endowed with property rights.

In the context of environmental policy this suggests that policy makers interested in introducing resource self-determination as an alternative property rights arrangement should consider the historical context of the environmental good or resource they wish to manage. Laws that are compatible with preexisting social norms are more likely to be well received and thus effectuated than laws that are poorly integrated with informal rules (Sunstein 1996).

Further, institutional settings that encourage an internal process of evolution and generate a self-sustaining demand for innovation, tend to perform much better than those in which the majority of rules are imposed on actors operating within the institutional system (Berkowitz 2003b). The results of chapter seven, for instance, showed that when a set of foreign informal rules were imposed on Iwi following European arrival, as a minority group Iwi destabilised the institutional equilibrium through repeatedly challenging the formal rules in court in an effort to affect change. This means that although from the outside, the property rights change appears to be a dramatic shift in beliefs and rules, the dynamic analysis showed that it was an evolutionary process driven by a combination of slowly evolving beliefs and exogenous shocks. This increases the likelihood that the property rights arrangement will be robust over the long-run.

The results of each analysis showed that in the case of the Whanganui River, the introduction of resource self-determination is a result of a range of interacting contextual variables. Because of this the replicability and generalisability of the results may be reduced; however, useful lessons can be taken from the broader institutional framework designed to support the redistribution of property rights under resource self-determination. As demonstrated in chapter eight, the case of the Whanganui River shows that it is possible to design a robust property rights system that bridges two contrasting worldviews. This could be of special significance to policy makers working with indigenous populations over contested environmental goods and resources. In the case of the Whanganui
River, the Crown and Iwi navigated the complexities of ownership of a common property resource by exploring Whanganui Iwi’s relationship with the river and creating a new property rights system that was able to approximate Iwi beliefs within existing legal frameworks. It proposes to manage the catchment in its entirety through an integrated framework that places *te ao Māori* values at its core. This has the potential to address some of the institutional weaknesses of the existing state ownership system.\(^{156}\)

Under resource self-determination development of the catchment management strategy and direction for decision-making is to be transferred to the operational level of the institutional arrangement. This creates opportunities for users to take ownership over decision-making and to ensure congruence between appropriation and provision rules.\(^{157}\) That the legislation was introduced at the upper policy level grants the arrangement legitimacy and provides an overarching framework in which all actors understand their roles and corresponding duties and responsibilities. Capacity has been provided through financial redress and trust is expected to develop over time through repeated strategic interactions (Axelrod 1984) and ongoing investment in social capital (Bowles & Gintis 2002).

Where property rights systems have been introduced elsewhere, empirical and theoretical results suggest that the resilience and robustness of property rights systems are dependent on a range of factors captured by Ostrom’s design principles (Cox et al. 2010). What this research shows, is that these lessons can be incorporated into the design of a range of policy and property rights systems to the possible net benefit of social, economic, and environmental outcomes.

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\(^{156}\) As a reminder, although rights to water are purposefully excluded from the transfer of ownership in the new framework, under English common law, title to the surface of land such as a riverbed entails proprietary authority to the space occupied by the water column, the superjacent air space to a reasonable height, and the space comprising the soils beneath the bed of the river. This creates space for negotiations over water to be affected by the property rights change and the new arrangement to treat the river as an integrated whole.

\(^{157}\) Important to note here is that allowing for local or community-based management does not always translate to the delivery of social net benefits. Ensuring that resource self-determination will achieve the objectives of the designated policy is a necessary consideration for policy makers interested in adopting resource self-determination.
9.2 Limitations of the research

Every research project has constraints. Some can be navigated and overcome; others place a clear boundary around the nature of the research conducted and the conclusions that can be drawn from it. As with all research that tries to create links between multiple disciplines and between empirical observations and complex theoretical questions, there are a number of significant limitations to this research. These limitations have been grouped in terms of those associated with the design process, those associated with the methodology, and general limitations.

9.2.1 Limitations associated with the research design

The design adopted for this research follows in the theoretical tradition of institutional economics. By bringing together the Bloomington School of institutional analysis and transaction cost economics it recognises that a combination of inductive and deductive reasoning leads to a stronger understanding of the commons (Agrawal 2014), that people are boundedly rational (Ostrom 1990; Williamson 2000), and that institutions are a result of both purposeful construction and endogenous evolution (Greif and Kingston 2011). A number of limitations associated with the research design of this project need to be acknowledged, however, including the limitations of examining a single case, the use of laboratory experiments, and the identification of criteria for evaluating institutional effectiveness.

First, as discussed in section 4.1, the case of the Whanganui River was selected because it offered a rare example of the application of resource self-determination to a river system. The advantage of examining this case is that by comparing the institutional arrangements before and after the property rights change and the process leading up to the identification of resource self-determination multiple observations within an individual case could be made.

Focusing on the Whanganui River also allowed for an ex ante examination of the proposed application of a new property rights arrangement – an acknowledged
gap in the literature. This research addressed this gap while simultaneously creating a record of attitudes and expectations of actors prior to the implementation of resource self-determination, which could be used for future ex post comparisons. This created some challenges in the data collection process as some actors held reservations about disclosing information before the enabling legislation was passed. The result of this is that some perspectives may not be as strongly represented in this thesis as others and indigenous methodologies are poorly utilised (Smith 2012).

Following a comprehensive literature review, general research questions were formed and the most suitable methods for answering them identified. The IAD framework provided a strong basis for examining how resource self-determination will be applied to the Whanganui River (Aligica 2006; Cole 2014). It also created some limitations, however, such as those discussed in section 3.2.1. Although some of these, such as the inability of the framework to capture ecological and resource characteristics of a system (Cole et al. 2014; Lejano et al. 2014; Ostrom & Cox 2010), can limit the framework’s applicability in some analytical cases, the IAD framework was considered the most suitable for guiding this analysis. This choice was made because the central focus of analysis was the outcomes generated by the interaction of actors under different rule settings, which the IAD framework is able to capture sufficiently.

As with all types of policy design, how alternative policies affect participants’ behaviours must be considered. Therefore, the institutional analysis was used to generate hypotheses to determine the environmental and economic effects of the new institutional arrangement. Testing these hypotheses required making a decision about how to best measure the effects of such change. There are several potential candidates for evaluative criteria, which can include economic efficiency, fiscal equivalence, distributional equity, accountability, conformance to general morality, and adaptability (Polski and Ostrom 1999). However, based on their complementary theoretical grounding, the concepts of transaction costs, resource allocation, and Ostrom’s design principles were selected as the most suitable measures for determining the institutional economic effects of granting
a river legal standing (Cole 2014). The omission of other measures provides opportunities for future research.

The question raised by the second research question and the hypotheses generated by the institutional analysis were first tested in the laboratory. An alternative approach would have been to carry out a field experiment or to conduct a survey or non-market valuation study to quantify actors’ expectations of transaction costs and resource distribution. The advantage of taking an experimental approach over a survey was that it provided an opportunity for peoples’ strategic behaviour under the two property rights settings to be examined and compared. Further, that people also received monetary rewards for their choices, theoretically incentivises them to respond to questions honestly and not over or understate their preferences (Smith 2010).  

Analyses testing the results of experiments with observations made in real-life have generally upheld the results found in the lab (Falk & Heckman 2009; Janssen et al. 2010; Ostrom 2006; Tisdell et al. 2004; Ward et al. 2006).

Carrying out the experiment in the laboratory was a more cost-effective alternative to administering the same experiment in the field. As discovered through this research, however, there are clear limitations to experimental processes; most notably, the difficulties associated with capturing the nuances of an institutional arrangement (Anderies et al. 2011; Dreber et al. 2012; Vatn 2009). In addition, experiments can only answer very tight questions, which often constrains the insight that can be gathered about why people make the decisions that they do (Anderies et al. 2011). For these reasons, complementing the experimental evaluation with a contextual evaluation of the changing institutional arrangements strengthened the conclusions of the case study analysis.

Finally, understanding how and why resource self-determination was selected as an alternative arrangement for governing the Whanganui River were useful

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158 Important to consider here is also the counter argument that paying respondents may give them an incentive to strategise on the basis of the payment. If this payment was not entirely linked to their own utility then answers could be biased.
complementary questions that allowed for the development of a new framework for analysing institutional change from within the Bloomington tradition and shine light on the processes behind the adoption of resource self-determination in the Whanganui River context. In New Zealand, water quality is declining, across the country and in some regions water scarcity is a growing issue (Ministry for the Environment & Statistics New Zealand 2017). In light of this, why was resource self-determination proposed for the governance of the Whanganui River but not for other rivers? Answering this question required an in-depth causal examination of the historical context leading up to the adoption of resource self-determination. As Howard Becker explains:

“To understand an individual’s behaviour, we must know how he perceives the situation, the obstacles he believed he had to face, the alternatives he saw opening up to him” (Becker 1970, p.64).

Identifying the institutional factors central to the identification of resource self-determination in the Whanganui River case provided an opportunity to make an empirical and methodological contribution to the literature. Institutional theory proffers several complementary mechanisms for explaining institutional change but a dynamic framework is not available for analysis of the diachronic components of institutions within the Bloomington tradition. An obvious limitation of designing an alternate frame is that there is no certainty that it will hold for other cases. This is an additional opportunity for future research.

9.2.2 Limitations associated with the methodology
For each section of this study some limitations associated with data collection and analysis are evident. The use of in-depth interviews creates opportunities for gathering insights not able to be garnered using a survey, however, drawbacks include the fact that they are time consuming, costly, and physically demanding to the interviewer (Bewley 2002). Interview subjects may have also chosen to be selective in their responses to suit their personal or political purposes (Robinson 2014). Further, specific to this research, by promising not to
broach sensitive subjects, the scope of the information gathered was limited and the use of intermediaries to identify subjects made random sampling impossible.

There are several ways these qualitative data limitations were addressed to ensure legitimacy and validity was still given to the analysis. First, because multiple sources of evidence were used in the qualitative part of this analysis, alternative perspectives could be gathered by document and archival research. These perspectives were then discussed with interview subjects, who then confirmed or corrected my interpretation of the data. Likewise, the responses given by subjects were always confirmed and checked across multiple data sources whenever possible. In cases where external sources could not be used for validation because the subject area was so new, subjects’ responses were repeated anonymously to multiple interview subjects to confirm whether a particular comment or idea could be upheld. This provided the data with internal and external validity. Second, during the analysis, data from multiple sources were coded and thematically ordered to allow for patterns to be identified across all types of evidence and explanations constructed. Third, in the comparative case study, replication logic was adopted which provided the research design with external validity. Finally, the research design, modeled on standard case study procedure (Yin 2014) and standing on the shoulders of 40 years of common pool resource research (Araral 2014; Janssen 2015; Lejano et al. 2014; Poteete & Ostrom 2008; Poteete et al. 2010), was designed with the explicit purpose of minimising errors and biases in the study.

Limitations were also present in the experimental design, which was an approximation of the institutional setting. Designing a clean experiment that could give useful insights into the effects of resource self-determination, while still capturing enough of the institutional setting governing the Whanganui River, was complex. The challenge was to create an experimental design that suitably balanced control and context while simultaneously engendering confidence that participants were motivated to make the choices that they did for the reasons anticipated. Initial plans to examine the problem from a collective action
perspective proved too messy and thus building on the existing bargaining and property rights literature became the focus.

In forming and testing hypotheses some of the formal axioms of game theory were used and some of the common experimental assumptions adopted. These included the notion that players engage in backward induction, that there is an independence of history and future, that players have complete information and are self-regarding, and that neither context nor from whom players receive payment matters (Smith 2010). However, it is unlikely that players in economic experiments or in real life make decisions aligning with all of these assumptions and therefore care needs to be taken in interpreting and generalising from the experimental results.

Further, specific to this experimental design the structure of the payoffs meant that the results of part one of the experiment were not unexpected. What were more surprising were the findings of part two that suggested that the assumption of independence of history and future did not hold. That others have found similar results adds support to this finding (Bednar et al. 2015; Rommel 2014). This finding simultaneously upholds the results of the diachronic analysis in chapter seven, which shows that actors placed in a new institutional equilibrium continue to be shaped by their previous experiences and beliefs.

9.2.3 General limitations

A particular difficulty of studying institutions is their ongoing definitional and theoretical ambiguities. This research aimed to navigate these complexities by choosing a definition of institutions and institutional change that was suitable for the study proposed and consistent with the literature. In saying this, however, there is potential that a different set of definitions of institutions could have caused a different set of conclusions to be reached. This creates an opportunity for future research.

This thesis also examined what could easily be considered a legal question through an economic lens. This means that there are significant questions that
this research has not addressed, such as what happens when the river can sue and be sued. An interesting opportunity is to examine whether the findings of this thesis are transferrable across disciplines and whether legal scholars reach similar conclusions in terms of the relative merits of resource self-determination.

Finally, findings are not always transferable across contexts. Even within New Zealand itself, interview subjects warned repeatedly against generalising from the case of the Whanganui River to hypothesise about the effects of resource self-determination on water governance nationally. The Te Awa Tupua (Whanganui River Claims Settlement) Act 2017 was designed to meet the needs of both Whanganui Iwi and the Crown and was identified as a way of navigating long-standing ownership concerns and uphold the mana of the Iwi and the river. It was not designed as a precedent or a model to be used more widely across the country.

In saying that, however, it is already clear that across New Zealand and globally there is real interest in the steps taken to grant the Whanganui River legal standing and in finding ways to apply resource self-determination to other river systems and CPRs. As discussed, Te Urewera National Park in New Zealand was recognised as a legal person in 2014 and some interview subjects alluded to the possibility that parts of the approach could be replicated to navigate other Treaty claims in New Zealand. Two possible future applications include the granting of resource self-determination to sacred mountaintops, and other specific rivers, such as the Mohaka River, in New Zealand’s Hawkes Bay. Internationally, five days following the Whanganui River announcement, the Ganges and Yamuna Rivers were also granted legal standing, as well as parts of the Himalayas – both cases cited the Whanganui River as inspiration for the decision.

In light of this, it may be better to think that the limitations discussed are less constraints and more opportunities. One of the positive elements of conducting research on a completely new topic is that, although the boundaries drawn
around the research seem to create more holes with each attempt, these holes stand as openings for future analysis. This is now discussed.

9.3 Further research

This research has the potential to lead to a number of promising areas for future study. These have been categorised into further research extending the method and further research with respect to resource self-determination.

9.3.1 Further research: Using the analytical approach

The ex ante study of policy decisions and property rights systems was identified as a gap in the literature. This thesis highlights that ex ante analysis of new property rights systems is a feasible approach to analysis and it demonstrates that it is an approach to research that could be undertaken more frequently to the benefit of policy outcomes (Palmer 2015; Giest & Howlett 2014; Ward et al. 2008). In such cases, economic experiments can be a useful and cost-effective way to quantify the potential effects of institutional change, with the potential to better inform policy makers of the respective costs and benefits of undertaking a systems change (Janssen et al. 2010; Ostrom 2006). Replicating this methodology to understand the likely implications of other proposed policy changes ex ante could be a useful opportunity for future research.

As part of this research a new framework was developed, which offers a way to examine the diachronic nature of institutions within the Bloomington tradition. By bringing together the rules-of-the-game approach and the equilibrium view of institutions it highlights the complementarity between the rules-of-the-game and institutions-as-equilibria approaches for understanding institutions and institutional change (Greif & Kingston 2011; Hindriks & Guala 2014; 2015). In the spirit of the IAD, the new framework encourages the researcher to identify key variables and parameters of institutional change and to look for exogenous variables, which could trigger a shift in institutional equilibrium. Treating rules as endogenous rather than exogenous allows for institutional change to be
examined as an evolving process that can be driven forward by individual
decision-making. Next steps will involve testing the framework in other
historical settings to determine if the dynamic IAD framework consistently
works as a guide for studying institutional change. The strong theoretical
foundations of the framework mean that it should; whether it will though is what
future studies can ascertain.

9.3.2 Further research: The study of resource self-determination
The identification of resource self-determination opens up new opportunities for
research within the common property resource and institutions literature. It is
one of the most innovative advances in resource management over the past
decade and, as indicated by the levels of interest shown by decision-makers
globally, after its slow start, the use of resource self-determination as an
alternative property rights arrangement is only likely to increase.

In terms of research, the most obvious opportunities include undertaking
broader comparative work across scales and time. Notable comparative cases
include the granting of legal rights to nature in Ecuador, Bolivia, Te Urewera in
New Zealand, and various US municipalities. In addition, in April 2017, the
Ganges and Yamuna Rivers in India were also granted legal standing, offering
additional cases for future comparative work. Such comparisons will allow for
contrasts to be identified across scales and across different resource types.
Opportunities also exist to make comparisons of the Whanganui River
institutional arrangement ex post. This study has provided a comprehensive
assessment of the institutional environment preceding the identification of
resource self-determination including offering insights into actors' expectations
of future institutional change. Comparing these expectations with observations
made in the coming decades will be an interesting source of future work.

There are also opportunities to examine resource self-determination through
different disciplinary lenses such as law and anthropology, sociology and

159 In Mohd. Salim v State of Uttarakhand & others [2017] PIC 126. Available at:
political science. This will strengthen our understanding of the circumstances in which resource self-determination could be a robust alternative property rights arrangement for the governance of common pool resources and public goods.

It is also potentially useful to think about how resource self-determination could work with other institutional arrangements, such as environmental markets. Taking the case of a river again, could the concepts of a water market be integrated with resource self-determination? Could this be an alternative mechanism for providing for instream flow or does the presence of one system preclude the other? Likewise, how would resource self-determination work with a piece of legislation like the US Endangered Species Act or the Public Trust Doctrine? New Zealand has a relatively flexible legislative setting, examining whether a more sticky institutional setting would support the granting of common property resources legal standing, is a sensible area for future research.

Finally, by demonstrating how alternative sets of beliefs can be brought together in a single framework, this study also lays the groundwork for further study on the effects of institutions on beliefs. Beliefs are widely recognised as influencing the development of institutions; yet, we still have insufficient insight into the coevolution of beliefs and institutions. Providing insight into this relationship will improve decision-makers’ ability to craft resilient solutions to society’s most intractable environmental problems, including how to best coordinate decision-making within the nexus and the potential benefits associated with incorporating indigenous worldviews into western legal systems.

**9.4 Final comments**

Granting a river legal standing may sound like the stuff of fiction, but the case of the Whanganui River in New Zealand shows that treating a river as a person in law is a viable alternative property rights arrangement for governing common property resources. The findings of this study show that in situations where the payoffs for the river and its representative differ from the payoffs for the existing
decision-maker, the application of resource self-determination is likely to result in a redistribution of water within the system. In situations where high levels of water extraction occur under existing property rights settings, resource self-determination may result in an increase in instream flow as the new decision-makers place more value on ecosystem health and wellbeing. In some cases, this may impose increased costs on property rights holders as they bargain over use.

However, resource self-determination may be a robust property rights arrangement, depending on the objectives of the legislation and the broader framework in which it is embedded. The motivation for applying resource self-determination to the Whanganui River was to navigate ownership concerns and to ameliorate two contrasting worldviews. By integrating the new property rights approach with existing formal and informal rules, the results of this research suggest the new institutional framework could successfully meet the policy objectives. Constraints have been incorporated into the broader framework, which have the potential to mitigate and control for some of the more obvious potential risks and costs of the change, including rent-seeking by the guardians and conflict over competing uses. Further, the new framework will develop in two stages smoothing the transition and potentially enabling the majority of Ostrom’s design principles to be met.

For policy makers interested in replicating the approach, these elements of the broader Te Pā Auroa framework are important to note. If resource self-determination is not complemented by a supportive framework, the transfer of responsibility from the jurisdiction of the legislature to the judiciary could have unintended consequences. For instance, recognising a river as a person will require the political system to find ways and means to deliver and uphold these new legal rights, where necessary at the direction of the courts. Unlike elected officials, judges cannot foresee the consequences of their decrees and rulings, and enforcing the economic right of the river may impact on the economic right of another section or scale of society without due consideration of the effects on efficiency.
Further, although, such a change has the potential to benefit some industries and professionals who stand to gain by providing court-mandated goods and services, it also carries the risk of forcing the court to become politicised. This has the potential to compromise moral authority and public confidence in the system. It also places the responsibility of looking after, and representing, the environmental good or resource in the appointed guardians, rather than elected officials. Without broader institutional and financial support, this means that it is only the wealthy or well-endowed representatives that will be able to challenge decisions and enter costly litigation should the CPR wish to sue or find itself the subject of an individual or class action. In the case of the Whanganui River, a NZD$30 million contestable fund has been created for the purposes of improving Te Awa Tupua’s health and wellbeing, as well as litigation purposes. Without such support, the arrangement would fail to have much legitimacy or power.

In the case of the Whanganui River, an obvious test of the legitimacy of resource self-determination will be when Genesis Energy Limited’s consent for water diversion comes up for renewal in 2039. As discussed, the diverted headwaters of the Whanganui River contribute over 5% of New Zealand’s electricity, potentially pitting the demands of energy consumers against the demands of the river. The results of the experiment conducted as part of this research suggest that in a bargaining situation the new arrangement may cause the allocation of water to shift towards a more equal division between extractive and instream uses, reducing the amount of flow granted to Genesis. However, the results also suggested that given the long-standing omission of the river from decision-making, granting the river and its representatives decision-making power may cause the new guardians to be more self-regarding than if they had not.

160 Only two cases have successfully recognised the rights of nature in Ecuador – a country, which granted all of nature legal rights in 2008 (Daly 2012). Perhaps it is not surprising that the first one was brought against the Provincial Government of Loja on behalf of the Vilcabamba River by two American residents who live part-time in Ecuador. The plaintiffs owned property downstream of a road that was to be widened and that runs past the river. The couple argued on behalf of nature that the new construction was adding debris to the river and thus increasing the likelihood of floods that affected the riverside populations that utilise the river’s resources. Although it is likely that the courts ruling did manage to reduce some erosion into the Vilcabamba River, the greater victory is that the ruling reduced the likelihood of future flooding events affecting land owned by the American couple on which they intended to develop a ‘Garden of Paradise Healing and Retreat Center’ with plots along the river to be sold for between $30,000 and $150,000 (Fish 2013).
previously been cut out of decision-making. This may cause an even more pronounced redistribution of water in the system in the case of the Whanganui River should the courts uphold the guardian’s demands.

Overall, the case of the Whanganui River sets a new precedent for water governance in New Zealand and across the world. It is one of the most significant changes in the area of resource management in the past decade. This research demonstrates that alternative property rights approaches, which challenge the status quo can be robust, and influence institutional economic outcomes. It also shows that treating a river as a person in law is a viable alternative approach for the governance of a river system. However, it also brings attention to the fact that the reason resource self-determination may be successful in delivering on the objectives of the legislation in the case of the Whanganui River is due to the broader institutional framework that embeds the new property rights system into existing legislative structures. For policy makers interested in using resource self-determination as an alternative property rights system for the governance of public goods and common pool resources, the results found and conclusions drawn in this research could help shine light on how this can be done effectively. With any luck this will help reduce the risk of additional costs arising when common property resources, such as rivers, are granted legal standing in the future.


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38.


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*Home Page of Horizons Regional Council*. Available at:


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geography of regulatory science and indigenous knowledges (IK).


Appendix i.

Māori terms used in this thesis

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition/Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aotearoa</td>
<td>land of the long white cloud, New Zealand</td>
</tr>
<tr>
<td>awa</td>
<td>river</td>
</tr>
<tr>
<td>hapū</td>
<td>sub-tribe</td>
</tr>
<tr>
<td>ihi</td>
<td>power</td>
</tr>
<tr>
<td>iwi</td>
<td>tribe, such as Whanganui Iwi</td>
</tr>
<tr>
<td>kāinga</td>
<td>villages</td>
</tr>
<tr>
<td>kaitiaki</td>
<td>guardian, caretaker</td>
</tr>
<tr>
<td>kaitiakitanga</td>
<td>guardianship, stewardship</td>
</tr>
<tr>
<td>kaumatua</td>
<td>elders</td>
</tr>
<tr>
<td>kawanatanga</td>
<td>governance</td>
</tr>
<tr>
<td>mahinga kai</td>
<td>food gathering sites and practices</td>
</tr>
<tr>
<td>Matua te Mana</td>
<td>Mt Ruapehu</td>
</tr>
<tr>
<td>mana</td>
<td>honour, prestige</td>
</tr>
<tr>
<td>mana whakahaere</td>
<td>governance, authority, particularly relevant to Waikato-Tainui’s relationship with the Waikato River</td>
</tr>
<tr>
<td>mauri</td>
<td>life force</td>
</tr>
<tr>
<td>pā</td>
<td>settlements</td>
</tr>
<tr>
<td>pā tuna</td>
<td>eel weirs, used for catching eels</td>
</tr>
<tr>
<td>Pākehā</td>
<td>non-Māori</td>
</tr>
<tr>
<td>Ranginui</td>
<td>the Sky Father</td>
</tr>
<tr>
<td>rangatira</td>
<td>leaders</td>
</tr>
<tr>
<td>rangatiratanga</td>
<td>chieftanship</td>
</tr>
<tr>
<td>ripo</td>
<td>rapids</td>
</tr>
<tr>
<td>tangata whenua</td>
<td>first people of the land</td>
</tr>
<tr>
<td>te ao Māori</td>
<td>values, Māori worldview</td>
</tr>
<tr>
<td>Te Atihauunui a Paparangi</td>
<td>Iwi of Whanganui</td>
</tr>
<tr>
<td>or Te Atihau</td>
<td>Iwi of Whanganui</td>
</tr>
<tr>
<td>Term</td>
<td>Translation</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Te Awa Tupua</td>
<td>River with Ancestral power</td>
</tr>
<tr>
<td>Te Heke Ngahuru</td>
<td>the autumn migration of eels</td>
</tr>
<tr>
<td>Te Karewao</td>
<td>the supplejack vine</td>
</tr>
<tr>
<td>Te Köpuka</td>
<td>white <em>mānuka</em>, the timber from which eel weirs</td>
</tr>
<tr>
<td>Te Koretete au Te Awa Tupua</td>
<td>a storage basket for food from the river</td>
</tr>
<tr>
<td>Te Pā Auroa</td>
<td>the broad eel weir</td>
</tr>
<tr>
<td>Te Pou Tupua</td>
<td>the sacred and revered station</td>
</tr>
<tr>
<td>taonga</td>
<td>treasures, such as the Whanganui River</td>
</tr>
<tr>
<td>taonga tuturu</td>
<td>physical treasures</td>
</tr>
<tr>
<td>tapu</td>
<td>sacred</td>
</tr>
<tr>
<td>tiaki</td>
<td>to care for, guard, protect</td>
</tr>
<tr>
<td>tikanga</td>
<td>the customary system of behaviour and practices</td>
</tr>
<tr>
<td>tupua</td>
<td>something extraordinary, from the ancestral</td>
</tr>
<tr>
<td>tupuna</td>
<td>ancestor</td>
</tr>
<tr>
<td>Tupua te Kawa</td>
<td>the principles of natural law</td>
</tr>
<tr>
<td>uri</td>
<td>descendants</td>
</tr>
<tr>
<td>waahi tapu</td>
<td>sacred place</td>
</tr>
<tr>
<td>whakapapa</td>
<td>genealogy</td>
</tr>
<tr>
<td>whanau</td>
<td>family group</td>
</tr>
<tr>
<td>whanaungatanga</td>
<td>relationships</td>
</tr>
</tbody>
</table>
Participant information sheet provided to interview subjects

Participant Information Sheet

Researcher:
My name is Julia Talbot-Jones and I am a PhD candidate at the Crawford School of Public Policy, in the College of Asia and the Pacific, at the Australian National University. Originally from Christchurch, I moved to Australia in 2013 to complete my doctorate in environmental economics after living in the US for several years where I had been studying and working as an economist in Washington, DC.

This Information Sheet gives an overall summary of the research you have been invited to participate in. It tells you about the research, what it means for you if you choose to take part, how the information you share is stored and how your identity is protected. If you have any further questions that you would like to discuss with me, please get in touch via the contact details provided at the end of this document. If you choose to take part in the research you will have a further opportunity to ask any questions about the information provided, before being invited to sign a consent form.

Titles:

- **Thesis title**: Institutions, choice, and endogenous preferences: the behavioural effects of granting nature legal standing
- **Title for this section of research**: Granting nature legal rights - A new approach to resource management?

General Outline of this research:

- **Description and Methodology**: This research aims to understand how institutions affect peoples’ behaviour, specifically looking at the preliminary new institutional arrangement governing the Whanganui River, New Zealand, which has granted the Whanganui River legal standing. This research will be split into two parts – the first part (which is what you are involved in) is looking to understand how and why this new institutional arrangement emerged as a management mechanism. Using a series of interviews and a range of secondary sources this section of my research aims to answer two key research questions:
  - Why has this new institutional arrangement emerged for the management of the Whanganui River?
  - How does it differ from the traditional management approach ie the previous institutional arrangement?

- **Participants**: Those contributing to this research are people involved in the management of the Whanganui River, both past and present. This may include policy makers, people from the private and public sector, iwi representatives, government officials, and private landowners. I am intending to interview around 30 key participants.

- **Use of Data and Feedback**: The data collected through this research will form the basis of the institutional analysis section of my research (ie Part One). The results will also contribute to Part Two, which will focus on directly testing peoples’ behavioural responses to the changing conditions using economic experiments. Data may also be used in future research.
Data will be presented in academic journals and discussed in conference settings. Once complete, I will send you a summary of the final research findings and explain how the full thesis can be accessed. If you would like to receive this summary and further information, please indicate your interest on the attached Consent Form.

- **Project Funding:** I have received limited funding from the Australian National University to support research costs, such as travel. Remaining costs are self-funded.

**Participant Involvement:**

- **Voluntary Participation & Withdrawal:** Participation in this research is completely voluntary. If you do agree to take part you are subsequently able to withdraw from the research, without fear of penalty. You can withdraw at any time up until the research is published. No explanation is necessary. If you do decide to withdraw after the interview, any data you have provided will be destroyed. If you do agree to be interviewed, you can decline to answer any questions you feel uncomfortable about answering.

- **What will participants have to do?** Your participation will involve an individual interview with me. You can choose whether or not to have this interview audio-recorded. The purpose of audio-recording is to enable me to focus on our conversation during the interview and respond to what you say, without having to focus on documentation. Audio records will be securely stored and only I will have access to them.

  Discussing this institutional change, particularly if you were part of the process, may be uncomfortable or upsetting. Please consider this as you decide whether or not to take part in an interview. If you become upset during the interview, we can stop for a break or reconvene at a later date. The option to withdraw completely from this research is also always available.

- **Location and Duration:** The interview will take place at a private location of your choice. The interview will take approximately one to two hours.

**Confidentiality:**

- **Confidentiality:** Your confidentiality will be ensured, as far as the law allows, in several ways. No one other than me and my direct supervisor will have access to the material you provide. The attached Consent Form allows you to indicate whether or not you wish to have your name and/or type of organisation you are affiliated with listed as a participant or for your name and general organisation to remain confidential. You will also be able to indicate whether you are happy for me to quote you directly, either under your name or as a member of a particular group e.g. an NGO worker.

  If you choose to remain confidential, you can choose to be either referred in the research by a pseudonym or using a code, which will only be known and understood by the researchers.

**Data Storage:**

- **Where:** Data and personal information will be stored on a password-secure computer for which I will only have access. Hard copy information, such as the Consent Form, will be stored in a locked filing cabinet to which I also will only be able to access. Interviews will be conducted in a private place. I will
transcribe interviews using headphones to ensure no other person can hear the interview. Data will be stored for at least five years following publication. At the end of five years, data may be archived to be used in future research or alternatively destroyed.

Queries and Concerns:

Please feel free to contact me or my supervisor directly if you, or anyone else, wishes to have more information about this research.

Chief investigator:
Julia Talbot-Jones  
PhD Candidate  
Crawford School of Public Policy  
The Australian National University  

Email: julia.talbot-jones@anu.edu.au (regularly checked)  
Phone: (+61) 424 424 814  
Mailing address: Crawford School of Public Policy; ANU College of Asia & the Pacific; J.G. Crawford Building No. 132; Lennox Crossing; The Australian National University; Canberra ACT 0200; Australia

Primary supervisor:
Jeff Bennett, BAgEc, PhD, FASSA, DFAARES  
Professor  
Crawford School of Public Policy  
The Australian National University  

Email: jeff.bennett@anu.edu.au  
Telephone: (+61) 2 6125 0154  
Mobile: (+61) 419 232 250  
Mailing address: Crawford School of Public Policy; ANU College of Asia & the Pacific; J.G. Crawford Building No. 132; Lennox Crossing; The Australian National University; Canberra ACT 0200; Australia

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee. If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager  
The ANU Human Research Ethics Committee  
The Australian National University  
Telephone: +61 2 6125 3427  
Email: Human.Ethics.Officer@anu.edu.au
Appendix iii.

Written consent form provided to interview subjects

WRITTEN CONSENT TO PARTICIPATE IN RESEARCH ON GRANTING NATURE LEGAL RIGHTS –
A NEW APPROACH TO RESOURCE MANAGEMENT?

When you sign this form, your signature indicates you choose to participate in this research, and give your full consent to do so, understanding the following:

• You have received written and oral information about this research, and been provided with the opportunity to have your questions answered;
• You fully understand the aims and nature of the research;
• You understand you are able to stop the interview at any time;
• You understand you are able to withdraw from the research at any stage up until publication. If you withdraw after the conclusion of the interview and before publication, you understand the information you provided will be destroyed;
• You understand you can request the researcher does not use particular pieces of information you provide, and that you can make this request up until publication; and
• You understand how the information you provide will be used in the research, including in the publication of research findings. You understand the researcher will store all information in a secure manner.

In the below statements, please circle the choice you consent to:
I do / do not consent to my interview being audio-recorded.
I do / do not consent to having my name, role, and organisation listed as an interviewee in an appendix of the final thesis publication.
I do / do not consent to being quoted in research products.

If you consent to being quoted, please tick the box of the quote attribution choice you consent to, from the three choices below.

☐ I am happy for my name and organisation to be attributed to any quotes used.
☐ I wish to have only the type of organisation I work for attributed to any quotes used (for example: public servant, NGO staff, business staff, parliamentarian).
☐ I want my quotes to remain unattributed.

Signed: ______________________________

Printed Full Name: ________________________ Date: ____________
Appendix iv.

Written consent forms for experimental participants

WRITTEN CONSENT for Participants

Testing incentives using the bargaining game

I have read and understood the Information Sheet you have given me about the research project, and I have had any questions and concerns about the project (listed here) addressed to my satisfaction.

I agree to participate in the project.  

YES ☐  NO ☐

Signature:....................................................
Instructions for experimental subjects participating in the 'Changing' treatment

Instructions

Welcome and thank you for participating in this experiment! You receive $10 for having shown up on time. If you read these instructions carefully, you can earn more. The $10 and all additional money will be paid out to you privately in cash immediately after the experiment.

It is strictly forbidden to communicate with the other participants during the experiment. If you have any questions or concerns, please raise your hand and we will answer your questions individually. Following this rule is very important; if not followed, we must unfortunately exclude you from the experiment and from all payments.

This experiment will consist of two phases: Phase One and Phase Two. Phase Two is an additional exercise that will be explained at that time. You will be paid for your decisions made in one of the two phases by the determination of a coin toss at the end of the experiment. Since you do not know which phases you will be paid for you should ensure you understand what is required in each phase. Instructions for Phase Two will be given to you upon completion of the previous phase.
Phase One

Random Matching and Anonymity
You will be assigned a letter: A or B or C. You will form a group with two other people of a different letter. No one will learn the identities of the people he/she is grouped with. You will not play with the people who you are grouped with in this game beyond this phase.

Starting Balances
This time the endowment of 100 tokens is given to Player C. Player B and A will have no endowment.

As before, for each player, each set of tokens is worth a different value and can be represented in a choice set as shown in the table below (Rows A-G). The value of each set of tokens for each player and the respective choice sets are the same as in Phase One and are as follows:

Table One: Respective payoffs available to players A, B, and C dependent on the number of tokens Player A offers Player B.

<table>
<thead>
<tr>
<th>Choice Set</th>
<th>Quantity of tokens for Player A</th>
<th>Quantity of tokens for Player B</th>
<th>Payoff of Player A</th>
<th>Payoff of Player B</th>
<th>Payoff of Player C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100</td>
<td>0</td>
<td>$3</td>
<td>$0</td>
<td>$15</td>
</tr>
<tr>
<td>B</td>
<td>83</td>
<td>17</td>
<td>$4.5</td>
<td>$4.5</td>
<td>$13.5</td>
</tr>
<tr>
<td>C</td>
<td>67</td>
<td>33</td>
<td>$6</td>
<td>$6.8</td>
<td>$12</td>
</tr>
<tr>
<td>D</td>
<td>50</td>
<td>50</td>
<td>$9</td>
<td>$9</td>
<td>$9</td>
</tr>
<tr>
<td>E</td>
<td>33</td>
<td>67</td>
<td>$13.5</td>
<td>$11.3</td>
<td>$6</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>83</td>
<td>$15</td>
<td>$13.5</td>
<td>$3</td>
</tr>
<tr>
<td>G</td>
<td>0</td>
<td>100</td>
<td>$3</td>
<td>$15</td>
<td>$0</td>
</tr>
</tbody>
</table>
Decision Task
Steps:

1) Player C must decide how many of his/her 100 tokens he/she would like to offer to Player B by selecting a choice set from A-G.

2) Player B will be informed of Player C’s choice on his/her computer monitor. Player B can then decide whether to accept or reject Player C’s offer
   a. If Player B accepts: both Player C and B split the 100 tokens as proposed giving them their respected payoffs. Player A also receives the allocated payoff as per the choice set offered. This phase will then end.
   b. If Player B rejects: players will enter another round of decision-making. Doing so will reduce all players’ payoffs in the table by 10 per cent. There will be a maximum of 10 repeated rounds per phase. Each round will be identical to the round described above.

3) Player A makes no decisions and will only observe the final decisions of Player C and B at each round

A visual representation of each player’s decision task is shown below where Player A is endowed with tokens and can make an offer to Player B. Player C can observe all offers and responses but does not make any decisions.
Examples:
The diagrams illustrate the possible payoffs for players A, B, and C in round one, round two, and round eight as the quantity of tokens allocated to Player B increases. The solid line reflects payoffs in round one, the dashed line reflects payoffs in round two, and the dotted line: payoffs in round eight.

For example, after looking at the payoff table (previous page) Player C may decide that he/she wants to offer Player B 33 tokens in round one. He/she consequently indicates to Player B that he/she will offer them Choice set C (as shown in the payoff table). If Player B accepts, Player C will receive a payoff of $12, Player B will receive $6.80, and Player A will get $6. If Player B rejects, play will proceed to round two with reduced payoffs (as demonstrated in the diagrams above) and the process repeated. This decision process can be repeated up to 10 times, at which time all payoffs would have fallen to zero and all tokens will be returned to Player A.

Earnings
If this task is selected for payment you will earn the payoff agreed to in addition to your show-up fee. Your earnings will be collected from the experimenter anonymously and confidentially at the end of the experiment.

Summary
- Player C is endowed with 100 tokens
- Player C must decide how much to give to Player B
- Player C can accept or reject Player C’s offer
- If Player C’s offer is accepted, phase one ends; if Player C’s offer is rejected play moves to the next round
- Maximum of ten repeated rounds after which all tokens are returned to Player C and the payoffs are zero for all players
- Player A can observe all players’ offers and responses but makes no decisions.
Phase Two

Random Matching and Anonymity
Your letter will remain the same in this experiment, however, YOUR GROUP WILL CHANGE. You will no longer be matched with any player with whom you have previously played. You will all continue to remain anonymous.

Starting Balances
This time the endowment of 100 tokens is given to Player A. Player B and C will have no endowment.

As before, for each player, each set of tokens is worth a different value and can be represented in a choice set as shown in the table below (Rows A-G). The value of each set of tokens for each player and the respective choice sets are the same as in Phase One and are as follows:

Table One: Respective payoffs available to players A, B, and C dependent on the number of tokens Player A offers Player B.

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<tr>
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<th>Payoff of Player C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100</td>
<td>0</td>
<td>$3</td>
<td>$0</td>
<td>$15</td>
</tr>
<tr>
<td>B</td>
<td>83</td>
<td>17</td>
<td>$4.5</td>
<td>$4.5</td>
<td>$13.5</td>
</tr>
<tr>
<td>C</td>
<td>67</td>
<td>33</td>
<td>$6</td>
<td>$6.8</td>
<td>$12</td>
</tr>
<tr>
<td>D</td>
<td>50</td>
<td>50</td>
<td>$9</td>
<td>$9</td>
<td>$9</td>
</tr>
<tr>
<td>E</td>
<td>33</td>
<td>67</td>
<td>$13.5</td>
<td>$11.3</td>
<td>$6</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>83</td>
<td>$15</td>
<td>$13.5</td>
<td>$3</td>
</tr>
<tr>
<td>G</td>
<td>0</td>
<td>100</td>
<td>$3</td>
<td>$15</td>
<td>$0</td>
</tr>
</tbody>
</table>
Decision Task
Steps:

4) Player A must decide how many of his/her 100 tokens he/she would like to offer to Player B by selecting a choice set from A-G.

5) Player B will be informed of Player A’s choice on his/her computer monitor. Player B can then decide whether to accept or reject Player A’s offer

   a. If Player B accepts: both Player A and B split the 100 tokens as proposed giving them their respected payoffs. Player C also receives the allocated payoff as per the choice set offered. This phase will then end.

   b. If Player B rejects: players will enter another round of decision-making. Doing so will reduce all players’ payoffs in the table by 10 per cent. There will be a maximum of 10 repeated rounds per phase. Each round will be identical to the round described above.

6) Player C makes no decisions and will only observe the final decisions of Player A and B at each round

A visual representation of each player’s decision task is shown below where Player A is endowed with tokens and can make an offer to Player B. Player C can observe all offers and responses but does not make any decisions:

![Visual representation of decision task](image-url)
Examples:
The diagrams illustrate the possible payoffs for players A, B, and C in round one, round two, and round eight as the quantity of tokens allocated to Player B increases. The solid line reflects payoffs in round one, the dashed line reflects payoffs in round two, and the dotted line: payoffs in round eight.

For example, after looking at the payoff table (previous page) Player A may decide that he/she wants to offer Player B 33 tokens in round one. He/she consequently indicates to Player B that he/she will offer them Choice set C (as shown in the payoff table). If Player B accepts, Player A will receive a payoff of $6, Player B will receive $6.80, and Player C will get $12. If Player B rejects, play will proceed to round two with reduced payoffs (as demonstrated in the diagrams above) and the process repeated. This decision process can be repeated up to 10 times, at which time all payoffs would have fallen to zero and all tokens will be returned to Player A.

Earnings
If this task is selected for payment you will earn the payoff agreed to in addition to your show-up fee. Your earnings will be collected from the experimenter anonymously and confidentially at the end of the experiment.

Summary
• Player A is endowed with 100 tokens
• Player A must decide how much to give to Player B
• Player B can accept or reject Player A’s offer
• If Player A’s offer is accepted, phase one ends; if Player A’s offer is rejected play moves to the next round
• Maximum of ten repeated rounds after which all tokens are returned to Player A and the payoffs are zero for all players
• Player C can observe all players’ offers and responses but makes no decisions.
Appendix vi.

Additional analysis carried out as part of the experiment

Table 1A: Choice set offered by the proposer in periods 1 and 2 of phase 2 of the Resource Self-Determination and Changing treatments.

<table>
<thead>
<tr>
<th>Proposers' offers by choice set</th>
<th>RSD (Phase 2)</th>
<th>C (Phase 2)</th>
<th>Z-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Period 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice set A</td>
<td>0</td>
<td>0.136</td>
<td>1.42</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0.071</td>
<td>0.364</td>
<td>1.95*</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0.043</td>
<td>0.318</td>
<td>0.663</td>
</tr>
<tr>
<td>Choice set D</td>
<td>0.500</td>
<td>0.136</td>
<td>2.341**</td>
</tr>
<tr>
<td>Choice set E</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set F</td>
<td>0</td>
<td>0.045</td>
<td>0.79</td>
</tr>
<tr>
<td>Choice set G</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Period 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice set A</td>
<td>0</td>
<td>0.181</td>
<td>1.679*</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0.148</td>
<td>0.091</td>
<td>0.477*</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0.071</td>
<td>0.227</td>
<td>1.206</td>
</tr>
<tr>
<td>Choice set D</td>
<td>0.214</td>
<td>0.136</td>
<td>0.603</td>
</tr>
<tr>
<td>Choice set E</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set F</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set G</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: All tests are two sided Wilcoxon rank sum tests. *** p<0.01, ** p<0.05, * p<0.1

Table 2A: Comparison of offers made in periods 1, 2 and 3 by Player C in phase 1 and 2 of the Resource Self-Determination treatment.

<table>
<thead>
<tr>
<th>Proposers' offers by choice set</th>
<th>RSD (Phase 1)</th>
<th>RSD (Phase 2)</th>
<th>Z-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Period 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice set A</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0</td>
<td>0.072</td>
<td>0.35</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0.642</td>
<td>0.428</td>
<td>1.00</td>
</tr>
<tr>
<td>Choice set D</td>
<td>0.357</td>
<td>0.500</td>
<td>0.707</td>
</tr>
<tr>
<td>Choice set E</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set F</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set G</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Period 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice set A</td>
<td>0.071</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0</td>
<td>0.143</td>
<td>1.41</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0.214</td>
<td>0.071</td>
<td>1.00</td>
</tr>
<tr>
<td>Choice set D</td>
<td>0.286</td>
<td>0.214</td>
<td>0.378</td>
</tr>
</tbody>
</table>
### Table 3A: Comparison of offers made in period 1 in phase 1 and 2 of the Changing and Resource Self-Determination treatments

<table>
<thead>
<tr>
<th>Proposers' offers by choice set</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Z-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Changing</strong></td>
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<td></td>
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<tr>
<td>Choice set A</td>
<td>0</td>
<td>0.136</td>
<td>1.77*</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0</td>
<td>0.364</td>
<td>3.09***</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0</td>
<td>0.318</td>
<td>2.85***</td>
</tr>
<tr>
<td>Choice set D</td>
<td>0.136</td>
<td>0.136</td>
<td>0.00</td>
</tr>
<tr>
<td>Choice set E</td>
<td>0.135</td>
<td>0</td>
<td>1.77*</td>
</tr>
<tr>
<td>Choice set F</td>
<td>0.727</td>
<td>0.045</td>
<td>4.59***</td>
</tr>
<tr>
<td>Choice set G</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>RSD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice set A</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set B</td>
<td>0</td>
<td>0.072</td>
<td>0.35</td>
</tr>
<tr>
<td>Choice set C</td>
<td>0.643</td>
<td>0.428</td>
<td>1.00</td>
</tr>
<tr>
<td>Choice set D</td>
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<td>0.707</td>
</tr>
<tr>
<td>Choice set E</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set F</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Choice set G</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: All tests used Wilcoxon rank sum tests. *** p<0.01, ** p<0.05, * p<0.1