Towards Robust Exchanges

Evaluating Ecological Compensation in New Zealand

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Abstract

Ecological compensation is commonly employed but rarely evaluated around the world. In order to assess application of the tool in New Zealand, a systematic nationwide review was undertaken. The research used a combination of qualitative and quantitative tools (i.e. a mixed methods approach) to investigate outcomes associated with ecological compensation under the Resource Management Act 1991 and how variation among outcomes might be explained. Three key research components were addressed: compliance, practice and stakeholder perspectives.

Compliance

The levels of regulatory compliance were assessed in 81 consents and 245 conditions with an overall compliance level of 64.8%. Public organisations (75.5%) were more likely to comply than private companies (65.5%), followed by private individuals (54.7%). Administrative conditions (paper-based) were much more likely to be complied with (82.6%) than non-administrative (action based) conditions (49.6%). There were significant differences in compliance rates across different activities from Agriculture (4.8%) through to Energy Generation (100%), demonstrating the importance of understanding the nature of non-compliance in improving regulatory compliance and enforcement.

Practice

The recognition of key implementation issues of ecological compensation were investigated based on the ecological exchanges approved in 110 consents. The key implementation issues were (1) equivalency, (2) spatial proximity, (3) additionality, (4) timing, (5) duration and compliance, and (6) currencies and ratios. Most exchanges approved under the RMA were ‘in-kind’ (i.e. broadly similar in type) but that their ecological equivalence was difficult to determine due to poor information. Most exchanges were close to the site of impact (65.5%), and those at a distance were typically the result of aggregated schemes such as mitigation trusts. Most requirements for ecological compensation can be

considered to be additional, as there are few other means of compelling ecological restoration or other positive conservation activities in New Zealand. Most ecological compensation (94.5%) was required to be delivered concurrent with or after the activity that was approved with a range of mechanisms used to secure those outcomes. This research also showed that currencies and ratios are rarely used in the determination of ecological compensation.

Stakeholder perspectives

Semi-structured interviews were conducted with 116 stakeholders from a wide range of disciplines, and demonstrated that while the potential of ecological compensation is well understood and its use is well-supported (96.5%), most stakeholders have significant concerns about implementation. Strong support (87.9%) exists for a more robust and formalized approach to ecological compensation.

For ecological compensation to contribute positively to the management of effects on the environment, the exchanges of biodiversity lost and gained must be robust. The present research has demonstrated that the implementation of ecological compensation in New Zealand is falling short of this expectation, and has identified a range of areas for improvement. The significant potential for failure inherent within ecological compensation requires mitigation with policy and practice improvements, and comprehensive follow-up and review of outcomes. Changes in the use of ecological compensation in New Zealand, toward a context that supports more robust exchanges and limits the potential for negative impact of the tool upon ecosystems and species are essential.

Dedicated to the memory of

Elizabeth (Jean) Jane Moreland Meiklejohn (nee Phillips) (30 May 1928 – 3 February 2009)

and

John (Jock) Douglas Meiklejohn (1 October 1928 – 26 July 2011)

Gone but never forgotten.

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Introduction

1.1 Overview

Compensating for ecological harm is a policy tool that is growing in its relevance and application worldwide. Ecological compensation falls within a rubric of activities known by various names around the world including mitigation, compensatory mitigation, habitat banking/offsets, and biodiversity offsets. Compensatory mechanisms are used in many jurisdictions around the world, presenting an opportunity for agencies, communities and developers to come to more flexible arrangements on land development and resource use, beyond typical command-and-control techniques. Agencies and developers can reach agreements that mandate ecological compensation, which can alleviate the adversarial nature of the planning process, contribute to local, regional or national conservation goals and at the same time, secure control over resources and land for extractive or development purposes.

Economic growth is constrained by significant environmental features on the landscape, and ecological compensation as a mechanism can act to limit those constraints, making the concept very attractive (Cowell, 1997). However, reviews

of the implementation of the concept (such as the wetland mitigation banking schemes in the United States) have seen it widely criticised due to poor compliance and enforcement, among other factors, meaning that ecological goals are not realised (Burgin, 2010; Department of Environment and Conservation NSW, 2006; Hornyak & Halvorsen, 2003; Matthews & Endress, 2008). There are also concerns about how to underwrite for failure of compensation projects, and where to allocate responsibility for long term monitoring of compliance and success (Burgin, 2008; Gibbons & Lindenmayer, 2007; Tonkin & Taylor, 2012).

Some authors go further, and suggest that not only does the concept contain fundamental errors, but that it will simply not work. For example, and most prominently, Walker et al (2009) argued that agency behaviour would see the mechanism used to facilitate inappropriate exchanges at the expense of the environment. While most authors conclude that administrative improvements, technical solutions and improved practice overall will enhance outcomes, Walker et al contend that such proposed 'fixes' will not arrest the likelihood of failure of such schemes and concluding that overall trading of biodiversity will generate poorer ecological outcomes than traditional approaches (i.e. rules and prohibitions).

The regulatory appeal of ecological compensation is a major contributor to concerns (both suspected and actual) regarding its effective implementation. It is politically more palatable to allow developments, and agencies can promote the practice to avoid an unpopular decision of declining a proposal (Walker et al, 2009). More broadly, weak frameworks, poor institutional design, inappropriate application of the concept and lax follow-up and enforcement exacerbate this inherent bias, placing vulnerable biodiversity at risk (Matthews & Endress 2008, Salzman & Ruhl, 2000). Further, the promise of biodiversity gains not otherwise facilitated by low conservation spending can weaken traditional arguments against the practice by both agencies and other players (i.e. conservation interests). For example, the impact of invasive species in New Zealand contributes to an often significant background rate of ecological decline. This provides for developers to offer pest control measures in offset scenarios and argue (and often quite correctly so) that the context with the offset is better for the ecosystems at stake than the status quo (typically beset by non-existent or low-intensity pest management). For

these reasons and more, the bias toward the affirmative in development is unsurprising. There is no doubt of the risk of ecological compensation to ecosystems, and this is a central consideration in the present research – can we fix the implementation of ecological compensation and if not, is there a viable alternative?

Returning to the promises of ecological compensation, Gibbons and Lindenmayer (2007) noted that although schemes surrounding compensation had many shortcomings, they hold potential if the shortcomings were understood and acknowledged within policy and practice. Introducing the principle of ecological compensation is also an early step in allowing the costs of environmental harm to be integrated into markets and recognised in development projects (Brownlie *et al.*, 2007). Ecological compensation does promise a number of potential benefits to developers, regulatory agencies, the community and the environment. The many potential benefits means calls to dismiss the concept as unworkable must be carefully considered as they are unlikely to be practical, at least in the short term (Gibbons & Lindenmayer, 2007; ten Kate *et al.*, 2004).

In order to address deficiencies of implementation, research is needed to understand the complexities of the concept as it applies to a given jurisdiction. The current research aimed to address this gap in understanding of how ecological compensation is used under the Resource Management Act 1991. Providing a greater understanding of implementation will enable New Zealand to assess whether the deficiencies are terminal to the use of the concept, or whether they may be managed with policy tools and other mechanisms.

1.2 Research topic

Ecological compensation is used in New Zealand as a mechanism to address adverse effects on the environment. No formal policy yet exists to guide the consideration or implementation of the concept however. Numerous authors have reviewed its place in resource management to date (Christensen, 2007; Memon & Skelton, 2004; Memon *et al.*, 2004; Norton, 2008; Turner, 2000). Policy evaluation is rare (Bennear & Coglianese, 2004), and where policy on a matter is patchy or does not exist, it can be assumed that evaluation of outcomes is even less likely. The present research aimed to investigate the use of the concept in

New Zealand and provide an analysis of the strengths and weaknesses of the current approach. To do this, levels of compliance were investigated, planning practice was examined, and the views of stakeholders collected, with respect to ecological compensation under the Resource Management Act 1991.

Definition of terms in this topic area is complex, as they vary enormously across jurisdictions and change with some frequency depending on progression of policy, case law and the wider discourse (Briggs *et al.*, 2009; International Council on Mining and Metals, 2005; ten Kate, *et al.*, 2004). In New Zealand the discussion has been no less perplexing than elsewhere, and serves as something of a barrier to a coherent discussion (Christensen, 2008). The terms of ecological compensation, biodiversity offsetting, and mitigation are typically employed to describe, somewhat interchangeably, the same concept: that of the counterbalancing of adverse ecological effects with positive ecological actions. The variation exists in the goals, the structure and parameters within which ecological compensation is delivered, and the method of demonstrating that it will be delivered. In the present research the focus was on ecological exchanges, although similar concepts are used in the fields of landscape, amenity, visual character and heritage under the broader banner of 'environmental compensation'. Ecological compensation is therefore defined for the purposes of this research as:

> *"Positive conservation actions required by resource consent, and intended to compensate for residual adverse effects of development and resource use"*

1.3 Research questions

The primary goal of this research was to conduct an analysis of the use of ecological compensation in New Zealand. In a policy vacuum, the evaluation of practice and outcomes is very challenging and it is important that such analyses are objective and empirical. In order to conduct a systematic investigation, a series of methodologies was designed to glean information from the sources available (existing case studies, literature from New Zealand and around the world, case law and the views of stakeholders). From this the aim was to produce a series of multi-scale recommendations that would be useful to agencies and organisations engaged in the negotiation, approval and delivery of ecological compensation.

Principal question: What outcomes are associated with ecological compensation agreements under the Resource Management Act 1991 and how might the variation among outcomes be explained?

1. What are the levels of compliance with ecological compensation requirements in consents under the Resource Management Act 1991, and how might variation in compliance levels be explained? This key question is addressed in Chapter 4, Compliance.
2. How is ecological compensation considered in practice by agencies under the RMA, with respect to key implementation issues? This question is addressed in Chapter 5, Practice.
3. What are the perspectives of stakeholders on the implementation of ecological compensation under the RMA and the possible improvements that are required? This question is addressed in Chapter 6, Stakeholder Perspectives.

1.4 Thesis structure

The core of this thesis comprises a series of papers submitted to international journals. Additional information is included to provide the basis for the papers, articulate the research approach used and, later, summarise the key findings and outline the contribution to new knowledge. The three papers each address one of the three key research questions related to compliance, practice and stakeholder views. The parts of the thesis and how they fit together are summarised below.

Chapter 2 is a review of the literature relating to ecological compensation, from both New Zealand and around the world. Ecological compensation is a point at which numerous disciplines converge, including planning, conservation, ecology and law. It holds a contentious place in most resource management regimes globally, and has been subject to much criticism due to its perceived and actual adverse consequences. It also holds significant promise, as a tool to leverage conservation gains from what would otherwise be situations where there would be

certain losses. Understanding the role of ecological compensation, the genesis of the concept and the research to date on its application in New Zealand is crucial background to the following chapters.

Chapter 3 provides a description of the research process, including a discussion of the mixed methods approach as it relates to the research topic. The tools and methods used to address each of the key research questions are also described, including both data collection and analysis techniques. Chapter 3 also details the assumptions and limitations of the research undertaken.

Chapter 4 is an analysis of regulatory compliance with ecological compensation requirements required by 81 resource consents around the country designed to answer Key Question 1.

What are the levels of compliance with ecological compensation requirements in consents under the Resource Management Act 1991, and how might variation in compliance levels be explained?

I aimed to understand not simply levels of compliance, but the factors that had a significant impact upon that compliance. I considered that describing the nature of non-compliance with ecological compensation would enable more specific recommendations to arise as to how to improve practice and what operational factors are more conducive to positive outcomes. Chapter 4 has been published in *Impact Assessment and Project Appraisal* Vol 31 pp.34-44 as "Ecological compensation: an evaluation of regulatory compliance in New Zealand" by M A Brown, B D Clarkson, B J Barton and C Joshi. While I was the principal author and undertook all data collection and writing, my co-authors provided advice on research design, analysis and editing.

Chapter 5 analyses the consideration of ecological compensation through the planning process in 110 resource consents to address Key Question 2.

How is ecological compensation considered in practice by agencies under the RMA, with respect to key implementation issues?

In the absence of specific goals and policy frameworks, I use the key implementation issues for biodiversity offsets proposed by McKenney and

Kiesecker (2010). The key implementation issues and the wider discussion within the paper provide a basis for a comparison of New Zealand with countries around the world. Chapter 5 has been published by the *New Zealand Journal of Ecology* as "Compensating for ecological harm- the state of play in New Zealand" by M A Brown, B D Clarkson, R T Theo Stephens and B J Barton Vol 38 (1) (*in press*). While I was the principal author and undertook all data collection and writing, my co-authors provided advice on research design, conceptual basis, data analysis and editing.

Chapter 6 describes the outcomes of a series of semi-structured interviews with a wide range of practitioners and other stakeholders across New Zealand undertaken to address Key Question 3.

What are the perspectives of stakeholders on the implementation of ecological compensation under the RMA and the possible improvements that are required?

The research allowed me to utilise views of some of the most experienced of New Zealand professionals and others in implementing the concept, to build a picture of its promise and its pitfalls, and how each might be better recognised. The line of questioning was intentionally broad, and the sometimes lengthy interviews provided rich data on the nature of implementation of ecological compensation in what is nationally a policy vacuum. Chapter 6 has been published in the *Journal of the Royal Society of New Zealand* as "Implementing ecological compensation – stakeholder perspectives and a way forward" by M A Brown, B D Clarkson, B J Barton and C Joshi (*in press*). While I was the principal author and undertook all data collection and writing, my co-authors provided advice on research design, analysis and editing.

Chapter 7 reviews and draws together the key lessons from the three papers, and demonstrates the original contribution of the present research to knowledge. Central to this synthesis is the section on recommendations, where I draw on the results of the core research to consider how the implementation of ecological compensation can be improved in New Zealand.

1.5 Summary

The present research takes an objective and empirical approach to discerning the nature of New Zealand's experience with ecological compensation to date and the outcomes that have been generated. As pioneering work in this jurisdiction, it takes a broad national view and traverses a wide range of issues, cases and contexts. The scale of the investigation is necessarily large in order to capture a significant degree of variation already present, and it hopefully provides something of a foundation for further work in this area, particularly in relation to the recommended future research detailed in Chapter 7.

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Chapter 2

The genesis of ecological compensation

2.1 The ailing environment

The impact of human actions on Earth's living systems has been phenomenal in degree and speed. Entire ecosystems, species and habitats face severe negative impacts as a result of human activities including land use changes, habitat removal, pollution and resource extraction. Such impacts – far from abating – have been shown to be intensifying (Earl *et al.*, 2010; Eppink & Bergh, 2007; Secretariat of the Convention on Biological Diversity, 2010; Wood, 2010). The Millennium Ecosystem Assessment estimated that 60% of global ecosystem services are being 'degraded or used unsustainably, as the human population continues to grow and overshoot the carrying capacity of the planet (Guth, 2008; Millennium Ecosystem Assessment, 2006; Secretariat of the Convention on Biological Diversity, 2010). The persistence of the development imperative and perilous state of ecosystems demand new approaches to striking this critical balance (Kiesecker *et al.*, 2009; Underwood, 2011). The implicit desire to achieve balance between these competing elements is a common tenet of environmental law, one of concern to several authors as it ultimately favours economic interests over environmental interests (Guth, 2008; Murray & Swaffield, 1994; Salzman & Ruhl, 2000).

Regulation of and restriction upon human behaviour regarding the use of ecological resources occurs in most jurisdictions throughout the world, and have existed in some form or another for most of the history of civilisation (Wood, 2010). Wood (2010) refers to environmental law as a 'membrane through which individuals act in relation to nature' and separates it from other forms of law because it is "accountable to a supreme set of laws – the law of nature..." Strong environmental policies are only becoming more critical as the state of ecosystems degrades and the need for resources continually increases (*TEEB – The Economics of Ecosystems and Biodiversity for National and International Policy Makers – Summary: Responding to the Value of Nature 2009*, 2009). As much as the goal of environmental law is to achieve protection of ecological systems, decisions made within it demand consideration of much more than the environment alone (Frances & Warren, 1999). Health and safety, human rights, amenity and landscape values, the economic development imperative, resource requirements, heritage and cultural associations and other societal needs must be considered, all against a backdrop of limited funding for conservation and wider resource management (Faith & Walker, 2002; Frances & Warren, 1999).

2.2 Ecological compensation - background

Ecological compensation is an example of a tool in environmental law that attempts to reconcile the continued provision for development and resource use with negative ecological effects, while attempting to retain, protect and restore ecological values (Gibbons & Lindenmayer, 2007; Maron *et al.*, 2012; Memon & Skelton, 2004; Norton, 2007; Pilgrim *et al.*, 2013; ten Kate *et al.*, 2004). It is considered by some authors as necessary, particularly where those effects will not or cannot cease now or in the near future (Gibbons & Lindenmayer, 2007; ten Kate, *et al.*, 2004). Ecological compensation is a tool to assist in the internalisation of environmental externalities, a central theme of environmental economics (Endres, 2010). The concept also recognises that the effort to protect biodiversity on public land alone is not enough (Reid, 2011), and that abatement of effects and enhancement of ecological values on private land are also essential (Broberg, 2003; Gordon *et al.*, 2011; Kontoleon *et al.*, 2007).

The origin of ecological compensation has been variously described as US wetland mitigation banking in the 1970s (Burgin, 2008; Walker, 2010), 'planning gain' in the United Kingdom (Whatmore & Boucher, 1993) and the 'compensation principle' in use in Germany since the 1970s (Rundcrantz & Skarback, 2003). Ecological compensation is conceptually broad and is now implemented in a variety of ways around the world (Burgin, 2010; Gordon, *et al.*, 2011; Madsen *et al.*, 2010; Memon & Skelton, 2004; Naicker, 2008; Reid, 2011). The variation exists in the goals of the compensation programme, the structure and parameters within which it is delivered, and the methods of demonstrating that it will be delivered.

Ecological compensation includes negotiated one-off exchanges under the banner of 'mitigation' or 'compensation', through to more formal and quantitative biodiversity offsets. While some approaches to determining ecological compensation are heavily quantitative and formulated on the basis of relatively strict ratios, most programmes (whether policy-based or *ad hoc*) rely upon a significant degree of negotiation between parties to arrive at a solution that is socially acceptable (Galatowitsch, 2012; Johnson *et al.*, 2002). More strategic and landscape-level systems, sometimes using methods and approaches derived from systematic conservation planning, are also being applied including habitat and species banking that operate as auctions (Briggs *et al.*, 2009; Burgin, 2008; Department of Environment and Conservation NSW, 2006; Kontoleon, *et al.*, 2007; Margules & Pressey, 2000; Pawliczek & Sullivan, 2011). Such approaches often enshrine market-based principles, and are viewed as operating more transparently or efficiently than traditional approaches (Kontoleon, *et al.*, 2007).

Environmental economics provides a useful theoretical framework for some elements of ecological compensation, particularly with respect to resource valuation, contract design and the actual and potential effects of information asymmetry, imperfect knowledge of the commodity and the impact of transaction costs and discount rates (Kontoleon, *et al.*, 2007). Environmental economics recognises at biodiversity is deeply complex and poorly understood and therefore is difficult to appropriately value (Field & Field, 2006; Salzman & Ruhl, 2000; Walker, 2010). The explicit role of environmental economics in ecological compensation varies with jurisdiction, depending upon the degree to which a

market approach is used, but it is well acknowledged that ecological compensation draws heavily on the underlying principles of environmental economics to inform policy approaches (Beder, 2000; Gustafsson, 1998; Hallwood, 2007).

Tools derived from environmental economics to manage ecological compensation have caused concern due to the assumptions of fungibility of biodiversity that are inherent in such an approach (Freese & Trauger, 2000; Pawliczek & Sullivan, 2011; Reid, 2011; Salzman & Ruhl, 2000; Walker, 2010; Walker *et al.*, 2009). A key insight of environmental economics is that when a commodity has no price, it is viewed as free and therefore used at a rate that exceeds what is socially or ecologically desirable or sustainable (Gowdy, 1997). The commodification of biodiversity to some degree, however imperfect, has been seen as necessary to ensure the damage to it in the course of economic development is not ignored (Endres, 2010). The market exchange value of biodiversity therefore, only represents a fraction of the overall value of biodiversity, which includes market and non-market values to humans, other species and ecosystems (Gowdy, 1997).

Approaches to ecological compensation, whether regulatory or voluntary, market-based or ad hoc, that seek to trade biodiversity values are inherently risky, and a wide range of guidance schemes and approaches has been developed around the world to manage that risk (TBC, 2012). One example is the Business for Biodiversity Offsets Programme (BBOP), an international alliance of industry, NGOs and government agencies which has released a range of documents and a list of guiding principles for offsetting (Business and Biodiversity Offsets Programme, 2009). Programmes like BBOP recognise that scientific input is only one aspect of successfully meeting the challenge of ecological compensation and other conservation challenges, and that positive outcomes can arise from collaborative engagement across sectors (Business and Biodiversity Offsets Programme, 2009; Phillis *et al.*, 2012).

2.3 Ecological compensation – key elements

The literature on the various types of ecological compensation contains common themes including that assessment of ecological compensation (the mandatory form) typically occurs within the Environmental Impact Assessment (EIA)

process relevant to that jurisdiction. EIA is a long-established process that provides the regulatory starting point for determination of the degree of impacts (Morrison-Saunders & Bailey, 1999; Villarroya & Puig, 2009). EIA enshrines the concept of trade-offs, one of which is ecological compensation (Brown *et al.*, 2013; Faith & Walker, 2002; Morrison-Saunders & Pope, 2013; Puig & Villarroya, 2013; Rundcrantz & Skarback, 2003). Monitoring of project impacts and implementation is also covered in the field of EIA, although this is widely regarded as an often neglected element (Bailey & Hobbs, 1990; Khanal, 2007; Marshall *et al.*, 2005; Villarroya & Puig, 2009).

Inherent within ecological compensation – and indeed EIA more generally – is the concept of the mitigation hierarchy, which acts to focus compensatory efforts on the effects that remain (i.e are residual) after impacts have been avoided and directly remediated as far as possible (Business and Biodiversity Offsets Programme, 2009; McKenney & Kiesecker, 2010; Quertier & Lavorel, 2011; ten Kate, *et al.*, 2004; Villarroya & Puig, 2009). In addition to the mitigation hierarchy, it is critical that policy and/or practice recognise that there are limits to what can be offset (Business and Biodiversity Offsets Programme, 2009; Pilgrim, *et al.*, 2013; Reid, 2011). Negative outcomes are unavoidable if components that cannot be adequately offset are lost to development pressure, such as threatened species, relict environments and other vulnerable ecosystems.

2.3.1 Goals of compensating for harm

The implicit and explicit goal of ecological compensation is to counterbalance adverse effects on the environment and to achieve some measure of equivalence in doing so (Maron, *et al.*, 2012). Goals of schemes range from non-specific desires for broad equivalency, through the rigorous benchmark of achieving *no net loss* of biodiversity, to the even more onerous requirement to have the overall project achieve a *net gain* in biodiversity (Brownlie & Botha, 2009; Gardner & von Hase, 2012; Gibbons & Lindenmayer, 2007; ten Kate, *et al.*, 2004; Zedler, 1996). For example, the requirement for wetland mitigation in the US state of Washington requires that the process reduce the total adverse effect to an 'acceptable level'(Johnson, *et al.*, 2002). No net loss if biodiversity is also a common goal, followed by the more aspirational version of achieving a net gain in

biodiversity (Business and Biodiversity Offsets Programme, 2009; McKenney & Kiesecker, 2010; New, 2009). The detailed examination of the specifics of all these goals is a complex and challenging research area (Gordon, *et al.*, 2011; Matthews & Endress, 2008), with some authors contending that aspirations of no net loss or net gain are not possible to achieve (Walker, *et al.*, 2009). Whatever the eventual goal, the determination of that equivalency is multi-dimensional and here three critical and commonly identified aspects: equivalency in time, space and type, are discussed.

2.3.2 Time lags

Ecological compensation is typically designed to offset an immediate loss, and the timing of the delivery of the compensation is important for whether or not this is achieved. If equivalence is not achieved at the time of exchange then the time lag experienced can have significant ecological implications (Gibbons & Lindenmayer, 2007; Maron *et al.*, 2010). Studies have shown that the timing of ecological compensation is a critical determinant of success, with temporal equivalency outweighing spatial proximity in importance (Gordon, *et al.*, 2011). Projects that result in a significant lag between loss and gain are unlikely to be successful and are difficult to secure on a legal and practical basis (Maron, *et al.*, 2010).

2.3.3 Spatial proximity

Spatial proximity relates to the physical proximity of the compensatory action to the site of ecological harm. There is value in aiming to locate them as close as possible to each other for social and ecological reasons (BenDor *et al.*, 2008). Many programmes and policies around the world limit the distance or range of possible opportunities to compensate for ecological harm on this basis (Gordon, *et al.*, 2011). Physical proximity acts to preserve ecological processes and limit the degree of difference between sites of the same habitat type (Walker, 2010). The importance of spatial proximity as an indicator of a 'good' exchange has been reduced somewhat in recent years by recognition of the value of aggregating mitigation efforts into large projects and the importance of other relevant factors in determining appropriate compensation (Gordon, *et al.*, 2011; Kiesecker, *et al.*, 2009). The practice of compensating at a distant site is becoming increasingly

common in the field of ecological compensation (Johnson, *et al.*, 2002; McKenney & Kiesecker, 2010).

2.3.4 Similarity of exchange

Similarity of exchanges is a success indicator that is commonly present in compensation schemes, often referred to as a desire for elements of exchange to be 'like-for-like' or 'in-kind' (BenDor & Riggsbee, 2011). Trading of biodiversity components relies on the ability to determine if an exchange is like-for-like, and the metrics used to demonstrate this may obscure instances of biodiversity loss (Walker, 2010). Concern that exchanges are between dissimilar components are commonly highlighted in the literature, not least because there are few accepted methods for comparing loss and gain in this context (Burgin, 2010).

2.4 Ecological compensation – the lure and the limitations

Some authors argue that ecological compensation has wide application and significant purpose (Gillespie, 2012), while others contend that its capacity to contribute positively exists within a narrow band of conditions, if at all (Walker, 2010). Here the key opportunities promised by ecological compensation are discussed, followed by a discussion of common criticisms or disadvantages of the concept.

2.4.1 Opportunities of ecological compensation

Ecological compensation is a unique opportunity to ensure that development and resource use do not persist as zero-sum games. It requires that the overall outcome is neutral or positive with respect to natural values, or at the very least a significant overall loss does not occur. Many authors have detailed the array of benefits and opportunities arising from ecological compensation (e.g. Burgin, 2008) and we discuss those most salient to a New Zealand context.

2.4.1.1 Stakeholder benefits

Ecological compensation has a suite of potential benefits to stakeholders (ten Kate, *et al.*, 2004). Developers have access to resources and a licence to operate where they agree to deliver positive conservation gains, and the concept has been said to enjoy the broad support of industry (Burgin, 2008; Christensen, 2008; ten Kate, *et*

al., 2004). Ecological compensation provides the possibility to build the trust of a community, gaining proponents a "licence to operate". Non-vested conservation interests and communities have access to a platform from which to negotiate positive conservation outcomes (Burgin, 2008), employing funding from – usually the private sector - to contribute to their activities.

The challenges of conservation are great and the resourcing is typically poor. Agencies can exploit gains from ecological compensation to assist in meeting wider goals (Burgin, 2008; Walker, 2010) including international treaty obligations (e.g. those related to the Convention on Biological Diversity), national goals (e.g. the NZ Biodiversity Strategy) and regional and local management goals. Providing for compensation also avoids the sometimes awkward decision of saying 'no' to a proposed development, because a mutually agreeable alternative pathway can be negotiated. It steers the discourse away from the yes/no binary and toward a platform of collaborative alternative decision-making.

2.4.1.2 New approaches to environmental management

It is increasingly acknowledged that the effectiveness of traditional methods of environmental management is limited and shrinking (Earl, *et al.*, 2010), and that new approaches are needed if the binary of development and ecological protection is to be reconciled (Donlan & Wilcox, 2008; Pilgrim, *et al.*, 2013; Reid, 2011). Ecological compensation may provide a means by which development and resource use contribute less to the loss of ecological capital, providing a formal mechanism to demand more effective counterbalancing of impacts and a means to raise the profile of environmental values in a development context (Burgin, 2008; New, 2009; ten Kate, *et al.*, 2004; Wilding & Raemaekers, 2000).

2.4.1.3 Strategic conservation gains

Conservation is a costly exercise and relies on significant fiscal input to generate a wide range of indirect outputs that are often not recognised on the basis of their economic value (although there is little doubt that conservation outcomes have economic value) (Eppink & Bergh, 2007; Secretariat of the Convention on Biological Diversity, 2010; *TEEB – The Economics of Ecosystems and Biodiversity for National and International Policy Makers – Summary:*

Responding to the Value of Nature 2009, 2009). Ecological compensation can provide a catalyst to attract funds from the private sector and other resource users that were perhaps untapped to date, and undertake strategically important conservation projects while providing an opportunity for alliances to be formed between the private and public sector, and between conservation agencies and developers (Burgin, 2008; Donlan & Wilcox, 2008).

2.4.2 Growing concerns

Concerns regarding the uncertainty and risk inherent in compensating for ecological harm dominate reviews of its achievements to date, and act to limit hopes for its future (BenDor & Riggsbee, 2011; Gordon, *et al.*, 2011; Walker, 2010).

2.4.2.1 Complexity of biodiversity

Several authors discuss the scientific limitations of ecological compensation at length, noting that the suggestion that natural values can be traded across time, space and even type is incorrect and thus fundamentally challenges the workability of the concept (Burgin, 2008; Clare, *et al.*, 2011; Matthews & Endress, 2008; Salzman & Ruhl, 2000; Walker, 2010; Walker, *et al.*, 2009). Efforts to commodify elements of nature are typically underpinned by nascent science and untested and often untenable assumptions and methods (Burgin, 2008; Pawliczek & Sullivan, 2011; Walker, *et al.*, 2009). It is possible that there will be pressure placed on conserving and managing the easily identifiable components of ecological systems, while more cryptic, complex, process-oriented or obscure elements disappear unnoticed (Burgin, 2008; Eppink & Bergh, 2007).

2.4.2.2 Follow-up and failure

A failure to attribute sufficient priority and resource to following up on agreements for ecological compensation has curtailed and will continue to curtail positive outcomes, as it does more widely in environmental management (Burgin, 2008; Clare, *et al.*, 2011; Hornyak & Halvorsen, 2003; Johnson, *et al.*, 2002; Matthews & Endress, 2008; Quetier & Lavorel, 2011; Race & Fonseca, 1996; Reiss *et al.*, 2009; Walker, 2010). Several reviews have been undertaken of ecological compensation in practice, generally demonstrating low rates of

compliance and significant implementation issues due to poor management of regulatory risk (BenDor & Riggsbee, 2011; Gardner, 2009; Hallwood, 2007; Hornyak & Halvorsen, 2003; Wagner *et al.*, 1997).

A failure to sufficiently enforce these requirements also undermines the entire system of resource management and results in the resources expended at the front (planning stages) of the process having been essentially wasted (Burgin, 2008; Gibbons & Lindenmayer, 2007; Keane *et al.*, 2008). This cycle self-perpetuates when the likelihood of monitoring or enforcement – or the penalties likely to eventuate – are low. Research demonstrates that proponents will make a financial decision to not undertake the works, further marring the possibility of a good outcome (Dong, 2007; Hornyak & Halvorsen, 2003; Johnson, *et al.*, 2002; Keane, *et al.*, 2008). Some ecological compensation is also not achieved due to insufficient consideration of sources of uncertainty in negotiating the requirements, such as the capacity of current scientific knowledge to carry out the works (Maron, *et al.*, 2012; Matthews & Endress, 2008; Mitsch & Wilson, 1996; Moilanen *et al.*, 2008).

2.4.2.3 Delays and adversity in the project planning process

The anticipation of ecological compensation – while presenting an opportunity for flexibility – is often a source of significant tension and delay in the process toward obtaining consent. Applicants express annoyance at matters such as the inconsistency encountered in the process, the delays that result from additional assessment costs and the cost of the compensation itself (Christensen, 2008; Greer & Som, 2010).

2.4.2.4 Symbolic policy that facilitates inappropriate development

Ecological compensation in its many forms is regarded by some authors as a symbolic concept that, while attractive in principle for the reasons above, does not result in the promised benefits and serves to do little but facilitate inappropriate development and 'pacify' those that aim to protect the environment, and that perhaps that failure will not be avoided through improvement in practice (Walker, 2010; Walker, *et al.*, 2009). The widespread and detailed analysis of the fundamental shortcomings of ecological compensation obviously calls into

question the notion of compensating for ecological harm at all, and casts significant doubt on the likely outcomes of legislative sanctioning of the approach (Burgin, 2008). Despite widespread criticism of the validity of the concept, and significant caveats upon its use, most commentators however conclude by stating tentative support for the concept notwithstanding the implementation concerns (e.g. Gibbons & Lindenmayer, 2007; Race & Fonseca, 1996). The regulatory appeal of the concept however, is something of a warning bell, signalling that agency administration of the concept is unlikely to place ecological concerns at the forefront of decision-making.

2.5 Ecological compensation – the New Zealand experience

New Zealand has been implementing variations on ecological compensation for decades, with one of the first iterations being tradable development rights in subdivision. Dominant in the history of implementation is a lack of explicit treatment in law and policy, which has created uncertainty and confusion (Memon & Skelton, 2004; Turner, 2000). New Zealand continues to implement ecological compensation on an ad hoc and piecemeal basis. In 2000, Salzman and Ruhl identified that project by project compensatory mitigation has 'failed miserably' in the United States to achieve the purported goal of environmental protection because – among other issues - it made monitoring and enforcement of requirements difficult. It is likely therefore, based on international experience that the informal implementation of ecological compensation in New Zealand, will suffer the same shortcomings.

2.5.1 New Zealand biodiversity

New Zealand is an isolated archipelago, one third of which is managed within the Crown conservation estate: just over 8.4 million ha in area of a total protected area for nature conservation purposes of 8.7 million ha (Ministry for the Environment, 2010). Human habitation has for less than 1000 years been causing significant ecological change, resulting in severe rates of loss of indigenous cover which continues today (Frances & Warren, 1999; Green & Clarkson, 2005; Walker *et al.*, 2008; Walker *et al.*, 2006). Habitat clearance is the most pressing threat to indigenous biodiversity, followed closely (and in some cases surpassed) by the threats posed by pest plants and animals (Parliamentary Commissioner for

the Environment, 2011; Walker, *et al.*, 2008). Many species of plants and animals that persist today are threatened or data is insufficient to determine their status. The land area that is enclosed within the conservation estate is not representative of the full range of ecosystems, being heavily biased towards upland habitat types (Norton & Overmars, 2012).

Among the indigenous biota, there is a globally high rate of endemism (Ministry for the Environment, 2010). An evolutionary history largely devoid of land mammals (with the exception of terrestrial bats) has resulted in various unique ecological features including a preponderance of ground-nesting birds. While these curious creatures result in high rates of endemism and a unique and appealing biota, the flipside is that New Zealand fauna is extremely vulnerable to the impacts of exotic predators. Our native flora is also subject to significant mammalian browse by introduced fauna, and displacement and out-competition by naturalised and invasive plant arrivals. The high degree of endemism gives New Zealand a global responsibility to protect its unique suite of species (Parliamentary Commissioner for the Environment, 2011) much of which is now confined to offshore islands and dependent upon high levels of human intervention to ensure its survival (Towns *et al.*, 2007).

2.5.2 The legal context of compensating for ecological harm in New Zealand

New Zealand is a signatory to the Convention on Biological Diversity, and has in place (in response) the New Zealand Biodiversity Strategy which contains national-level goals for the conservation of indigenous biodiversity (Walker, *et al.*, 2008). New Zealand's two main pieces of environmental legislation are the Conservation Act 1987 (hereafter CA), applying to the Crown conservation estate, and the Resource Management Act 1991 (hereafter RMA) which has much wider jurisdiction. Other legislation has a role to play in relation to specific matters, such as the Wildlife Act 1957, the Biosecurity Act 1993 and others. As in most jurisdictions, the permitting regime for ecologically damaging activities is a key area of focus for environmental agencies (Wood, 2010), and ecological compensation in New Zealand can form part of permissions granted for activities under both the Conservation Act and the Resource Management Act (Madsen, *et al.*, 2010; Turner, 2000).

The Conservation Act 1987 is administered by a single agency, the Department of Conservation, and operates somewhat independently of RMA-based controls (Salmon *et al.*, 2005). The Act controls the use of the Crown-owned conservation estate which occupies more than one third of New Zealand's land area. Ecological compensation is not explicitly provided for by the Conservation Act; however the Department of Conservation has, for the past three years (2010-2012), been developing guidance material in relation to biodiversity offsets specifically as the leaders of a Cross-Departmental Research Fund investigation (Department of Conservation, 2010).

Most ecological compensation in New Zealand that is required in a statutory context occurs under the RMA. The Resource Management Act is implemented, in contrast to the Conservation Act, in a decentralised system comprising central, regional and local government agencies carrying out a range of functions, often identified explicitly within the Act (Gleeson & Grundy, 1997; RMA 1991; Salmon, *et al.*, 2005). The RMA does not specifically address the concept, with the most explicit reference being embodied in the broad principle that adverse effects on the environment are to be 'avoided, remedied or mitigated', with ecological compensation having been deemed to fit within 'mitigation' for the purpose of the Act. Some Regional Plans and Policy Statements make more specific reference to the concept, as do some District Plans, while some council agencies employ internal practice notes to guide consideration of proposals that include offers of ecological compensation (e.g. Waikato Regional Council).

Inherent to the RMA is the concept of trade-offs between various societal goals including environmental protection, health and safety, economic development and cultural heritage, among others, referred to by Gleeson & Grundy (1997) as an 'uneasy balance'. In the case of ecological compensation, applicants proposing a project with significant adverse effects are entitled to offer up forms of compensation to the agency to counterbalance their impacts, which the receiving agency can consider under section 104 of the Act. Section 104 states what a decision-maker must have regard to for the purposes of the Act *(*RMA, 1991). In this way, the practice of ecological compensation relies upon control of activities such that a need to seek permission is generated (Walker, 2010).

The requirements for ecological compensation are typically secured via resource consent conditions. In some situations, ecological compensation (along with other forms of compensation) may be stated within a 'side agreement' between the proponent and a third party (Parliamentary Commissioner for the Environment, 1998). While this can occur, such matters were not a focus of the present research as access to information can be problematic as many such agreements are confidential.

Consent conditions under the Resource Management Act 1991 must adhere to three principles, called the Newbury Principles:

- The condition must be for a resource management purpose
- Conditions must relate to the authorised development
- Conditions must be reasonable

(Ministry for the Environment, 2001).

The Newbury Principles were determined in 1981 in Newbury District Council v Secretary of State for the Environment [1981] AC 578 by the English House of Lords. They were formally discussed under the RMA in Housing NZ Ltd v Waitakere City Council [2001] NZRMA 202 (CA) and the Court of Appeal determined that they were to be generally applied when considering the scope and purpose of consent conditions under Section 108 of the RMA (Nolan, 2005, NZRMA, 2001).

In New Zealand, follow-up is regulator-driven, although many individual consents require self-monitoring by the proponent (Tonkin & Taylor, 2012). The issuing agency has a statutory duty to monitor whether the consent conditions have been achieved, and to undertake enforcement as appropriate in the event that compliance is not achieved, in addition to a range of wider environmental reporting responsibilities (RMA, 1991). The Ministry for the Environment also has a statutory duty under Section 31 of the Environment Act 1986 and Section 24 of the RMA to provide advice and undertake various forms of monitoring and investigation related to matters of environmental management (Nolan, 2005). As in other jurisdictions, in New Zealand there is concern at the lack of monitoring

and follow-up in environmental management, despite significant provision in law for these to be undertaken (e.g. Laurian *et al.*, 2010).

Breaches under the RMA include failing to obtain required permission, failing to comply with conditions of permission, or other offences such as failing to comply with general duties laid down in the Act. The potential penalties under Section 338 of the Act are significant if prosecution is pursued, with a maximum fine of $600,000 and a potential imprisonment term of up to two years. Besides prosecution, there is a range of enforcement tools under the RMA including infringement fines, abatement notices and enforcement orders (Nolan, 2005).

2.6 Evaluating compensation in a policy vacuum

The effectiveness of environmental regulation, policy and management is dependent upon the quality of implementation and outcomes, which are rarely systematically reviewed (Bennear & Coglianese, 2004; Gardner, 2009; Laurian, *et al.*, 2010). A lack of post-implementation evaluation may be due to a lack of time, commitment or expertise, or a general reluctance to reveal inefficiencies or failures (Laurian, *et al.*, 2010). Follow-up of environmental provisions is critical to closing the policy loop, and providing sufficient feedback to improve approaches and enhance outcomes. This gap in analysis is serious, particularly with respect to certain phenomena such as the management of cumulative effects that may only be understood through systematic assessment (Morrison-Saunders, *et al.*, 2001).

Several authors have discussed the use of ecological compensation in New Zealand, (Christensen, 2007, 2008; Memon & Skelton, 2004; Norton, 2007, 2008), but an empirical and systematic analysis has been missing to date. In undertaking this research, a conscious choice was made to maintain a focus that was able to provide an objective analysis of current use and to provide recommendations on future implementation of ecological compensation.

The evaluation of the use to date of ecological compensation in New Zealand has been very limited. Much of the analysis of the concept, and the genuine attempts to formulate parameters for it have been confined to the consideration of specific instances within case law (Christensen, 2007, 2008, 2012; Gillespie, 2012;

Memon & Skelton, 2004; Norton, 2007; Stephens, 2010). Several regional councils and some district councils have also introduced ecological compensation into their planning and policy documents during plan review processes (e.g. Horizons Regional Council, Environment Canterbury and Auckland Council), and this trend is likely to continue as the appetite for certainty drives a proliferation of lower level policy. This proliferation may continue to create variable outcomes, and a lack of national guidance may result in significant variation in outcomes that then become the subject of lengthy review processes, particularly where provisions depart from best practice or are likely to generate perverse outcomes. A systematic evidence basis from which policy development and implementation guidance can be developed is long overdue.

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Chapter 3

Methods

3.1 Research proposal

An empirical approach defines this research, as it aims to address and quantify a gap in knowledge of how ecological compensation is being practised in New Zealand under the RMA. The research aimed to establish a baseline understanding of implementation in New Zealand to date, with the proposed outcome to be a series of recommendations as to how better to address the concept in policy, practice and follow-up. It was also likely that, as a foundation project, the research would reveal areas of future inquiry that would further assist in improving outcomes.

It was possible to conduct this study in relation to both the Conservation Act 1987 and the Resource Management Act 1991. But given the degree of development on private land in New Zealand, it was assumed that the bulk of exchanges were undertaken within the RMA regime, rather than the Conservation Act 1987. In addition, initial inquiries revealed that the information was easier to access with respect to resource consents than access arrangements and concessions. Determining that the focus would be upon ecological compensation agreements within resource consents under the RMA led to the development of the key research question:

What outcomes are associated with ecological compensation agreements under the Resource Management Act 1991 and how might the variation among outcomes be explained?

Most of the reviews of ecological compensation around the world had focused on one of three topics: compliance, practice and stakeholder perspectives. Authors have investigated levels of regulatory compliance with ecological compensation requirements (Hornyak & Halvorsen, 2003; Matthews & Endress, 2008), researched the ways in which the concept is applied in practice (Cowell, 2000; Rega, 2013) and, finally, taken time to collect the views of stakeholders involved in ecological compensation (Hayes & Morrison-Saunders, 2007). All three topics were of interest and we undertook to carry out a study addressing each on a national scale in New Zealand under the RMA.

3.2 The research process

Ecological compensation is not a phenomenon typically subject to rigorous review. The concept is technically complex, and the context in which it is employed is multi-dimensional. Designing a research programme to effectively describe the implementation of ecological compensation relied on finding a way to investigate more than one aspect of the implementation, and a pure quantitative or qualitative approach was likely to be inadequate. As such, I opted to use a 'mixed methods approach' (Tashakkori, 2009). Mixed methods is defined as a research process *"in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry''* (Tashakkori & Creswell, 2007, p. 4). The present research is evaluative, and the use of mixed methods approaches enjoys particular support for such applications (Bryman, 2006).

Mixed methods draws on the strengths of both qualitative and quantitative tools, acts to offset some of the weaknesses of each by combining it with the other, contending that neither on its own is adequate (Bryman, 2006). It also enables the two very different forms of inquiry to be used together to best effect, arguably enriching the research findings and having greater explanatory power (Fielding, 2012). The use of a mixed methods approach must have a purpose, and in this example the chief purpose is triangulation around a complex research area (Bryman, 2006, Cresswell, 2003).

The use of multiple approaches found within mixed methods research was described by Fielding (2012) as having three key purposes (illustration,

convergent validation/triangulation and analytic density). All three purposes are relevant to this study, but of them triangulation is the most pertinent. Triangulation provides for the same phenomena to be examined from multiple angles, with each angle augmenting the rigour of the others and providing overall greater validity to the research findings. Given the lack of contextual understanding of ecological compensation in New Zealand that was available to inform the research approach, mixed methods ensured a range of data was collected to build a multi-faceted view of the concept and issues.

The present research began with an investigation of regulatory compliance with ecological compensation, a project that used a quantitative approach and drew on a number of similar studies worldwide as already discussed. The mixed methods approach formed somewhat organically due to a growing realisation that the complexity of the context would likely render numerical analysis somewhat shallow, and that a combination of approaches would have greater explanatory power.

The quantitative assessment of regulatory compliance drew upon practitioner experience in compliance assessment and yielded interesting data. In examining this data and the concurrent literature reviews, it became clear that not only was it important that compliance was achieved, but that the requirements of the resource consents were robust. As discussed in the Introduction, there is no formal policy framework for ecological compensation in New Zealand that contains ‘clues’ as to the expectations of agencies and the wider public as they relate to ecological compensation. Once a decision was made to delve deeper into analysing the case studies, it was necessary to determine an appropriate means of assessment, in the absence of a widely used framework. A framework would provide a consistency and transparency to the analysis of implementation, would be useful in limiting observer bias and avoiding unfair assessments of practice.

In the year the research was being planned (2010), McKenney & Kiesecker published ‘Policy Development for Biodiversity Offsets’, an analysis of a wide range of offset frameworks worldwide. The authors identified a suite of six key implementation issues from the schema and distilled both a definition of each issue and demonstrated its assessment in practice. Another possible alternative

was the recently developed principles from the Business and Biodiversity Offsets Programme (BBOP). BBOP principles were developed in a voluntary context, assuming minimal regulation and very low agency capacity. McKenney & Kiesecker by contrast were developed to characterise a range of contexts, with different levels of agency capacity and regulatory specificity that, ultimately, had greater utility for the assessment task. The flexibility of the McKenney and Kiesecker framework, along with the clarity of the concepts and ease of application to a New Zealand context saw it adopted for the purposes of this research.

Early in the research, a means of gathering views of practitioners was considered, and the original proposal included conducting a limited-recipient survey, likely web-based for ease of communication and analysis. As stated earlier, a growing appreciation for the value of qualitative approaches and discussions with social scientists cast doubt on the ability of web-based surveys to be of help. On recommendation of an expert practitioner, an interview approach was selected in lieu of a web-based survey. The interview would be based on a series of questions developed in association with practitioners and designed to understand the interviewee's views on the current implementation of ecological compensation, and how it may be improved.

A semi-structured interview approach allows for an interview to proceed as a conversation would, but to do so via a series of talking point questions of significance. Semi-structured interviews are an optimal method for collecting detailed information on a complex concept, providing for both closed-response questions and open responses (Kaplowitz, 2008). Interviews would be conducted over the phone in most cases, but in person where time and spatial proximity allowed.

3.2.1 Case studies

To carry out an investigation of both levels of regulatory compliance and practice under the RMA a case study approach was used, of consents that required ecological compensation under the RMA (Crowe *et al.*, 2011; Gillham, 2000). The present research aimed to collect a minimum of 40 case studies from around the country to ensure that a large degree of variation was captured, including

where appropriate, salient cases of interest and high public profile. It is optimal for statistical purposes that a suite of case studies may be considered to be representative and random. Unfortunately, New Zealand does not have a standard recording system for resource consents, with each local government agency managing its own database independently. Further, whether or not ecological compensation is required within the consent is rarely recorded in a way that would enable appropriate consents to be separated out from the rest of them. As such, random selection was not possible, so other strategies were employed to help enhance representativeness in the sample set.

All regional councils were approached around the country (to ensure geographic spread of examples, and a nationwide dataset) to provide examples of cases they were aware of. Several district councils were also invited, and a number of high profile cases were added, that illustrated particular pertinent aspects. Information was subsequently collected on 110 suitable case studies in total. The information included ecological reports, submitters' information, officers' reports on behalf of the council and other material such as approved plans. Other cases were also offered but excluded because they did not meet the criteria (see Table 1 of Chapter 4). Most commonly a case was excluded because ecological compensation was not required as a specific condition of the resource consent. This scenario was surprisingly common, in which the officer providing the case studies had been aware of ecological compensation being discussed, but the condition requiring it not being specified in the consent. These cases were excluded, but did illustrate that the connection between ecologists and other specialists in council with the consent-writing planning officers were often loose, and that poor communication could act to constrain outcomes (i.e. if a condition is not in the consent requiring something, failure to undertake it cannot be met with appropriate follow-up and enforcement action). Each consent case study was then subject to a systematic evaluation that is detailed across a number of forms, designed to standardise the information collection process (Appendix 1-5).

Figure 1: Map of New Zealand showing location of 110 case studies

3.2.2 Compliance

The formulation of ecological compensation agreements is the first step in a process that may be intended to take decades or even centuries. Assumptions of perfect compliance (i.e. that rules and requirements will be adhered to) is pervasive in natural resource management, but rarely supported by fact, and taking for granted that rules and restrictions are followed will result in negative outcomes for the environment (Keane, *et al.*, 2008). The lack of follow-up and monitoring of compensatory actions is an oft-cited shortcoming of ecological compensation (Gibbons & Lindenmayer, 2007; Hornyak & Halvorsen, 2003; ten Kate, *et al.*, 2004; Walker, *et al.*, 2009), with Gibbons and Lindenmayer (2007) contending that the success of such mechanisms is 'ultimately dependent upon adequate compliance'.

The research aim was to discern the level of regulatory compliance with ecological compensation in New Zealand, to compare it with the levels observed elsewhere in the world. Studies around the world have typically evaluated compliance with requirements to provide a picture of the reliability of agreements and to reflect the rigour and efficacy of the related enforcement. For example, a factor that is thought to have an impact on whether a consent holder complies with the terms of their permission is perceived likelihood of enforcement (Hornyak & Halvorsen, 2003).

The international literature also suggests that a deeper understanding of the reasons behind non-compliance is likely to be more helpful than simple percentage rates of satisfactory action (Clare, *et al.*, 2011; Keane, *et al.*, 2008). To more deeply investigate compliance, it was decided to examine variables related to each consent, for their correlation with compliance to assist in providing a deeper understanding of how outcomes might be improved. Variables in the planning process include the nature of the applicant, the type of activity and the way in which the requirements are specified through to whether a proposal is notified for public comment.

Compliance can be a difficult area to investigate as access to sites and information can be problematic (Keane, *et al.*, 2008). In addition, an absence of clear performance standards can make compliance difficult to determine as

requirements are unclear (Environmental Law Institute, 2004). However, despite the challenges, understanding the nature and extent of non-compliance is the first step in meaningfully addressing implementation issues related to compliance and to enhance the overall effectiveness of natural resource management.

Key question 1

What are the levels of compliance with ecological compensation requirements in consents under the Resource Management Act 1991, and how might variation in compliance levels be explained?

Addressing this question demanded an ex post facto analysis of outcomes already achieved, comparing them with the outcomes intended via regulation. To achieve this, reliable measures of outcomes were needed (Bennear & Coglianese, 2004). Determination of success or failure is reliant upon having goals established in the first place, either policy-based or on a project basis (Matthews & Endress, 2008). The 'goals' of the case studies were the conditions of the resource consent issued in respect of the project that explicitly related to ecological compensation.

The conditions of resource consent were the most reliable manifestation of the goals of each individual project as they are project specific and enforceable. Conditions may compel actions, set timelines or otherwise outline performance standards. Compliance was assessed independently of the issuing agency due to variability in agency record-keeping, the age of the consents, and the advantage of greater objectivity (as in Johnson, et al., 2002). Some studies have undertaken the assessment of compliance without visiting the site in question and/or the location of the compensation activity (Hornyak & Halvorsen, 2003). The present research included a site visit to help the researcher understand the context of the activity should be undertaken whenever possible. Compliance was assessed between 1 October 2010 and 28 February 2011, either visually on-site or by reviewing agency records and discussing the case with key informants, or a combination of the two approaches.

While further detail is provided in Chapter 4 on the research process, it is essential to explain the use of the compliance scale (see Table 2 in Chapter 4). The compliance scale was used to analyse and describe the degree of compliance that

an applicant had achieved with each condition. The scale had four categories, where 0 reflected that no effort had been made to achieve compliance, through categories 1 and 2 which were lesser degrees of non-compliance and the final category of 3 that denoted compliance with requirements. Scales describing extent of non-compliance with a requirement are in common usage around the country and the world, and provide a more meaningful reflection of legality than a mere 'yes' or 'no' binary. Importantly, only conditions which are fully complied were considered compliant, with the other categories representing *different degrees of non-compliance*.

3.2.3 Practice

The importance of compliance is negated where the requirements to be completed fall well short of achieving equivalency in terms of loss and gain. For this reason, compliance with regulatory requirements is not necessarily a reliable indicator of ecological outcomes generated by a project (Matthews & Endress, 2008; Race & Fonseca, 1996). The research aim of this section was to evaluate how key matters related to ecological compensation were considered in practice (i.e. during the processing of a resource consent), and what the nature was of ecological compensation agreements that are negotiated under the RMA. This would enable the quality of the exchanges to be better understood, while determining how widely-discussed concepts such as 'additionality' might be assessed in a New Zealand context.

Key question 2

How is ecological compensation considered in practice by agencies under the RMA, with respect to key implementation issues?

Little guidance is available to practitioners in New Zealand on what matters they must have regard to in respect of ecological compensation. The use of ecological compensation is also not considered in national monitoring programmes, limiting the possibility to improve implementation through feedback loops. In the absence of specified guidance, policy or goals the framework proposed by McKenney and Kiesecker (2010) was used to drive the assessment, due to its broad applicability. The key implementation issues identified by McKenney & Kiesecker provided a

framework to consider the exchanges that were encountered and to determine the way the issues are recognised in the present ad hoc regime for ecological compensation. McKenney and Kiesecker also discussed related issues such as the mitigation hierarchy, the goal of no net loss and the implications for landscape level planning. The present analysis includes discussion of these matters also.

3.2.4 Stakeholder perspectives

In the absence of significant guiding policy and decision support for ecological compensation in New Zealand, the ability to evaluate the implementation of ecological compensation is constrained. New Zealand has had significant experience with compensatory mechanisms which, to date, had not been collected in a manner that was systematic and able to contribute to a policy context. The present research therefore proposed to use interview methodologies to collect the views of practitioners involved in the concept on the nature of the strengths and weakness of the approach and how it may best be addressed in future.

This element of the research was deemed necessary in light of several studies around the world which note the value of engaging with practitioners via interviews or questionnaires when attempting to understand the implementation of ecological compensation and other environmental issues and events (Carruthers & Neis, 2011; Clare, *et al.*, 2011; Hayes & Morrison-Saunders, 2007; Murphy, 2006; Salzman & Ruhl, 2010-2011; Seabrook-Davison *et al.*, 2010; ten Kate, *et al.*, 2004). A programme of interviews would reflect broad opinions and experience from practitioners in New Zealand, enabling comparison both between New Zealand and the rest of the world as well as the ability to consider the breadth of views between individuals and sectors.

Key question 3

What are the perspectives of stakeholders on the implementation of ecological compensation under the RMA and possible improvements that are required?

Interviews have commonly been used to discern the practices and perspectives of end-users in environmental management and were considered likely to provide a valuable dimension to our investigation as they had for similar studies worldwide (Carruthers & Neis, 2011; Hayes & Morrison-Saunders, 2007; Kaplowitz *et al.*,

2008; Seabrook-Davison, *et al.*, 2010). A combination of self-selection and a key informant approach was used for the semi-structured interviews (Kaplowitz, *et al.*, 2008; Tremblay, 1957). As discussed earlier, semi-structured interviews enabled a deeper engagement with the subject matter and interviewee than other possible methods (i.e. web-based survey).

In situations where analysis methods are not envisioned or planned for, the usefulness of interview data can be constrained (see discussion of interview data outcomes in Johnson, *et al.*, 2002). Thematic and content analysis techniques were used to analyse to open-ended questions, coding the frequency of types of responses to understand dominant views and divergence across sectors. Conversion of the coding into percentages enabled these to be expressed numerically for ease of communication of results. Several papers on ecological compensation and biodiversity management more generally discuss actual or suspected divergence in views and aims across different groups such as developers, agencies and non-vested conservation interests (Burgin, 2008; ten Kate, *et al.*, 2004; Walker, *et al.*, 2009; Walker, *et al.*, 2008). In response, the aim was to ascertain whether significant differences were present in the dataset. The chi-squared test was used to test for significant differences in categorical responses, and otherwise employed simple data presentation methods such as frequency tables (Agresti, 1996; Braun & Clarke, 2006; Kaplowitz, *et al.*, 2008). Given the highly applied nature of the research, and the need to eventually clearly communicate the results to end-users, the research approach intentionally favoured simple analysis and data presentation.

3.3 Assumptions and Limitations

The present research into ecological compensation was made challenging by the lack of prior empirical inquiry in New Zealand, a lack of explicit treatment of the concept in law and policy and a poor understanding of the extent to which the concept is applied within New Zealand. In restricting cases to those consents issued under the Resource Management Act 1991, some of the ambiguity in practice was addressed. While not explicit in stating expectations of ecological compensation, the RMA does contain a suite of standardised processes that underpin the use of the tool (for example, it contains requirements for

Assessments of Environmental Effects, the RMA equivalent of an Environmental Impact Assessment).

A formal definition of ecological compensation was also (and remains) missing from New Zealand law and policy, with discussions in jurisprudence and practice often focussing on the perceived distinctions between 'mitigation', 'offsetting', 'compensation' and other terms found within the field (including most recently in High Court hearing over the approval of the Escarpment Mine on the Denniston Plateau). A general definition was formulated (later accepted into the published literature) and used that to define ecological compensation throughout the research process. The definition of ecological compensation for the purpose of the present research therefore, is:

> *"Positive conservation actions required by resource consent, and intended to compensate for residual adverse effects of development and resource use"*

An important assumption made, was that the implementation issues were likely to be the same for any requirement that met the above definition. This assumption was made on the basis of practitioner experience, and is likely a fair one, but it is important that it is stated.

A major limitation of the study was the inability to sample a random selection of case studies or interviewees, due to the specialist nature of the inquiry (i.e. only certain individuals were likely to have experience working with ecological compensation). To that end, it is accepted that the views and results pertaining to compliance may not constitute a statistically representative picture of practice as it stands. However, to address this obvious contextual constraint, a number of methods were employed, such as:

- Undertaking analysis of large samples of data, rather than a small number to improve the likelihood that variability would be captured.
- Using a range of communication methods to invite participants and case study contributions, to improve the diversity of data sources.

- Undertaking the study on a nationwide basis, and approaching a wide range of geographically distinct areas to gather regional experience of ecological compensation

Undertaking the compliance assessment required access to a large number of documents and access to the land or area in which the ecological compensation was carried out. This was because earlier considerations discounted using agency records to determine compliance due to their variability and incompleteness, and inconsistency in record-keeping across jurisdictions. A key limitation of the research therefore, was the ability to fairly assess compliance based on the information available, and whether or not access to land (usually private) could be obtained. If some of the compliance levels were determined second-hand via agency records, then the results may not be comparable enough to fairly aggregate them with researcher-led analysis. Therefore, assuming that access to records and land could be obtained, the research proceeded on the notion that the same analysis would be applied to all case studies irrespective and independent of the quality of monitoring data associated with them.

In respect of both the case studies and interviews, a major assumption was that there would be agencies, landowners and participants of suitable background willing to be involved. Low response rates would constrain any ability to provide analysis of practice and outcomes that could be generalised. The cost constraints also demanded that most of the interviews were conducted over the phone. Interviews over the phone may constrain communication opportunities and limit the depth of discussion, when compared with in-person communication.

A key assumption (typical of applied research) was that the outcomes would be relevant and useful to stakeholders. Approaching the research from a practitioner background was likely a strength in respect of this classic limitation. Constant engagement with end users and making an effort to remain in tune with developments in the field (both academic literature and professional practice) was an important dimension of improving applicability of results.

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Chapter 4

Ecological compensation: an evaluation of regulatory compliance in New Zealand[1]

4.1 Abstract

Ecological compensation is an example of a trade-off whereby loss of natural values is remedied or offset by a corresponding compensatory action on the same site or elsewhere, determined through the process of Environmental Impact Assessment (EIA). Ecological compensation actions are often criticized for having low levels of compliance: meaning that they are achieved only partially or not at all, while development activity proceeds with much greater certainty. Our research investigated compliance with 245 conditions relating to ecological

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compensation across 81 case studies across New Zealand under the Resource Management Act 1991.

Our research shows that present tools and practice in New Zealand are not adequately securing the necessary benefits from ecological compensation requirements, with 35.2% of requirements not being achieved. Significant variation in non-compliance with ecological compensation occurs between different activities, applicant types and condition types, while critical variables within the planning process influence levels of compliance. Our research demonstrates the importance of understanding the nature of non-compliance and of providing a consistent and robust decision-making framework for the consideration of ecological compensation in practice.

4.2 Introduction

Ecological compensation is a positive conservation action that is required to counter-balance ecological values lost in the context of development or resource use, and is an intentional form of trade (Morrison-Saunders & Pope 2013). Trade-offs are determined through Environmental Impact assessment (EIA) which provides a framework for decision-making in relation to projects with adverse environmental effects. EIA enables the effects of a proposal to be predicted and for the development and agreement of appropriate ways in which to mitigate them (Bailey & Hobbs 1990; Bailey *et al.* 1992; Marshall 2001).

Evaluation of the use of ecological compensation internationally has found common themes of poor administration, failures of implementation, low scientific capability to deliver required outcomes, high risk of non-compliance and a lack of enforcement; reducing the effectiveness of policies and practice designed to safeguard ecological values (Gardner 2009; Gibbons & Lindenmayer 2007; Gillespie 2012; Hornyak & Halvorsen 2003; Maron *et al.* 2012; Race & Fonseca 1996; Walker *et al.* 2009). This research paper focuses on the nature of non-compliance as it relates to ecological compensation. Of concern is that if compensation requirements do not materialise as agreed, then allowing those trade-offs does little but facilitate negative impacts on the environment (Bekessy *et al.* 2010). They also serve to undermine the credibility of impact assessment

processes and environmental regulations if the outcomes realised regularly fall far short of expectations (Hornyak & Halvorsen 2003).

In New Zealand, the principal legislation that relates to ecological compensation is the Resource Management Act 1991 (the "RMA"), which sets out impact assessment (termed an 'Assessment of Environmental Effects' or AEE, outlined in Schedule 4 of the Act) within a sustainable management regime that mandates the avoidance, remediation or mitigation of adverse effects (Jackson & Dixon 2006; Morgan 2012; *Resource Management Act 1991 (RMA)* 1991). Other than this broad mandate to address effects, there is presently no nationally agreed policy, guidance or legislation that articulates the concept of compensating for ecological harm through trade-offs, or that sets overall outcomes to be achieved (Department of Conservation 2010; Gillespie 2012; Madsen *et al.* 2010; Memon & Skelton 2004; Turner 2000). For example, Borrie et al (2004) argued that practice in New Zealand was lacking in comparison to other jurisdictions due to policy ambivalence, implementation and enforcement issues and the lack of sufficient security measures available to ensure gains are realised and protected, noting:

> *"we are profoundly concerned about this situation because it is already leading to the cumulative loss of New Zealand's valued biophysical environments".*
>
> (Memon *et al.* 2004 p.85)

Assuming that ecological compensation in some form or another is likely to persist as a policy tool, it is vital to improve the levels of compliance with compensation conditions and to better understand the nature of non-compliance, such that improvements can be made to the pre-decision stages of environmental impact assessment to reduce risk of default (Marshall *et al.* 2005). This research focussed on examining the levels of regulatory compliance with ecological compensation requirements in resource consents. We investigated what factors contributed to variation in those levels through a post-project implementation audit, based on 81 case studies, assessing compliance with 245 conditions that specifically related to ecological compensation.

4.2.1 Definition

A broad definition of ecological compensation for the purposes of this research was favoured in order to capture the range of current practice in New Zealand. Existing definitions were not appropriate, because they referred to matters that are not legally required in New Zealand including observation of the mitigation hierarchy and a goal of no net loss of biodiversity. The mitigation hierarchy places preference on avoidance of adverse effects, followed by minimisation of them and then, if required, the mitigation or offsetting of residual effects (McKenney & Kiesecker 2010). The observance of a mitigation hierarchy often occurs in practice in New Zealand (and indeed, is inherent within environmental impact assessment generally), but there is no statutory requirement or national level policy that requires that adherence to it be demonstrated. No net loss of biodiversity, which is commonly highlighted as a point of difference between biodiversity offsets and more conventional 'mitigation' (Brownlie & Botha 2009; Gardner & von Hase 2012; McKenney & Kiesecker 2010; Moilanen *et al.* 2008). The goal of no net loss of biodiversity also does not exist in New Zealand legislation, although it is referred to from time to time in relation to specific cases.

In the absence of an appropriate existing definition, ecological compensation is defined in the present research as:

> *"Positive conservation actions required by resource consent, and intended to compensate for residual adverse effects of development and resource use"*

The compensatory requirements encountered in this research were referred to as mitigation, compensation or biodiversity offsets, were undertaken both onsite and offsite, and were both in-kind and out-of-kind exchanges. All shared the broad intention of counterbalancing the ecological impacts of the development in question by undertaking a project that had a positive conservation benefits (restoration, habitat creation), and were in addition to activities that sought to mitigate adverse effects directly (e.g. sediment control). Several requirements encountered would perhaps fail to strictly qualify as compensatory actions depending on the circumstances (e.g. translocation, which is considered 'avoidance' more than 'mitigation'); however they were treated in the consent as

being intended to achieve the same purpose, so were subject to the same assessment. The validity of the requirements is not the subject of this research paper.

4.2.2 Research objectives

The present research aimed to answer three key questions:

Determining compliance - what are the levels of compliance presently being achieved with ecological compensation requirements in resource consents?

Determining variation in compliance - does the level of compliance differ between different types of activities, applicants and conditions, and in what ways?

Determining predictors of compliance - what process and consent variables are predictors of compliance?

4.2.3 Determining compliance

A lack of policy goals in New Zealand related to ecological compensation meant typical policy evaluation methods (Bennear & Coglianese 2004; Laurian *et al.* 2010) could not be used for the present research. A case study approach was instead employed, whereby cases were assessed for their compliance with consent conditions. The assessment of compliance was undertaken independent of agency monitoring records (often observed to be missing, incomplete or out of date) to ensure a consistent assessment across different councils. All conditions assessed were legally binding under the RMA – case studies that did not have specified enforceable compensation requirements were excluded from analysis. Projects were at varying stages of completion, but conditions were only assessed if sufficient time and progress had been made to assess it. Only the conditions that related to the ecological compensation were assessed, and were taken as a surrogate for goals of the policy tool in the absence of policy and guidance being available.

4.2.4 Determining variation in compliance

We determined that assessing compliance was the first step for this research, but that understanding the complexities of non-compliance was important as there is

very little information, empirical data and peer reviewed literature in New Zealand on this important topic. Non-compliance is not typically uniform across all activity types, applicants and types of requirement (International Network for Environmental Compliance and Enforcement 2009; Ministry for the Environment 2008; Shimshack 2007). In discussions throughout the country, most expert practitioners were easily able to recount the industries and other activity types that both dominated the consent application figures and those that were known to be non-compliant more frequently than others. Therefore, the principal activity that pertained to each condition was compared with compliance to investigate if there were differences in compliance between activity types in RMA consents. Applicants were grouped into 3 categories to compare relative compliance: public organisations, private companies and private individuals. A 'public organisation' for the purpose of this study included state-owned enterprises (registered companies that were typically former government departments, now operating on a commercial basis under the State-Owned Enterprises Act 1986) and agencies such as councils.

Some types of conditions were widely considered by the experts consulted in the planning of the research programme to be more likely to be complied with than others, for reasons of the availability of expertise, resourcing and other variables. The 245 conditions were clubbed into two categories comparing conditions which were administrative and non-administrative (i.e. action-based). The conditions were then further split into 14 groups that aligned broadly with their goals or purpose (as in Matthews and Endress, 2008) and compliance between those groups was compared.

4.2.5 Determining predictors of compliance

The present research examined the role that variables in the planning process and variables relating to the content of the consent play in predicting or otherwise influencing compliance. Understanding this role is important for ensuring that the impact assessment process, as far as possible, manages the risks of trade-offs. 'Process variables' related to the impact assessment process (presence of a professional ecologist, early mention of compensation in the process, compensation proposed by the applicant, detailed plan required before granting

and public notification of the proposal) while ‘consent variables’ related to the requirements in the consent and nature of the trade-off (timing of the compensation action, requirement for an RMA bond, requirement for monitoring by the applicant and the presence of a review condition). An assessment of correlation with compliance was undertaken for the following variables to shed light on critical elements of the impact assessment process with respect to managing trade-offs.

4.2.5.1 Process variables

Professional input and assessment is widely considered to be an essential component of establishing and implementing robust exchanges in the context of ecological compensation (ten Kate *et al.* 2004), and maintains a degree of scientific rigour in respect of environmental management more broadly (Morrison-Saunders & Bailey 1999). The compliance of cases where the input of a professional ecologist had been engaged by the applicant was therefore compared with where the applicant had proceeded through the process without that advice.

Early mention of ecological compensation in the process of impact assessment is good practice, as it enables a full analysis of the likely costs and benefits of the requirement (Morrison-Saunders & Pope 2013). Compliance in cases where there was clear evidence that the compensation had been discussed early in the application stages was compared with those where it was first considered very late in the process (such as in response to submitters at the hearing). Cases where the applicant had scoped and proposed the nature of the ecological compensation were also compared with where the council had proposed it, in a similar way to Bailey (1992) which distinguished between conditions that were proposed by the applicant and those imposed by the agency. This distinction was determined from reviewing the background information and officers’ decision report under section 42(a) of the RMA.

Although it could be considered best practice, it is not a legal requirement that detailed plans for compensation requirements are provided to the agency prior to the decision, and for many reasons this requirement is delayed to a nominal period following granting (often, six months). In many cases, this approach has practical

reasons, particularly for sites that require significant geotechnical modification. Delaying detail also enables the planning process to be sped up on the promise of more information to be submitted in broad accordance with an overall plan, but this promise is often not fulfilled. Whether or not a detailed plan was available at the time of decision was recorded for each case study.

Resource consent applications are sometimes publicly notified under section 94 of the RMA, if they are likely to result in significant effects beyond the subject site (RMA,1991). This forms the 'public participation' opportunity commonly referred to within impact assessment and invites additional scrutiny from the wider community of a given proposal (Morrison-Saunders *et al.* 2001; Morrison-Saunders & Early 2008). Compliance for conditions that were publicly notified was compared with those that were processed on a non-notified basis.

4.2.5.2 Consent variables

Timing of when a compensation action is required to be delivered affects the certainty of its delivery (Gardner & von Hase 2012; Greer & Som 2010; Maron *et al.* 2012; McKenney & Kiesecker 2010; Walker *et al.* 2009). Requiring benefits from compensation actions to be demonstrated in advance of a project have self-evident advantages over those that are undertaken concurrent with or following a project. The timing of the compensation actions were divided between those which were required in advance, concurrent with, and required following the development, and their relationship with compliance compared.

A bond required under section 108 (*Resource Management Act 1991 (RMA)* 1991), an "RMA bond", acts as a form of insurance on works required within a consent. A cash or bank guaranteed payment is made up front. In the event of a default by the applicant to meet bonded requirements, the agency is granted the ability to uplift the funds and carry out the required works. Compliance with conditions that were part of cases that had RMA bond requirements was compared with cases where section 108 had not been used in respect of those conditions.

Monitoring of the actions and outcomes related to a project and the mitigation requirements that are present is a fundamental requirement of impact assessment follow up and good resource management practice and should be 'extensive and

long-term' (Bailey *et al.* 1992). For each condition, it was recorded whether or not the relevant consent also contained a condition for the applicant or its agent to undertake monitoring.

The inclusion of a review conditions is standard practice in RMA consenting, although they are rarely triggered (Milne 2008). The review condition is based on section 128 of the Act which provides for the issuing agency to serve notice on the applicant of a decision to review the conditions of the consent for a range of possible reasons, including unforeseen level of adverse effects (*Resource Management Act 1991 (RMA* 1991). We tested whether the presence of such a condition did have a relationship with compliance in this study, in that its inclusion in consent conditions would act as a deterrent to non-compliance, although it was expected that it would not due to rarity of usage.

4.3 Methodology

The methodology used case studies to analysing compliance with ecological compensation requirements, which is a common approach in the literature to date (Breaux *et al.* 2005; Hornyak & Halvorsen 2003; Reiss *et al.* 2009). Case study-based research is valuable for examining, at a detailed level, complex phenomena in context (Cassell & Symon 2004). In this research, investigation of a wide range of case studies enabled systematic micro-scale evaluation of EIA as outlined in Marshall et al (2005). The way case studies were selected is described, followed by the methodology applying to addressing each of the three research questions.

4.3.1 Case study selection

For this research, regional and district councils were asked via email to provide examples of case studies that matched our criteria (Table 1).

Table 1. Case study criteria for data requested from Councils.

Permission to have been issued between 1 Jan 1992 and 31 Dec 2010 under the Resource Management Act 1991
Permission to have pertained to a negative effect on the biophysical environment, including but not limited to: resource take, vegetation clearance, discharges to land or water, stream, waterway or coastal modification under a Regional or District Plan
Permission to have included a negotiation for ecological compensation under the Resource Management Act 1991
A reasonable time has elapsed, such that the activity for which permission was granted ought to have been carried out
Sites in which permission from both regional & territorial authorities were required are acceptable
Sites in which an outline plan has been submitted with respect to a designation are acceptable, providing the compensation can be clearly attributed to the activity that the outline plan shows
The compensation can be anything negotiated through the planning process; from planting, species translocation, financial contributions etc.

Random selection was not feasible for several reasons:

- There is no central national repository of consent information
- There is rarely any recording of compensation requirements in council filing systems
- Information collection and consent administration processes are highly variable across councils

The numbers of cases provided by the councils varied from one through to 12, with 110 offered across all regions of the country. Of those 110 cases, 81 had sufficiently progressed to enable compliance to be ascertained. Several prominent cases were also included at the suggestion of expert advisors to both increase the sample size and to capture important examples. The statistical significance of the

sample size is not able to be determined, because agencies do not record the total number of consents issued with ecological compensation requirements each year.

The case studies were located all over New Zealand, in every region of the country and all related to one or a bundle of consents issued by a district or regional council (sometimes both). The most common form of compensation action was planting, such as habitat creation, restoration or enhancement. Other requirements included pest control, financial payments and the formal handover of tenure to an agency (vesting). Many of the trade-offs were indirect or loose, where quite dissimilar ecological values were exchanged (i.e. stream diversion and riparian corridor loss in exchange for restoration planting of hill slope habitat). This scenario is common in New Zealand where quantification and demonstration of ecological equivalence is not mandated.

4.3.2 Determining compliance

Previous studies overseas have found that low levels of routine consent monitoring and poor record-keeping by agencies have made desktop analyses of compliance, based on requested monitoring files, inadequate (Hornyak & Halvorsen 2003; Reiss *et al.* 2009; Walker *et al.* 2009). Reducing the reliance on agency record-keeping therefore seemed essential for the present research. As a result, the determination of compliance levels achieved with the 245 conditions was generally undertaken onsite; supported by an independent review of the relevant consent files, consultation with stakeholders, and investigation into other monitoring and financial data held by the issuing council (e.g. transaction information for the purpose of tracking a bond or financial payment). To assess compliance, a multi-point scale (Table 2) was used, similar to those commonly used by regional and district councils in enforcement and in previous studies of condition compliance (Breaux *et al.* 2005; Environment Canterbury 2009; Tonkin & Taylor 2012).

Table 2. The compliance scale used to assess each case in this study.

Compliance scale	Description
0 – No compliance	No apparent attempt to achieve compliance with the stated condition
1 – High level of non-compliance	Minor or insignificant attempt made to achieve compliance
2 – Medium level of non-compliance	Significant effort apparent in meeting the condition, but falls short of full compliance
3 – Satisfactory compliance	Acceptable compliance that is within a practical margin of error and minor flexibility

The compliance with conditions was assessed on a 0-3 scale as detailed in Table 2, rather than a simple 'yes' or 'no' mark to reflect that degrees of non-compliance are often present and to make the dataset more meaningful. A score of 0 was given where no effort was apparent to meet the conditions, and a score of 1 was given when some effort was apparent, but it fell well short of what was required. A score of 2 was given where the requirements were clearly not met, but a substantial effort had been made, while a score of 3 was given where the condition was demonstrably met. If there was minor deviation from the stated goals then a score of 3 was still given. For the sake of consistency, the score reflects the level of compliance *with the condition in question* and does not automatically translate to the level of seriousness of adverse effect. For example, a failure to submit a monitoring report, which would constitute a high level of non compliance in relation to the relevant condition, is not likely to cause a serious adverse effect.

4.3.3 Determining variation in compliance

Activity, applicant and condition types were grouped and compared for their respective relationship with compliance scores in order to better understand the nature of non-compliance. The consents were first divided into 10 activity type categories (see Table 5) in order to compare the activity type with the level of compliance achieved. It is important to note that each may contain elements of the other, such as subdivision consents that collectively included many of the other types of conditions; but the categorisation refers to the principal activity.

Secondly, consents were allocated to three applicant categories of private company, private individual and an aggregated category comprising state-owned enterprises and public organisations to compare compliance levels between them. Thirdly, conditions were clubbed into two categories: 'administrative' conditions, (generally paper-based such as the payment of a bond, lodging of a financial contribution or the vesting of land into estate of an agency) and 'non-administrative', which were those that were conservation action-oriented and typically related to an active requirement in the field such as planting. Finally, they were divided into 14 categories (Table 3) in accordance with the type of ecological compensation requirement they related to.

Table 3. Compensation consent condition categories.

Administrative	Non-administrative
RMA Bond	Hydrological changes
Mitigation trust	Maintenance/Pests
Plan content	Restoration intention
Monitoring	Planting
Consent notice/Covenant	Fencing
Vesting of land	Translocation
Financial Payment	
Protection (restriction)	

4.3.4 Determining predictors of compliance

As outlined in detail in the Introduction, a list of 9 variables (Table 4) likely to have an impact on eventual levels of compliance was developed with the input of expert advisors and a review of the literature on the implementation of ecological compensation.

Table 4. Variables that were considered for each case, categorised as either process or consent variables.

Process		Consent	
Variable	Explanation	Variable	Explanation
Professional ecologist	Was a professional ecologist engaged by the applicant during the process of applying for consent?	Timing	Was the compensation action was required prior, concurrent with or following the activity that has been consented (i.e. a development)?
Early mention	Was the compensation action was mentioned early in the process, or alternatively was it late in the process at around the time of granting in response to agency or submitter concerns	RMA bond	Was a bond required for the compensation works (i.e. under section 108 of the RMA)?
Applicant proposed	Was there evidence that the applicant proposed the compensation action?	Monitoring	Was monitoring required as a condition of the consent?
Plan before	Was a detailed plan submitted prior to consent being granted?	Review condition	Was a review condition under Section 128 of the RMA present in the consent?
Notification	Was the consent in question notified, limited notified or non-notified		

4.3.5 Data analysis

The Chi-squared test was used to determine whether significant relationships existed between a response variable (the score attained in a ranking of regulatory compliance) and a range of predictor variables, as it has been used before in previous compliance audits (Bailey *et al.* 1992; Hornyak & Halvorsen 2003). Chi-squared test assesses whether paired observations on two variables, expressed in a contingency table, are independent of each other, the null hypothesis being that they are. In this case, each (mostly binary) predictor variable was compared against the categorical response variable for the level of compliance attained. Under the null hypothesis, the compliance levels will be similar in the presence or the absence of the factor. However, differing compliance levels will result in a

larger value of the Chi-squared test statistics and a smaller p-value. Chi-squares tests were conducted at a 5% level of significance, i.e. the null hypothesis was rejected if the p-value was smaller than 0.05 (Agresti 1996).

4.4 Results

In summary, the present research has examined 81 case studies, comprising 259 separate conditions of consent, across New Zealand, for the levels of compliance with ecological compensation requirements. For 14 of those conditions, it was not possible to determine whether they had been complied with or not so they were excluded from the analysis.

4.4.1 Determining compliance

For the 245 conditions assessed, compliance overall was 64.8%, meaning that in approximately two-thirds of cases the condition's requirements were met (Figure 1). The remainder were non-compliant to varying degrees [0 (15.2%), 1 (9.4%) and 2 (10.7%)].

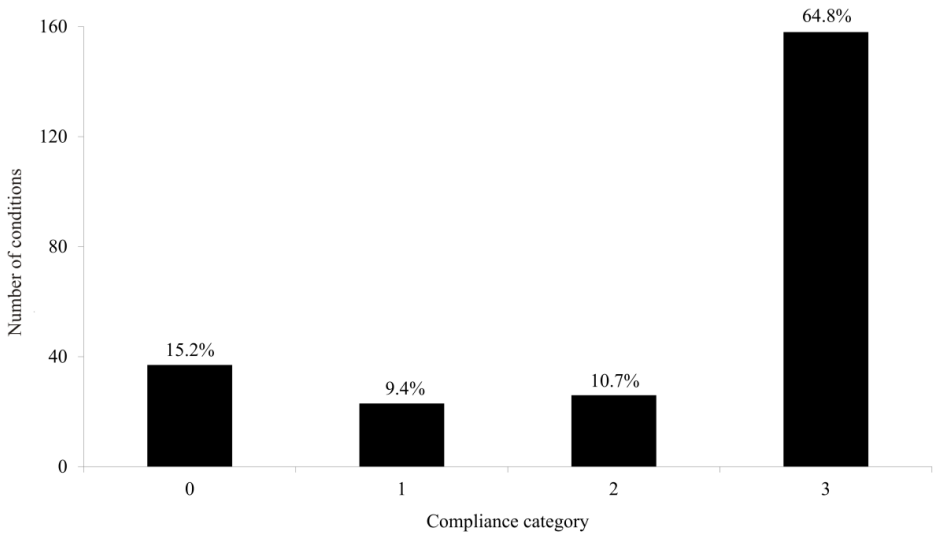

Figure 1. Number of conditions in compliance categories. The percentage values at the top of bars show the proportions in that category of the total number of different conditions recorded in this study (n ¼ 245).

4.4.2 Determining variation in compliance

Compliance varied significantly with consent type ($X^2 = 73.207$, df = 9, P = 0.000) as shown in Table 5. Consents related to agriculture exhibited the lowest overall level of compliance (4.76% with a score of 3), whereas energy generation successfully complied in respect of all 11 conditions assessed (100% with score of 3).

Table 5. The distribution of cases (%) across the compliance scale for different categories of consent assessed in this study.

Consent category	Number	0	1	2	3
Energy generation	11	0.0	0.0	0.0	100.0
Education	8	0.0	0.0	12.5	87.5
Subdivision	104	8.7	11.5	6.7	73.1
Resource extraction	30	13.3	3.3	13.3	70.0
Recreational	14	7.1	14.3	14.3	64.3
Water discharge	22	9.1	9.1	18.2	63.6
Water take	10	0.0	20.0	20.0	60.0
Infrastructure	18	27.8	11.1	5.6	55.6
Waste management	6	16.7	16.7	16.7	50.0
Agriculture	21	71.4	4.8	19.0	4.8

Note: See Table 2 for a description of the compliance scale.

Compliance varied significantly with applicant type ($X^2 = 13.243$, df = 6, P = 0.039) as shown in Table 6. Public organisations and state-owned enterprises exhibited greater likelihood of attaining compliance (75.51%), followed by private companies (65.49%) and private individuals (54.72%).

Table 6. The distribution of cases (%) across the compliance scale for different categories of applicant assessed in this study.

Applicant category	Number	0	1	2	3
Combined SOE/PO	49	14.3	8.2	2.0	75.5
Private company	142	10.6	11.3	12.7	65.5
Private individual	53	26.4	5.7	13.2	54.7

Note: See Table 2 for a description of the compliance scale.

Administrative conditions were generally complied with more often than non-administrative ($X^2 = 34.022$, df = 3, P = 0.000). Conditions that are administrative in nature were fully complied with in 82.61% of cases, which is significantly more often than those that require action on the ground (49.61%) as shown in Table 7.

Table 7. The distribution of cases (%) across the compliance scale for administrative and non-administrative conditions assessed in this study.

	Number	0	1	2	3
Administrative	115	13.0	2.6	1.7	82.6
Non-administrative	129	16.3	15.5	18.6	49.6

Note: See Table 2 for a description of the compliance scale.

The two categories were further broken down in Table 8, and showed that mitigation trust establishment exhibited the lowest level of compliance of the administrative conditions; however as there are only two examples they are unlikely to provide an accurate indication of expected compliance.

Table 8. A breakdown of the distribution of cases (%) across the compliance scale within the administrative and non-administrative condition categories presented in Table 7.

Administrative	Number	0	1	2	3
Bond	14	14.3	0.0	0.0	85.7
Mitigation trust	2	50.0	0.0	0.0	50.0
Plan content	29	0.0	6.9	3.5	89.7
Consent notice/Covenant	18	11.1	5.6	0.0	83.3
Vesting of land	8	0.0	0.0	0.0	100.0
Financial Payment	17	17.7	0.0	0.0	82.4
Monitoring	22	31.8	0.0	4.6	63.6
Protection (restriction)	5	0.0	0.0	0.0	100.0
Non-administrative					
Hydrological changes	5	0.0	20.0	40.0	40.0
Maintenance/Pests	38	7.9	18.4	18.4	55.3
Restoration Intention	10	50.0	20.0	0.0	30.0
Planting	58	10.3	15.5	22.4	51.7
Fencing	17	35.3	5.9	11.8	47.1
Translocation	1	100.0	0.0	0.0	0.0

Note: See Table 2 for a description of the compliance scale.

4.4.3 Determining predictors of compliance

Nine variables related to the planning process were tested for their relationship with compliance with the 245 conditions. Five variables that were considered did show a significant relationship with the eventual level of compliance attained (Table 9).

Table 9. Pairs of predictors with statistically significant differences in the distribution of cases (%) across the compliance scale, pairs are marked with the same symbol (p<0.5).

Predictor	Number	0	1	2	3	
Action required after activity	139	19.4	12.2	11.5	56.8	*
Action required concurrent or before	105	9.5	5.7	9.5	75.2	*
Action proposed late in process	101	27.7	11.9	15.8	44.6	+
Action proposed early in process	143	6.3	7.7	7.0	79.0	+
Action not proposed by applicant	84	25.0	8.3	15.5	51.2	º
Action proposed by applicant	160	10.0	10.0	8.1	71.9	º
Detailed plan not required before granting	182	17.0	8.2	12.1	62.6	⁑
Detailed plan required before granting	59	5.1	13.6	6.8	74.6	⁑
RMA bond not required	150	16.7	6.0	13.3	64.0	-
RMA bond required	94	12.8	14.9	6.4	66.0	-

Note: See Table 2 for a description of the compliance scale.

Higher levels of compliance (X^2 =9.911, df = 3, P = 0.019) occurred where the requirements were required before or concurrent with an activity (75.24%) of requirements were met in comparison to when the requirements were not required to be done until following the project (56.83%). The point in the planning process at which the compensation is first proposed also has a significant relationship with compliance (X^2 = 34.236, df = 3, P = 0.000). If the compensation was raised and discussed early in the process, the requirements were met in 79.02% of cases, compared with 44.55% for those that were discussed late in the process, typically at the time of granting.

Compensation proposed by the applicant (and subsequently included in the consent) is also more likely to be complied with (71.88%) compared with that which is imposed by the agency or advocated for by submitters, with those conditions being met in 51.19% of cases (X^2 = 14.768, df = 3, P = 0.002). In cases where a plan was required prior to granting, the compliance levels were significantly higher (X^2 = 7.961, df = 3, P = 0.047) with 74.58% of conditions

being met, compared with 62.64% where a detailed plan was not submitted prior. A condition with a bond attached to it under section 108 of the RMA is more likely to be complied with than one that did not require a bond ($X^2 = 8.083$, df = 3, P = 0.044), although the percentages of 64.00% and 65.96% respectively were very similar.

Table 10. Groups of predictors without statistically significant differences in the distribution of cases (%) across the compliance scale, groups are marked with the same symbol (p<0.5).

Predictor	No.	0	1	2	3	
Professional ecologist not involved	65	18.5	9.2	15.4	56.9	*
Professional ecologist involved	179	14.0	9.5	8.9	67.6	*
Monitoring requirements absent	71	11.3	7.0	14.1	67.6	+
Monitoring requirements in consent	173	16.7	10.4	9.2	63.7	+
Review condition not present	122	16.4	9.8	9.0	64.8	º
Review condition present	122	13.9	9.0	12.3	64.8	º
Notification	79	12.7	11.4	11.4	64.6	⁑
Limited notification	15	40.0	0.0	13.3	46.7	⁑
Non-notification	150	14.0	9.3	10.0	66.7	⁑

Note: See Table 2 for a description of the compliance scale.

There was no significant relationship between the input of a professional ecologist and the eventual level of compliance; neither did a requirement for monitoring. Review conditions included under section 128 of the RMA were present in approximately half of the cases, and did not have a significant relationship with compliance; neither did the requirement for public notification (full or limited) of the initial consent application (Table 10).

4.5 Discussion

Three research questions were posed at the outset and the following discussion deals with each in turn, providing interpretation of the results and comparing and

contrasting our results with others obtained in New Zealand and internationally. The results show that two-thirds (64.8%) of conditions relating to ecological compensation are satisfactorily met. However, it is the nature of non-compliance with the remainder that is the focus of this paper; and in particular, the ecological implications of that non-compliance. The results go on to show that the level of non-compliance is not evenly distributed through the different activities, applicant types and condition types. Finally, variables within the planning process and those related to the final form of the permission that is granted, show varied relationships with compliance that are of interest to improving the practice of managing trade-offs within environmental impact assessment.

4.5.1 Determining compliance

The level of overall compliance with conditions was 64.8%, meaning that in two thirds of cases the condition's requirements were met satisfactorily. The Ministry for the Environment (MfE) coordinates a biannual survey of local government agencies, investigating (among other things) levels of monitoring and compliance with consent conditions. The 2010/2011 MfE survey reported that of the consents that 'required monitoring', 68% were monitored and 72% of those 68% found to be complying with their conditions (Ministry for the Environment 2011). Note that this level of compliance considered all conditions in contrast to our research which focussed only on compensatory conditions. Nevertheless, overall compliance levels found were of a similar magnitude.

A compliance audit of several artificial waterway projects in Western Australia by Bailey et al (1992) found a similar compliance rate of 63% with conditions that related to the mitigation of adverse effects. Hornyak & Halvorsen found compliance rates of 44% and 60% for country road agency and general public wetland mitigation requirements respectively. Breaux et al (2005) found that an assessment of 18 wetlands saw 17 ranked as 'good' for compliance, with 8 fully complying with both permit criteria and ecological indicators of success (Breaux *et al.* 2005). This research suggests that better and increased use of security and insurance mechanisms, and research and innovation into alternatives is needed; as our research (like most) show levels of compliance that mean a large proportion of ecological compensation requirements do not eventuate.

4.5.2 Determining variation in compliance

The heterogeneity of non-compliance across industries and activity types is best reflected by the contrast of compliance levels between agriculture and energy generation, which was extreme and appears to signal a need for further research as to the reasons for such different levels of performance in this study. In respect of applicants, highest levels of compliance were achieved by public organisations, followed by private companies and then private individuals. Hornyak & Halvorsen (2003) found, by contrast, the county road agency in Michigan, USA (a 'public organisation' with a significant degree of interaction with the regulator) was less likely to comply with requirements (44%) compared with permittees that were part of the general public (either 'private companies' or 'private individuals'), with compliance levels of 60% (Hornyak & Halvorsen 2003). The data also showed that non-administrative conditions are much less likely to be complied with than administrative, which reveals that although overall compliance compares favourably with national level estimates, that the nature and scale of non compliance with respect to ecological outcomes is inferior. These findings contrast with previous studies that found no difference in compliance across condition types (Bailey *et al.* 1992).

Understanding the specific profile of non-compliance in an area can help agencies and their communities prioritise scarce education and monitoring resources, in order to improve their enforcement strategies (Hornyak & Halvorsen 2003). This research shows that level of non-compliance differs between the type of activity, applicant and condition type; and indicates that regulatory agencies would benefit from understanding the relevant trends within their jurisdiction in order to ensure environmental impact assessment procedures take account of different trends and risks.

4.5.3 Determining predictors of compliance

Understanding the variables that are more likely to have an impact on the eventual level of compliance can help to inform and improve planning practice, and this assists agencies in managing risk of default through the impact assessment process. Of the 9 variables hypothesised to correlate with compliance, 5 showed significant correlation while 4 were weakly or not correlated.

4.5.3.1 Factors with insignificant impact on compliance

Variables which the dataset showed were insignificant in terms of a relationship with eventual levels of compliance included the input of a professional ecologist, the presence of monitoring requirements for the applicant or third party, public notification of the application, and the presence of a review condition.

In most cases, the professional ecologist (if there was one engaged during the initial planning stages), did not appear to have been retained throughout implementation. This was difficult to determine due to quality of record-keeping in many cases, so was not part of the formal assessment. For example, if a report was produced by an ecologist a period of time following implementation, it could not be assumed that he or she had overseen the implementation works. The lack of apparent effect of a professional ecologist's input may also signal low quality advice being provided to clients, or poor efficacy of the manner in which professional contributions are considered in project planning. Further research on these matters is desirable.

The presence of monitoring requirements in the consent did not have a strong correlation with higher levels of compliance, which was somewhat surprising. There are a number of possible explanations for this. The first is that the monitoring conditions were only met 63.64% of the time. The second is that the monitoring conditions were of varying quality and detail, from requiring a letter confirmation of works having met conditions at the time of assessment, through to detailed and long-term monitoring of water quality with appropriate feedback loops. Finally, there was evidence of reports having been submitted but not necessarily being acknowledged or acted upon by the agency, which may diminish the incentive to comply if there is a perception of a lack of oversight. Our results also showed that public notification had no significant relationship with compliance, and neither did the presence of a review condition.

4.5.3.2 Factors with significant impact on compliance

Where compensatory actions were required before or concurrent with the consented activity, the likelihood of compliance was observed to be significantly higher. There were very few examples of prior requirements, so it is not clear to

what degree prior requirements are also stronger than those that are undertaken concurrently. It is also usually impractical to delay projects until after full outcomes of an ecological compensation requirement are demonstrated. At present in New Zealand, there is no formal framework to package advance mitigation programs as may be able to occur overseas (including species banking, wetland mitigation banks and credit trading in other forms). It is probable that an absence of regulatory certainty that the works will be recognised as compensating for a later activity dissuades developers from undertaking advanced works.

Where compensation requirements were mentioned early in the process, and presumably better integrated into project planning including timelines, eventual levels of compliance are higher. The data indicates that compliance is more likely to be achieved if the full scope and nature of activities are determined by the time of granting consent. Together, the correlation with compliance of both the early mention of ecological compensation, and the detailed planning through the project planning stages is strong. This aligns with best practice for the purpose of managing trade-offs in environmental impact assessment, where systematic consideration of a project and detailed planning is viewed as critical (Morrison-Saunders & Pope 2013).

The presence of an RMA bond on a condition had a significant positive correlation with compliance although weaker than most other measures. A weaker correlation than expected could be due to a number of factors. For example, bonds are often set too low, so that they are insufficient to pay for the works required. Where default occurs and a bond is in place that is unlikely to cover the cost of the works, the requiring agency may not undertake to take action as they will be required to meet the shortfall. Overall, bonds were only required in 25 cases of 110 cases overall. For a mechanism that represents a relatively simple form of insurance, the low usage of the section 108 provision for a bond to be requested was surprising. Throughout the research, it was apparent the available security measures were often not utilised, and that further innovation into improving the range of these measures available would be advantageous.

4.6 Conclusion

The results of the research also show that there is a clear need to understand the complexities of non-compliance as they apply to trade-offs that justify development at the expense of ecological values. Our research showed that 64.8% of ecological compensation requirements are met, and that there was significant variation in compliance across different activity, applicant and condition types. The significant number of conditions not complied with indicate that present tools and practice within the domestic field of impact assessment are not securing the necessary benefits from ecological compensation requirements that are required. Our research also showed that process-related and consent-related variables are often powerful predictors of levels of compliance. Understanding the nature of non-compliance will assist in improving the manner in which trade-offs such as ecological compensation are managed in environmental impact assessment.

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Chapter 5

Compensating for ecological harm: the state of play in New Zealand[2]

5.1 Abstract

Ecological compensation involves measures to create positive conservation outcomes intended to offset the residual impacts of development (e.g. restoration planting, pest control). Rarely, however, have the exchanges arranged been subject to objective assessment. Here we assess 110 cases of ecological compensation involving diverse New Zealand ecosystems on the basis of how they addressed the six key implementation issues identified by McKenney and Kiesecker (2010: Environmental Management 45: 165–176): equivalence, location (i.e. spatial proximity), additionality, timing, duration and compliance, and currencies. Our research showed that habitat enhancement and protection is the most common form of ecological compensation, and that 72 of 110 case studies undertook compensation on the same site or immediately adjacent. The

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great majority (94.5%) of compensation was required by condition of resource consent to be demonstrated after the development had proceeded, with an average of 11.3 years of continuing management or monitoring required. The most common form of security other than a consent condition was a covenant (29 of 110 cases) followed by a resource management bond (25). We also found that in 97 cases there was no objective quantification of the compensation needed to make up for impact losses, with the requirements being devised by negotiation between parties with the assistance of expert input. We recognise the potential of ecological compensation as a policy tool, but recommend that significant improvements are made to its implementation to enhance ecological outcomes.

Keywords: ecological compensation; mitigation; offset; RMA

5.2 Introduction

The need to extract resources, alter land use and dispose of waste results in continuing adverse effects on biodiversity and ecosystems. Ecological compensation, although widely criticised for failures of implementation (Hornyak & Halvorsen 2003; Gibbons & Lindenmayer 2007; Burgin 2008; Walker et al. 2009), is promoted as a potentially important mechanism to alleviate the pressures of ongoing development and to contribute to achieving wider conservation goals (BBOP 2009; Quertier & Lavorel 2011; Gillespie 2012). Ecological compensation is typically an agreed positive conservation action intended to compensate for losses of habitat and ecosystem function caused by development and resource use. It is a commonly used mechanism that brings together the often conflicting priorities of environmental protection and economic development, in a system of trade-offs. These trade-offs are inherent in environmental management and occur at all stages of the development process (Murray & Swaffield 1994; Morrison-Saunders & Pope 2013).

At present, ecological compensation in New Zealand is implemented under both the Resource Management Act 1991 (hereafter RMA) and the Conservation Act 1987, typically as a condition of approval for development to occur. New Zealand does not have an explicit policy framework for ecological compensation. While

ecological science contributes to the determination of appropriate compensation, such agreements are typically the product of negotiation between parties (Galatowitsch 2012). There is no national-level policy on the matter and very few regional and local planning instruments make specific reference to ecological compensation. Most resource consents do not include outcome-oriented conditions, as demonstrated in our related study of regulatory compliance with ecological compensation, where just 10 conditions of 245 specifically articulated a restoration-related outcome (Brown et al. 2013). In the general absence of goals that specifically relate to the implementation goals of ecological compensation, we draw upon an existing framework to facilitate assessment and evaluation of the New Zealand example. We examine the ecological compensation requirements in 110 case studies of resource consents issued under the RMA, against the six key implementation issues identified by McKenney and Kiesecker (2010): equivalence, location (i.e. spatial proximity), additionality, timing, duration and compliance, and the use of currencies and ratios in determining appropriate compensation. McKenney and Kiesecker discussed the overall approach to applying the concept, the presence or absence of the goal of no net loss of biodiversity, and the use of the mitigation hierarchy. We also consider these elements in the New Zealand context.

In New Zealand, ecological compensation is referred to mainly as mitigation, compensation or biodiversity-offsetting, with varying and evolving opinions on the distinctions between each of those terms that is not always consistent with use of that same term in other jurisdictions (Christensen 2008; Norton 2008). It is, however, likely that implementation issues across all types of ecological compensation are broadly the same, and are articulated in planning permissions ('resource consents' under the RMA) in a similar manner. In this research therefore, 'ecological compensation' is an umbrella term defined as:

> *Positive conservation actions required by resource consent, and intended to compensate for residual adverse effects of development and resource use (Brown et al. 2013)*

5.2.1 Ecological compensation under the RMA

The RMA, New Zealand's principal environmental legislation, does not specifically mention ecological compensation, nor is there a national-level policy to guide decision-making. Regional councils and city or district councils issue planning permission (in the form of resource consents) to allow activities to be undertaken that have adverse effects and sometimes require ecological compensation. A proposal to mitigate, compensate or offset ecological harm is one of the wide range of factors that a consent authority can take into account under section 104 of the Act (which outlines matters the decision-maker must have regard to in determining whether to grant the consent and under what conditions).

Internationally, policies that address ecological compensation typically emphasise the mitigation hierarchy (i.e. avoid ecological effects, minimise impacts, and finally mitigate or offset the residual effects; McKenney & Kiesecker 2010; Gardner & von Hase 2012). While New Zealand law does not explicitly require adherence to the mitigation hierarchy, in a recent Board of Inquiry decision on a plan change and accompanying resource consent related to a major roading project (Transmission Gully), it was noted that a mitigation hierarchy was supported by ecological evidence and was broadly consistent with the RMA (Environmental Protection Authority 2011; Christensen 2012).

5.2.2 No net loss

Ecological compensation, and biodiversity offsets in particular, are often highlighted as a mechanism to achieve 'no net loss or preferably net gain' of biodiversity (ten Kate et al. 2004). This generally requires that what is lost in development is counterbalanced by conservation gains that are at least equivalent and preferably greater in value, although the definition of this goal and measurement of success or failure varies across stakeholders and jurisdictions (Bull et al. 2013). It is articulated in the first of the 10 principles on biodiversity offsets developed by the Business and Biodiversity Offsets Programme (BBOP 2009). The goal itself is criticised as being symbolic and rarely achieved (Burgin 2010), with Walker et al. (2009) referring to it as 'administratively improbable and technically unrealistic'. Further, as the Transmission Gully Board of Inquiry

noted, applicants can choose to state ‘no net loss’ as a goal, but they are not legislatively bound to demonstrate that it has been achieved (Environmental Protection Authority 2011).

5.2.3 Key implementation issues

There have been several comprehensive reviews worldwide of ecological compensation schemes and most reveal significant problems with implementation and follow-up (Hornyak & Halvorsen 2003; Gibbons & Lindenmayer 2007; Burgin 2010; Walker 2010; Quertier & Lavorel 2011). Here we use the framework proposed by McKenney and Kiesecker (2010) (summarised in Table 1) to examine compensation in the New Zealand context, and generate recommendations aimed at improving implementation. We chose to use this framework because of its broad applicability and clear articulation of key matters that facilitate a consistency with transferable learning outcomes.

Table 1. Key implementation issues identified by McKenney and Keisecker (2010).

Key issue	Explanation
Equivalence	Equivalence and similarity of compensatory action with the impact being addressed (i.e. in-kind or out-of-kind)
Spatial proximity	Location of compensation in relation to the site of impact, with an assumption that closer is better
Additionality	The compensation action must be a new contribution to conservation that would not have otherwise occurred
Timing	Timing of demonstrating the compensation, relative to the timing of the impact
Duration & compliance	The required longevity of the compensation action and security of delivery
Currency & ratios	Metrics used to determine exchanges including mitigation replacement ratios

Ecological equivalence is a goal of compensatory mechanisms and can be determined at a range of scales. At the broadest scale, exchanges are grouped into in-kind or out-of-kind relating to the similarity of elements to be traded (McKenney & Kiesecker 2010). In-kind refers to protection or enhancement of a similar value while out-of-kind compensation involves different values of greater conservation significance (also referred to as a 'trade-up').

Compensatory works should occur near the site of impact (McKenney & Kiesecker 2010) to avoid negative ecological and social outcomes of compensation at a distance. In practice the investment of mitigation money leveraged from impacts on one habitat type is often used to ameliorate broader impacts affecting areas of higher strategic conservation importance (Blundell & Burkey 2007; McKenney & Kiesecker 2010). Aggregating efforts into large areas of habitat instead of many smaller and fragmented compensation projects located haphazardly around the landscape has been shown to perform better ecologically (Breaux et al. 2005; McKenney & Kiesecker 2010).

Additionality demands that compensatory actions are new and would not have occurred under the status quo (McKenney & Kiesecker 2010). Assessment of additionality requires that the future level of management under the status quo must be reliably forecasted, which is difficult. Common approaches include set-asides, habitat improvements or financial contributions. The level of additionality is dependent upon the current level of protection and management of the habitat (at a range of scales), as well as the inherent vulnerability of that habitat type. If the habitat set-aside is adequately represented elsewhere, already protected or not otherwise vulnerable, then it is not likely a new gain and therefore not additional (Gibbons & Lindenmayer 2007).

The timing of compensatory benefits should be similar to the loss so that temporal equivalence is achieved, and lags between impact and compensation are minimised. Planting to offset the loss of existing older habitat may take decades or centuries to be of similar value to an extant habitat, with the time lag potentially risking threatened species' population viability and leading to extinction (Gibbons & Lindenmayer 2007; Maron et al. 2010). Securing compensation gains in advance is the most efficient and reliable means of orchestrating robust exchanges

because it limits uncertainty (Bekessy et al. 2010; Gardner & von Hase 2012). Advance mitigation enables applicants to plan for and reliably demonstrate gains in advance, which may be important to securing access to diminishing resources such as minerals (Kuiper 1997; Greer & Som 2010).

Failure to secure compensation exchanges because of issues with duration and compliance is a common shortcoming (Race & Fonseca 1996; Hornyak & Halvorsen 2003; Gibbons & Lindenmayer 2007; Burgin 2008; Matthews & Endress 2008; Brown et al. 2013). Post-decision failures of compliance (and subsequent enforcement) undermine compensation, and society bears the burden of unfulfilled promises (Beder 2000; Hornyak & Halvorsen 2003; Gibbons & Lindenmayer 2007; Keane et al. 2008; Bekessy et al. 2010; Brown et al. 2013). Compensation should persist for as long as the impact and permanent losses should not be offset by temporary gains (Gibbons & Lindenmayer 2007). While monitoring and follow-up are widely recognised as being of critical importance, they rarely receive sufficient attention (Rubec & Hanson 2009).

Currencies that compare values of different habitats rely on surrogate measures of ecological value (Gibbons & Lindenmayer 2007). Assessment of habitat quality and condition can rely on predetermined indicators, or they may be established on an ad hoc, case-by-case basis (Quertier & Lavorel 2011). At the crudest level, extent of habitat lost and gained are compared (Quertier & Lavorel 2011). Habitat condition and rarity provide a more accurate reflection of ecological value, while use of multiple metrics or combinations of methods limits critical omissions (Kiesecker et al. 2009; Bull et al. 2013). However, methodologies continue to fail rigorous scrutiny, with a high likelihood of losses being obscured within broad considerations of value (Walker et al. 2009; Pawliczek & Sullivan 2011).

5.3 Methods

We assessed how each of the six implementation issues in McKenney & Kiesecker (2010) was addressed in 110 resource consents issued between 1991 and 2010 by 39 councils across the North and South islands of New Zealand. Consent information typically included the consent itself, supporting documentation such as ecological surveys and agency officers' reports, plans, and other documents such as covenants and was primarily provided on request by the

issuing agency. Further details on selection of examples and study design are available in Brown et al. (2013), while Table 2 reflects the types of activities investigated. We used the case-study approach as it provided for the detailed, contextual and multidimensional analysis of a wide range of examples of ecological compensation, capturing variation and highlighting general trends beyond the circumstances of each individual situation (Gillham 2000; Crowe et al. 2011).

Table 2. Distribution of activity types in the consent case studies (*n* = 110).

Activity type	n	%
Subdivision	38	34.6
Infrastructure	14	12.7
Water discharge	12	10.9
Agriculture	11	10
Energy generation	10	9.1
Resource extraction	8	7.3
Water abstraction	7	6.4
Recreational	4	3.6
Waste management	4	3.6
Other	2	1.8

Equivalence

We grouped the case studies into four categories according to their principal effect, and compared that with the main form of compensation required for each (Table 3). In cases where a financial contribution was sought from the developer (*n* = 20), we differentiated between those that were ring-fenced for in-kind exchanges and those that had considerable flexibility in the way in which they were to be spent. An analysis of exchanges at the ecosystem level was not possible, as many consents did not contain enough information about the types of habitat involved in the exchange.

Spatial proximity

The shortest distance between impact and compensation sites was measured in kilometres, with zero distance indicating ecological compensation undertaken on or immediately adjacent to the impacted site. Where the financial payment did not define a destination site but gave a scale such as 'within catchment', the furthest distance from the site to the edge of the catchment was used.

Additionality

We devised questions for each of the common compensation actions (set-asides, habitat improvements, financial payments, or a combination), in Table 4, and interrogated the information to assess whether additionality was achieved.

Table 3. Questions devised for common scenarios in order to determine additionality of compensation.

Compensation	Questions
Set-asides	1. Is there a formal means of protection in place for the set-aside?
	2. Is the area of the habitat already formally protected by some other means (e.g. covenant)?
	3. Is there provision for management actions to be undertaken?
	4. Was the area subsequently given to a public agency for management purposes?
Habitat improvements	1. Will the works be undertaken to public or private land?
	2. Do the works constitute the statutory responsibility of any agency?
	3. Were the works already planned or required by another means (e.g. Clean Streams Accord)?
	4. Did the works for improvement serve an additional purpose (e.g. stormwater detention)?
Financial payments	Were the actions already occurring or were they new?
Purpose	Was the compensation action primarily for avoidance or remediation purposes (e.g. translocation)?

Timing

The numbers of requirements to be achieved prior to, concurrent with, and after the development were tabulated and compared. The length of time required (in years) for delivery of the compensation was then also determined from the conditions of the resource consent.

Duration and compliance

We assessed the number of years of specific ongoing requirements articulated in consents through conditions, and the frequency of requirements for an RMA bond to be taken under s.108 of the Act. We also considered tenure, noting where compensation actions were required to be carried out on land of different tenure to the site of ownership. We then considered more permanent mechanisms such as covenants, consent notices and endowment funds, noting their relative frequency of use and aspects of their implementation.

Currency and ratios

We identified where a set method was used to determine the ecological compensation required in each of the cases, such as a set ratio of area of habitat damaged to area required to compensate for that damage.

5.4 Results

Equivalence

Most of the exchanges were equivalent at a high level, in that habitat loss was typically exchanged for habitat gain rather than for other more disparate gains (Table 3). ‘Domestication’ generally refers to subdivision, and is not included within ‘Habitat loss’ because although it sometimes resulted in habitat loss, more typically the subdivision was undertaken to pasture and the principle effects of the activity related more closely to immediate and long-term impacts of a pastoral environment being converted to more intensive residential development (e.g. increased impervious surface, noise and light disturbance).

Table 4. An overview of exchanges encountered in each of the 110 consents, showing common exchanges.

	Principal compensation		
Principal effect	Habitat gain	Financial RF	Financial NRF
Domestication	34	0	0
Habitat loss	41	3	5*
Other	5*	1	2*
Water take/discharge	10	5	4*
Total	90	9	11

RF, ring-fenced for in-kind exchange; NRF, not ring-fenced; * out-of-kind exchange permitted or likely.

There were three main forms of compensation: (1) habitat gain (whether by condition or extent), (2) financial payments that were designated for a purpose, or (3) those that were required but their destination was not specified. 'Habitat gain' refers to the creation, management or enhancement of natural areas, their legal protection, or a combination thereof. Riparian planting was included within this, and compensated for water takes and discharge consents (where compensation was defined) in more than half the examples (52.6%). Payments were not clearly ring-fenced in 11 of the cases encountered and some were difficult or impossible to track. The out-of-kind exchanges encountered also included funding for research and monitoring, and payments to agencies for other conservation actions. The habitat protected or managed as compensation was not necessarily similar to that which was removed. Rather, the most intact and best examples of remaining habitat on the site were subject to management actions such as supplementary planting of existing habitat, planting of new habitat, pest control, and fencing (i.e. habitat improvement).

Spatial proximity

Seventy-two of the 110 (65.5%) compensation requirements applied to sites that were on or adjacent to the site of impact, while a further 21 (19%) were required within 50 km of the site of impact. The remaining 17 (15.5%) were undertaken more than 50 km from the site of impact (Table 5). Of the offsite works encountered, 20 resulted from financial payments required in place of or in

addition to works to be undertaken on-site, where money was pooled under a common fund or paid directly to an agency. The spatial limit of compensation was usually defined by the jurisdiction of an agency, or the geographic range of a contestable fund or mitigation trust.

Several exchanges involved financial contributions to pools of funding for conservation purposes, including mitigation trusts and endowment funds. Mitigation trusts are common, such as the Taranaki Tree Trust (Taranaki Regional Council), the Hei Tini Awa Trust (Horizons Regional Council) and the Turanganui a Kiwa (Gisborne District Council). Establishing a trust or fund in this way enables councils to access funds from private and public bodies to undertake wider ecological restoration programmes in association with the community, in addition to receiving compensation payments. Several energy generation and waste management companies have established these structures within their consents to fund a wide programme of compensation measures, usually via contestable funding of an agreed amount (paid annually or as a one-off payment).

Table 5. Results of analysis of key implementation issues (note that more than one metric applies to 'Duration and compliance'. (See Table 3 for equivalence issue.)

Implementation issue and metric	Variable	N	%
Spatial proximity: Distance in kilometres between site of impact and site where ecological compensation was carried out	0	72	65.5
	0.2–3 km	13	11.8
	3.1–10 km	1	0.9
	11–20 km	3	2.7
	21–50 km	4	3.6
	51–100 km	3	2.7
	101–200 km	9	8.2
	201–300 km	4	3.6
	301+ km	1	0.9

	Set-aside of unprotected land	38	34.5
	Set-aside of land already protected	2	1.8
	Set-aside with provision for management	33	30
	Set-aside with no management*	7	6.4
	Management actions to public land	29	26.4
Additionality: Compensation actions encountered in case studies with respect to additionality	Management actions to non-public land	63	57.3
	Financial payment for new works	15	13.6
	Financial payment for works already occurring	6	5.5
	Statutory duty or responsibility	7	6.4
	Habitat creation or enhancement already planned	3	2.7
	Enhancement of a dual-purpose feature	20	18.2
	Actions were monitoring, avoidance or remediation measures	17	15.5
	Vestment to public agency to manage	10	9.1
Timing: Time frame (years) for ecological compensation to be initiated or completed relative to the impact	Prior	6	5.5
	Concurrent	44	40
	After	60	54.5
Duration and compliance: Mechanisms used to secure compensation action	Condition of consent, designation or consent order	102	92.7
	Other agreement (e.g. Memorandum of Understanding)	15	13.64
	Combination	8	8.8
Duration and compliance: Mechanisms used to secure long-term gains	Covenant	29	26.4
	RMA Bond (s.108)	25	22.7
	Consent notice (s.221)	13	11.8
	Vestment into reserve status	11	10.0
	Mitigation trust or endowment fund	7	6.4

Duration and compliance: Tenure of site of compensation action	Same site, same owner	67	60.9
	Another site third party	40	36.4
	Another site same owner	3	2.7
Duration and compliance: Number of years of required action following granting as required by consent	None	41	37.2
	0.1–5 years	37	33.6
	6–10 years	13	11.8
	11+ years	19	17.3
Currency and ratio: Evidence of a formal approach to quantifying the degree of compensation required	No evidence	97	88.2
	Area	10	9.1
	SEV (Stream Ecological Valuation method)	3	2.7

(*) No specific management refers to management actions not being prescribed in the consent, and does not include situations where the land is vested under a public agency with an existing maintenance programme.

Additionality

Thirty-eight (94.5%) of 40 set-asides were of land not otherwise protected, and included requirements for management (Table 5). Sixty-three of 110 compensation actions occurred on private land. Seven cases included works that are part of the statutory duty of an agency, such as the management of an existing protected area administered by a council under the Reserves Act 1977. Six financial payments contributed to works that were already occurring, such as existing pest control programmes, and therefore were not additional. Most management actions were new works, and the majority of financial payments were also for works that were not otherwise planned, and so were truly additional. Twenty cases included compensation that fulfilled more than one purpose, such as the creation or enhancement of a water feature that would later be used for stormwater disposal, detention and treatment. Ten cases included the vesting of habitat in a public agency and these cases were a mix of those that required a degree of management to occur before handover and those that were immediately vested, such as extensions to existing reserves on the subject-site boundary. Seven actions described as compensation were not in fact compensatory actions, but

rather prevention of damage. These included translocation of threatened species from the site and retaining or restoring fish passage when diverting or obstructing waterways.

Timing

One hundred and four of 110 (94.5%) compensatory actions were required concurrently with the development or following its completion (Table 5). There were only six requirements for prior action (5.5%), and in most cases they were developer-driven, such as boutique subdivisions where most of the ecological restoration took place prior to application, for dual purposes of conservation and amenity. Most requirements involved the protection of extant habitat and its enhancement with some supplementary planting, while others involved planting from scratch. There was little evidence that the time lag between impact and compensation action (e.g. planting reaching maturity) was a factor in decision-making. In one instance, however, an applicant was required to undertake habitat enhancement activities in a nearby reserve in addition to establishing the new area of planting. The consent assumed that enhancement works would help maintain habitat values in the vicinity in the 10 years until the new planting matured.

Duration and compliance

Compensation was usually secured by making it a condition of consent. Some agreements were secured by an alternative means such as a Memorandum of Understanding or other form of side agreement. In eight cases, both an agreement and a consent condition reflected the compensation requirements (Table 5).

The gains required to meet compensation requirements were secured with covenants, consent notices under s.221 of the RMA, mitigation trusts and other endowment funds, and they included land vested with agencies for protection purposes. An RMA bond provides for a cash or bank-guaranteed bond to be held by the agency to be uplifted in the case of default. Twenty-five consents required that a bond be held by the agency under s.108 of the RMA (Table 5). Sixty-seven of 110 compensation actions (60.9%) were required to occur on the site of impact, while nearly all the others occur on a different site with unconnected tenure.

Resource consent conditions may specify a length of time within which specific tasks have to be carried out, such as pest management and monitoring. The mean number of years for continuing requirements in consents where this was stipulated was 11.3 with an overall median of 7.4. The figures related to years of management do not include outside arrangements such as covenants, which often require action for longer, perhaps even in perpetuity.

Currency and ratios

In 97 cases (88.2%) no objective metric had been applied and in 10 cases area was used as an informal metric of biodiversity loss. Three of the 110 consents reflected the application of the Stream Ecological Valuation method (Rowe et al. 2009).

5.5 Discussion

Most exchanges are undertaken between broadly similar values, and habitat improvement and set-asides are by far the most common means of compensating for ecological harm. Many cases where financial contributions had been sought left open the possibility of a significantly unlike exchange. Although out-of-kind exchanges are becoming more common around the world there is a lack of tools or guidelines for decision-making for unlike exchanges (McKenney & Kiesecker, 2010). If New Zealand follows the rest of the world in the increasing frequency of out-of-kind exchanges, methods and decision support tools will be needed if compensation is to be quantified and objectively determined.

The majority (77.3%) of compensation requirements were carried out within 3 km of the site where the loss occurred, but many occurred much further away. If off-site compensation becomes more common, a lack of a formal framework in which to manage exchanges will be limiting. By contrast, many jurisdictions around the world orchestrate exchanges of biodiversity more systematically through large-scale operations (e.g. US wetland mitigation banking; Burgin 2010; BenDor & Riggsbee 2011). Uncontrolled off-site compensation could lead to an expansion of low quality 'restored' habitat in the place of destroyed high quality habitat. Macro-scale landscape changes cannot be detected with piecemeal methods (BenDor & Riggsbee 2011). Most instances of compensation at a distance were enabled by

mitigation trusts. The use of mitigation trusts has potential advantages, but care is required in drafting project eligibility requirements. We noted significant variation in the deeds and other governing criteria for trusts, with some having very specific requirements related to the key general principles for use of the funds.

Compensation was typically required during or after a development, although best practice typically calls for implementation in advance to reduce risks to ecosystems and species (McKenney & Kiesecker 2010; Gardner & von Hase 2012; Pilgrim et al. 2013). The few examples of prior requirements is likely due in part to a lack of formal mechanisms to recognise prior works. In two cases there was clear evidence in background documents that the agencies involved were reluctant to accept that the works are additional if they are undertaken in advance and outside the consent process. Some types of consents, such as subdivisions, provide an opportunity to tie some achievements to the release of the s.224C certificate (certification that confirms that the conditions of subdivision consent have been met, issued by a city or district council), but most consents issued under the RMA (e.g. land use consents) have no such option.

Compared with many other jurisdictions, New Zealand landowners and agencies face few statutory requirements as regards ecological management. Habitat improvements such as weed and pest management or fencing of streams, wetlands or lake are typically a decision of the landowner. Therefore, most new management actions to habitat on private land in New Zealand are considered additional, owing to an absence of a minimum standard of land management and alternative statutory means for compelling actions such as pest control.

Active management of protected areas in New Zealand is critically important to the persistence of the biodiversity values. New Zealand has a large portion of land protected for the primary purpose of conservation at 8 763 300 hectares or 33.4% of the total land area (Ministry for the Environment 2010). Funding for the management of protected areas is typically constrained, however, and there is an absence of quantifiable and time-bound goals for biodiversity management (Green & Clarkson 2005).

Compensation payments can result in planned works being carried out sooner than expected. For example, if a council uses a compensation payment to fund a

planting project, the advancement of the work can increase the additionality of the gain. Of critical importance to assessing additionality, particularly on public land, is that compensation requirements do not simply result in cost-shifting (Christensen 2008). Cost-shifting is when compensation payments displace other funding used for a given conservation purpose.

Duration and compliance is of concern in New Zealand, as recent research has found that many compensation requirements are not met (Brown et al. 2013). Most compensation requirements (70.9%) cease within 5 years – usually specifying an expectation of the end of agency monitoring and oversight, particularly where there is no corresponding agency monitoring regime for covenants or consent notices (which is commonly the case). Compensation requirements are usually expressed as conditions of consent, while a range of other mechanisms are used to secure those actions including RMA bonds, covenants and mitigation trusts.

The most basic form of security is robust conditions that set clear and detailed requirements, set out in an enforceable document such as a consent or side agreement referred to in that consent, designation, or a consent order. The likelihood of securing any given compensation requirement, and to enforce it in the case of default, diminishes with increasing ambiguity of stated requirements. In some cases, conditions that had been negotiated were not actually included in the consent itself, omitting a clear legal mandate for the consent holder to undertake the works (Marshall 2001). This is of serious concern, because the conditions represent the key means of ensuring that the adverse effects of the activity are avoided, remedied, or mitigated (Ministry for the Environment 2001).

The research also revealed significant issues with the security measures that are imposed to ensure compensation works occur. Covenants and consent notices were commonly used but very few agencies appear to have a formal means of recording and archiving them in a way that ensures their regular monitoring and evaluation. We also noted that the use of endowment funds or mitigation trusts was becoming common, particularly in large projects where there is a wide range of effects. However, our research showed that more than half of the financial payments required as compensation had indeterminate ends, meaning that they

might or are likely to result in out-of-kind exchanges, potentially leading to ongoing environmental losses.

We encountered few instances of quantification or standardised methods of compensation assessment. The level of compensation seems to have been determined primarily by the resourcing by and willingness of the applicant, and the council specifying and insisting on a minimum standard. Financial payments were typically determined via negotiation, rather than an objective assessment of the magnitude of effects, or against a consistent and transparent cost scale.

In the recent case of Transmission Gully, a project involving the extension of a road through significant habitat, the quantification of the offset through an 'environmental compensation ratio' was discussed. The Court noted that ratios would be 'always a subject of debate', and that the final determination of appropriate mitigation was reasonably the domain of the judiciary and not any one method (Environmental Protection Authority 2011).

5.6 Conclusion

Ecological compensation is an increasingly common mechanism around the world, which has the potential to significantly contribute both to ameliorating the impacts of continued development and augmenting wider conservation efforts. Our review of process and consent variables suggests that the consideration and implementation of ecological compensation in New Zealand is noticeably ad hoc. Therefore, ecological compensation as it is presently implemented is unlikely to achieve environmental protection goals.

It is difficult to evaluate the effectiveness of ecological compensation without strategic and consent-specific goals for ecological compensation. Unambiguous goals are needed to specify what compensatory mechanisms are to achieve, what types are acceptable in what situations, and when ecological compensation is unlikely to be appropriate. Goals should be measurable, such that, in time, a quantitative analysis can be undertaken on the implementation of these mechanisms in New Zealand. Increased emphasis upon monitoring and compliance by agencies is also necessary such that instances of default can be identified and rectified as soon as possible. We conclude that the application of

ecological compensation under the RMA in New Zealand requires significant improvement if the ongoing erosion of the natural capital upon which our prosperity and economy ultimately depends is to be slowed and reversed. Ecological compensation remains a catalyst for creating greater synergies between ecological and economic interests, but the successful implementation of the concept is some way off.

5.7 Acknowledgements

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Chapter 6

Implementing ecological compensation: stakeholder perspectives and a way forward[3]

6.1 Abstract

Ecological compensation is widely used and often criticised for promulgating poor outcomes for biodiversity. There is a lack of systematic research on ecological compensation, and to date limited research globally into the perspectives of the various stakeholders involved. We undertook 116 semi-structured interviews with practitioners working with ecological compensation in New Zealand. Participants consider that benefits to biodiversity are the chief attraction of ecological compensation (49.2% of all responses), with the

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disadvantages mainly relating to the difficulties of practical implementation of the concept. Our results also show that 96.5% of participants support the concept fully or to a limited extent and most (83%) of participants consider that it contributes to sustainable management with significant support (87.9%) for a statutory approach. Formal statutory guidance at a national level in New Zealand and an increased focus upon follow-up and monitoring is considered likely to generate more robust exchanges.

6.2 Introduction

Ecological compensation is a practice where the negative effects of development are sought to be offset by positive environmental activity, either on the same site, or on one nearby. The concept has its roots in 'planning gain' mechanisms introduced in the 1960s in the United Kingdom and in US wetland mitigation banking programmes arising from the introduction of the Clean Water Act 1972 (ten Kate et al. 2004; Whatmore & Boucher 1993). In the context of ecological compensation, development is considered allowable if the losses of natural capital can be adequately counter-balanced (Cowell 1997). However, globally concern is growing that the various means of compensating for ecological damage are failing to meet their goals, and that a lack of monitoring is obscuring on-going biodiversity losses and confounding accountability (Burgin 2008; Gibbons & Lindenmayer 2007; Villarroya & Puig 2010; Walker 2010). In addition to concerns that ecological compensation is being poorly implemented, fundamental issues with the fungibility of biodiversity exist. Many commentators highlight that the degree to which natural systems are bartered places them at risk of degradation and extinction, as the capacity and methods to do so may be beyond current knowledge levels of ecological science and restoration (Bull et al. 2013; Burgin 2008; Salzman & Ruhl 2000; Walker et al. 2009a).

The *ad hoc* nature of the application of ecological compensation in New Zealand has previously drawn criticism from several commentators (Memon & Skelton 2004; Memon et al. 2004; Turner 2000) who note that the policy vacuum and inconsistent decision-making is likely having deleterious impacts on the environment. Some regional plans and policy statements make reference to compensatory mechanisms, including biodiversity offsetting, but the majority of

cases proceed with limited guidance or policy being applied. Some commentators in New Zealand and around the world suggest that more formal consideration of ecological compensation is likely to improve consistency and quality of implementation (Faith & Walker 2002; McKenney & Kiesecker 2010; Memon & Skelton 2004; Race & Fonseca 1996; Rega 2013; Rubec & Hanson 2009). There has yet to be a systematic collection of views on the matter: a niche this research intends to fill.

Studies worldwide point to the important role that government agency staff and other actors play in influencing the performance and outcomes of any consent planning process, and in revealing complexities of a given issue or system (Carruthers & Neis 2011; Salzman & Ruhl 2000). The purpose of this research was to gain an understanding of how the concept of ecological compensation is being and could be used in New Zealand, by surveying those who regularly encounter the concept in either a professional or a voluntary capacity. Similar programmes of survey and interview of practitioners in relation to ecological compensation and related policy matters have contributed to improved understanding of complex concepts overseas (see (Carruthers & Neis 2011; Hayes & Morrison-Saunders 2007; Kaplowitz et al. 2008; Murphy 2006; Rijke et al. 2013; ten Kate et al. 2004) and a New Zealand-based study was considered to be important as the practice increases domestically. When discussing a single concept with a range of stakeholders, only part of the analysis lies in the aggregation of responses. It is necessary to consider and reflect divergent views among sector groups such as business people, agency staff and non-vested conservation interests, because different players in any ecological compensation case will have different and potentially opposing objectives (Burgin 2010; Kaplowitz et al. 2008; Murphy 2006; ten Kate et al. 2004; Walker et al. 2009a).

Specifically, the present research sought to answer the following key questions:

- What are the views of stakeholders on the implementation of ecological compensation in New Zealand, under the Resource Management Act (RMA) 1991?

- What are the views of stakeholders on the way ecological compensation could be addressed on a formal basis in New Zealand?
- Is there evidence of divergence in views across the different sectors represented in the sample, and what might be the basis of that divergence?

6.3 Methods

Participant selection

Participants for the interview research were identified purposefully. Invitations to participate in the research were distributed through major professional organisations including the New Zealand Ecological Society, the New Zealand Planning Institute and the Resource Management Law Association. When contact was made by respondents, a time for a phone-based or face-to-face interview was determined. The self-selection approach may influence the sector composition but the number and breadth of responses received is considered adequate to address the key research questions posed. Questions were not provided to participants in advance of the interviews.

Interview method

We elected to use semi-structured interviews conducted with key informants to gather our data. Interviews are particularly useful for obtaining the story behind a participant's experiences, because they can pursue in-depth information around a topic more effectively than closed-response questionnaires (Kaplowitz et al. 2008). Key-informant interviews are an established technique for capturing critical viewpoints of stakeholders involved in a specific issue (Clare et al. 2011; Tremblay 1957). Semi-structured interviews were considered to be the optimal method of interviewing when compared with others because, although they are time-consuming, they provide a flexible and effective means of obtaining detailed information (Kaplowitz et al. 2008). Using a combination of standard open response and closed fixed-value responses, a specific topic or area of expertise can

be thoroughly canvassed, with participants selected based on their knowledge or familiarity with the topic (Tremblay 1957). Categorical responses and the use of thematic and content analysis also enables statistical representation of aggregated responses, which is of use in demonstrating dominant viewpoints.

Interviews were predominantly conducted over the phone so that participation in the study would be accessible to people from around New Zealand. Face-to-face interviews were possible on request or if persons were passing through Hamilton City, where the research was based. Interviews were undertaken between the 7th of June and the 29th of August 2011 and lasted for between 18 minutes and 2 hours and 45 minutes, with a mean interview time of 46 minutes. The questions were standardised and all but one were asked of all participants (see supplementary material). The answers to the open-response questions were recorded in summarised note form by one interviewer. Participants were able to decline to respond to any of the questions. The interviews were conducted within the guidelines of the University of Waikato Human Ethics Research Committee [Approval #FSEN7/10].

Interview questions

The interview began with an informal discussion in which participants were asked to define ecological compensation. All participants were able to provide an appropriate definition and many asked questions to clarify that both interviewer and interviewee were discussing the same concept. Participants were then asked to give examples of the types of actions that could be considered ecological compensation, and all were able to provide several examples. This exercise, although the data was not formally analysed and presented, was a helpful introduction and assisted in clarifying the topic at hand.

The interview was divided into three key parts; collection of basic information including the sector in which the participant was most engaged; matters that were of specific relevance to implementation of ecological compensation; and matters relating to policy treatment and future means of addressing the concept in law and practice (Table 1). The questions were not asked under these headings, but flexibly to facilitate the flow of conversation, in the typical style of a semi-

structured interview. The structure and questions in the order in which they were asked are available as supplementary material.

Table 1: Questions that were analysed grouped under two main themes of the interview

Question
Implementation
What are the potential advantages or positive aspects of ecological compensation?
What are the potential disadvantages, negatives or risks of ecological compensation?
What are the barriers to successful implementation of ecological compensation?
What key considerations do you make in establishing the appropriateness of a compensation option?
A way forward
To what extent do you support the use of ecological compensation under the RMA?
How important is it that exchanges are 'like-for-like'?
Should formal provision for ecological compensation be statutory as opposed to non-statutory?
Which of the following legal tool/method would be the most appropriate to deliver this policy?
Would you consider it appropriate for policy or guidance to contain set methods for determining compensation?
What matters do you consider national level guidance should address?
Does ecological compensation as a concept contribute to sustainable management?

The implementation questions were designed to draw on the participant's assessment of ecological compensation (advantages, disadvantages and barriers to implementation) and what they saw that having that option available meant compared with a context where such an option was not available. The next question provided the chance to record what the key elements were that practitioners noted in assessing a situation in which compensation had been proposed. The final question considered stakeholder perspectives on the critically important issue of similarity of exchange. All of these questions enabled areas of critical focus to be revealed in addressing the issues with ecological compensation.

The second set of questions related to the level of support for ecological compensation, how the participants viewed the concept, and its current and potential place in resource management in New Zealand. A series of questions were designed to glean views on how ecological compensation might be better addressed in the future, based on discussions in the New Zealand literature to date (Christensen 2007; Christensen 2008; Christensen 2012; Memon & Skelton 2004; Memon et al. 2004; Norton 2007; Norton 2008; Turner 2000; Walker et al. 2009b). Most were subject to a combination of thematic and content analysis as described below, although the answers to the questions prompting any 'other suggestions for improvement' and 'any other comments' were recorded and common statements extracted that were not otherwise addressed by the analysis.

Analysis

Questions that had binary or categorical responses were analysed in aggregate to determine dominant perspectives. Those that had open responses were subject to thematic analysis. Thematic analysis is the grouping of responses to open-ended questions which run along similar themes, so help aggregate a large body of information into an array of dominant outcomes after Braun & Clarke (2006). We employed this technique of analysis due to its flexibility and capacity to reveal trends and ideas not necessarily captured in existing literature (Braun & Clarke 2006). Following the establishment of the key themes, content analysis was applied that recorded the frequency of occurrence of themes, enabling quantitative analysis to be undertaken to infer relative importance of the themes. In a similar manner to Seabrook-Davison (2008), the five most frequently occurring themes were listed in rank order. We analysed for significant discrepancies between the broad trend and the perspectives of sectors using the Chi squared test where data were sufficient to do so (Agresti 1996).

6.4 Results

The response rate to our interview programme was higher than expected, with 125 respondents significantly exceeding the target number of 40. Of the 125 people who responded, 116 progressed through to interview. Nine did not progress to interview, mainly due to time availability. The participants came from a variety of backgrounds and were identified based on their current sector of employment or

interest (Table 2). Our third key question related to divergence of views across sectors and this is addressed below in response to each interview question. We also direct readers to the supplementary material which includes the raw response data across sectors for the open-ended questions, as this information provides greater detail on the responses of participants and the differences that can be observed among sectors.

Table 2: Table showing sector distribution of participants in semi-structured interviews (total = 116)

Sector	Total	Consultant	Local Govt	Reg Govt	Central Govt	Research
Consent Planning	12	2	1	8	1	
Policy Advisory	9	1	2	5	1	
Environmental other	69	28	3	18	6	14
Advocacy/NGO	5					
Business	15					
Law	6					

Participants were not identifiable by name in the analysis and information such as gender and ethnicity were not collected. The main defining piece of information collected was the sector with which the respondent identified for employment or interest purposes. While most of the categories are self-explanatory, the 'Environmental other' should be considered as including those that work in the environmental sector but do not occupy a position in policy or planning. This was comprised mainly of ecologists, nearly half of which worked for private consulting firms. Participants were asked to provide two key pieces of background information in addition to the nature of their current position (sector type): (1) the numbers of relevant years of work experience, and (2) an indication of their self-rated level of knowledge of ecological compensation on a scale of 1 (very little knowledge) to 4 (strong knowledge) with the description of the categories detailed verbally. The majority of participants (81%) had more than ten years relevant work experience, spanning the sectors mentioned above, with the remainder equally split (9.5% each) into 5-10 years of work experience, and less than 5 years.

Nearly half (48.3% of participants ranked their knowledge at the level of 3, followed by 27.6% rating their own knowledge at the level of 4. A smaller group (20.7%) rated themselves as a '2' while just four placed themselves in the lowest knowledge category of 1. The dominant profile of an individual participant is therefore an experienced professional with a relatively good understanding of ecological compensation. They all clearly demonstrated knowledge and experience of the concept and its application.

What are the views of stakeholders on the implementation of ecological compensation in New Zealand, under the RMA 1991?

Advantages

Across all sectors, the most commonly cited advantage of ecological compensation was the benefits to biodiversity through an overall reduction in ecological effects, with more than half of all responses to this question coming under that theme (Table 3).

Table 3: Most frequent response to the advantages of ecological compensation

Rank	Theme	%
1	Reducing the impacts of development and resulting in biodiversity benefits*	49.2
2	Integration of environmental considerations in development	20.4
3	Stakeholder benefits	8.8
4	Allows development to proceed	8.2
5	Communication and relationship building (social outcomes)	6.0

(*) Denotes that this theme was dominant across all sectors

For example, one participant noted: "*It [ecological compensation] works best when we are hostile to the destruction of primary habitat"*. This and many other similar comments noted that giving the environment primacy was the chief attraction of the concept. The benefits to biodiversity were followed by the advantage of seeing environmental concerns better integrated in the consideration of development proposals. The fourth most common response (8.2% of

participants) noted the concept enabled development not otherwise possible to proceed on the basis of compensation being provided.

Disadvantages

Responses to the disadvantages were more divergent than advantages and rankings were more different among the sectors (see supplementary material). The disadvantages overall primarily related to the difficulties and inefficiencies in managing the concept, rather than shortcomings of the concept itself (Table 4).

Table 4: Most frequent response to the disadvantages of ecological compensation

Rank	Theme	%
1	Poor security of exchange	15.3
1	Lack of transparency and misuse of the concept	15.3
3	Lack of guidance, policy and tools	14.6
4	Additional pressure on biodiversity	13.5
5	Poorly planned exchanges	10.5

Equally ranked as the most commonly-cited disadvantages were poor security of exchanges and the misappropriation of the concept; closely followed by concern at the lack of guidance. Concern that biodiversity is placed under additional pressure ranked fourth, followed by concerns regarding poor planning of exchanges.

Barriers

Four of the five barriers identified, like the disadvantages, concerns related to the difficulties and inefficiencies in managing the concept (Table 5). Ecological limitations constituted 8.5% of responses.

Table 5: Most frequent response to the barriers to the implementation of ecological compensation

Rank	Theme	%
1	Lack of guidance, tools and a framework for decision-making *	20.1
2	Lack of follow-up and security	14.8
3	Agency and operational failures	13.0
4	Lack of willingness, resourcing and priority	11.4
5	Ecological limitations	8.5

(*) Denotes that this theme was dominant across all sectors

Of dominant concern was the lack of guidance and policy across all sectors, followed by lack of security and agency and operational failures. Ecological limitations concerned responses that considered that some elements of ecosystems cannot be replaced and some effects cannot be ameliorated by current knowledge and tools.

Key considerations

Participants indicated that the key matter they considered in evaluating ecological compensation was that the exchange was fair and appropriate, followed by the significance of the biodiversity being impacted (Table 6).

Table 6: Frequency of response for each category on key considerations made in establishing the appropriateness of a compensation option

Rank	Theme	%
1	Fair and appropriate exchange	26.6
2	The significance of the biodiversity being impacted	25.0
3	Monitoring, security and follow-up provisions	14.8
4	Strategic conservation gain	11.4
5	Ecological limitations	6.2

This reflected the sentiment for the previous question, where several participants noted that if the exchange was poor to begin with, the implementation was unimportant as the ecological loss was inevitable. Perceptions of the fairness and appropriateness of exchanges no doubt vary, but the unifying contention is that the effects must be meaningfully addressed by the compensation as the gateway test. The ability to secure the provisions was again a significant matter of interest, while the strategic opportunities to contribute to wider conservation goals was next important, followed by ecological limitations at fifth. The matters participants considered in assessing proposals of ecological compensation strongly echoed those matters perceived to be the chief areas of concern. The recognition that getting those key elements right may signal an improvement that is actually occuring, or at least imminent, in the quality of vetting of ecological compensation proposals.

What are the views of stakeholders on the way ecological compensation could be addressed in the future?

Support for ecological compensation

Participants were asked the extent to which they supported the concept of ecological compensation and its actual or potential contribution to resource management (Table 7). A significant majority (70.7%) fully supported the concept and a higher proportion supported it in each group compared with those that support only limited use of the concept. A further 30 participants (25.8%) supported the concept, but consider that its use should be limited. Only two participants were ambivalent to ecological compensation being available or did not support it outright, while two did not respond. When the two outlier respondents were excluded from the Chi-squared analysis among the sectors the level of support for ecological compensation between those that ‘support limited use and those that generally support it was significantly different (χ^2 = 16.765, DF = 6, P-Value = 0.010). This suggests that some groups are more tentative in their support of the concept but do overall support its presence as a policy tool.

Table 7 Frequency and percentages (in brackets) of response for each category of support for ecological compensation

Question	Planning & Policy n=21	Enviro consult n=28	Enviro govt n=27	Enviro research n=14	Advocacy n=5	Business n=15	Law n=6	Total n=116
Do not support	0	0	1 (3.7)	0	0	0	0	1
Neutral	0	0	0	1 (7.1)	0	0	0	1
Support but use should be very limited	3 (14.3)	8 (28.6)	11 (40.7)	6 (42.9)	2 (40.0)	0	0	30 (25.8)
Generally support	18 (85.7)	20 (71.4)	14 (51.9)	7 (50.0)	2 (40.0)	15 (100.0)	6 (100.0)	82 (70.7)
No response	0	0	1 (3.7)	0	1 (20.0)	0	0	2

The importance of like-for-like exchanges

'Like for like' exchange of values is one of the key premises of ecological compensation. The majority of participants (67.2%) noted that it was very important but that flexibility was needed, with just 4.3% regarding it as non-negotiable (Table 8). Only two participants considered it unimportant, with the remainder regarding it as somewhat important. There was no significant difference across sector responses (χ^2= 11.669, DF = 6, P-Value = 0.070). Where participants entered into further detail about situations in which flexibility was appropriate, interview notes reflect that they were typically referring only to cases of 'trading-up', whereby areas of greater conservation significance are put aside or managed in place of less valuable areas that are impacted in the course of the development.

Table 8: Frequency and percentages (in brackets) of response for each category on scale of the importance of like for like

Like for Like	Planning & Policy n=21	Enviro consult n=28	Enviro govt n=27	Enviro research n=14	Advocacy n=5	Business n=15	Law n=6	Total n=116
Not important	1 (4.8)	0	0	0	0	1 (6.7)	0	2 (1.78)
Somewhat important	2 (9.5)	8 (28.6)	4 (14.8)	8 (57.1)	1 (20.0)	5 (33.3)	3 (50.0)	31 (26.7)
Very important	17 (81.0)	19 (67.9)	21 (77.8)	6 (42.9)	4 (80.0)	8 (53.3)	3 (50.0)	78 (67.2)
Non-negotiable	1 (4.8)	1 (3.6)	2 (7.4)	0	0	1 (6.7)	0	5 (4.3)

Future policy direction

The questions in this section inquired whether there was a need for a statutory approach, what an appropriate legal tool might be to use, and whether the resulting guidelines ought to include reference to prescribed methods for determining the quantum of compensation (Table 9). All groups, and the majority within all sectors, strongly favoured statutory methods to address ecological compensation, with three not responding and 11 suggesting a non-statutory approach is more appropriate. The categories of possible legal tools (National Policy Statement, National Environmental Standard, other RMA method or separate legislation) were provided to participants, with most choosing a National Environmental Standard as the most appropriate legal tool to address ecological compensation. The second most common response was that of the participant not being sure or stating no preference, followed by opting for a National Policy Statement to address the matter. However all three categories of National Environmental Standard, 'unsure' and National Policy Statement were similar in response frequency.

Table 9 Frequency and percentages (in brackets) of responses to questions regarding future direction and policy

Question	Planning & Policy n=21	Enviro consult n=28	Enviro govt n=27	Enviro research n=14	Advocacy n=5	Business n=15	Law n=6	Total n=116
Do you support ecological compensation being addressed with a statutory approach?								
No	2 (9.5)	2 (7.1)	2 (7.4)	1 (7.1)	0	2 (13.3)	2 (33.3)	11 (9.5)
Yes	19 (90.5)	25 (89.3)	24 (88.9)	12 (85.7)	5 (100.0)	13 (86.7)	4 (66.7)	102 (87.9)
No response	0	1 (3.6)	1 (3.7)	1 (7.1)	0	0	0	3 (2.6)
What is the most appropriate legal method to address ecological compensation?								
NPS	7 (33.3)	9 (32.1)	10 (37.0)	1 (7.1)	2 (40.0)	3 (20.0)	1 (16.7)	33 (28.4)
NES	9 (42.9)	10 (35.7)	6 (22.2)	4 (28.6)	3 (60.0)	7 (46.7)	3 (50.0)	42 (36.2)
Other RMA method	0	3 (10.7)	0	1 (7.1)	0	3 (20.0)	0	7 (6.0)
Separate legislation	0	0	2 (7.4)	0	0	0	0	2 (1.7)
NR	5 (23.8)	6 (21.4)	9 (33.3)	8 (57.1)	0	2 (13.3)	2 (33.3)	32 (27.6)
Should future policy include set methods for determining ecological compensation?								
No	13 (61.9)	18 (64.3)	8 (29.6)	7 (50.0)	1 (20.0)	5 (33.3)	4 (66.7)	56 (48.3)
Yes	8 (38.1)	9 (32.1)	18 (66.7)	6 (42.9)	3 (60.0)	10 (66.7)	2 (33.3)	56 (48.3)
No response	0	1 (3.6)	1 (3.7)	1 (7.1)	1 (20.0)	0	0	4 (3.4)

(NPS = National Policy Statement; NES = National Environmental Standard – both policy tools available to provide guidance and/or rules at a national level on matters of national significance. NR = no response.)

Whether or not set methods or prescribed decision-support tools should be provided to calculate ecological compensation is perhaps where some of the most striking divergence between sectors was present. Of the total number of respondents, four did not give a response to this question, while the remainder were evenly split (56/56) over whether they considered set methods to be appropriate. Most that responded 'no' to set methods voiced concern that the field is moving so quickly that such methods would likely soon become outdated. There was a clear distinction between the perceived appropriateness across the sectors. Environmental Government and Business participants mainly selected 'yes', while Planning & Policy, Environmental Consultants mainly selected 'no' to set methods. The remainder of groups demonstrated a more event split or a low n value. Despite some evidence of divergence in the raw counts, a Chi-squared analysis reflected no statistically significant difference ($\chi^2 = 11.447$, DF = 6, P-Value = 0.076).

Guidance content

The proposed content of guidance addressed both high level principles and detailed operational guidance (Table 10). Practitioners highlighted the need for guidance to be explicit and principle-based and to be standardised across the country. They noted that it should include tools and methods, it should be scalable and it should include standards for follow-up and security. Further – and perhaps contradictory to a push for standardisation – there was a clear desire that the guidance material be flexible, scalable and open to modification as new tools and knowledge became available.

Table 10: Frequency of response for each category on content of future guidance and policy

Rank	Theme	%
1	Clear and unambiguous policy direction based on key principles *	27.5
2	Standardised decision-making framework	19.0
3	Tools, methods and guidance on expected level of information	15.2
4	Standards for follow-up and security	9.1
5	Flexible, open to innovation and use at different scales	8.7

(*) Denotes that this theme was dominant across all sectors

Sustainable management

The majority (71.5%) of respondents agreed that ecological compensation contributes to sustainable management, with a further 19% (total of 90.5%) suggesting that it does so 'somewhat' (Table 11). There was also no statistically significant difference (χ^2 = 9.035, DF = 6, P-Value = 0.172) among the sectors with the great majority of respondents considering that ecological compensation contributes to sustainable management.

Table 11 Frequency and percentages (in brackets) of response for each category of the extent to which ecological compensation contributes to sustainable management

	Planning & Policy n=21	Enviro consult n=28	Enviro govt n=27	Enviro research n=14	Advocacy n=5	Business n=15	Law n=6	Total n=116
No	0	1 (3.6)	8 (29.6)	0	0	1 (6.7)	0	10
Somewhat	4 (19.0)	3 (10.7)	5 (18.5)	4 (28.6)	1 (20.0)	3 (20.0)	2 (33.3)	22
Yes	17 (81.0)	24 (85.7)	14 (51.9)	10 (71.4)	3 (60.0)	11 (73.3)	4 (66.7)	83
No response	0	0	0	0	1 (20.0)	0	0	1

Other matters

The open-ended summary questions prompting further ideas for improvement of the implementation of ecological compensation, as well as the section for 'any other comments' allowed participants to raise matters not otherwise addressed. Twenty-two participants did not have any further ideas for improvement, while many more reiterated matters already addressed elsewhere in the questionnaire (such as the need for guidance). Of the matters not otherwise addressed, poor agency oversight was most frequently mentioned (16), followed by the importance of increasing the capacity of agencies to administer the concept (14). It is clear that many participants are concerned with the resourcing and capacity of agencies, and consider that this must be addressed in order to improve implementation. In addition, nine participants identified the opportunity presented to New Zealand by bio-banking, enabling the aggregation of mitigation funding

into a credit scheme, while a further seven noted that ecological compensation would generate the best outcomes if integrated with systematic conservation planning.

6.5 Discussion

This research provides insight into the knowledge and experience of a significant number and wide range of stakeholders involved in ecological compensation in New Zealand. Studies overseas note difficulty in engaging with the regulatory community due to a lack of availability (BenDor & Riggsbee 2011) and low participation by practitioners and the business sector due to the potential negative consequences of research (Carruthers & Neis 2011). However we found significant and unexpectedly high willingness to participate in the research and from all sectors. This is perhaps symptomatic of the rapid development of the field in New Zealand and of an appetite for greater discussion and analysis of this concept. In the context of economic recession and an ongoing need for development and resource use, there is also global interest in these mechanisms due to their potential to help resolve the binary of economic development and environmental protection.

What are the views of stakeholders on the implementation of ecological compensation in New Zealand, under the RMA 1991?

The principal advantages of the concept, particularly the two most commonly identified, were eco-centric and related to the better achievement of biodiversity and environmental benefits. Strikingly, however, ecological matters featured comparatively little in the discussion of disadvantages and barriers – most of which were confined to operational matters. This indicates that although the potential ecological benefits of the concept are well-recognised, the scientific shortcomings of it are considered minor compared with the organisational and social impediments (contextual challenges) to effective implementation. This contention reflects findings overseas that addressing contextual challenges such as by increasing follow-up and enforcement are necessary to generate better outcomes from ecological compensation (Bull et al. 2013; Cowell 2000; Gibbons & Lindenmayer 2007; Rega 2013; Walker et al. 2009a).

What are the views of stakeholders on the way ecological compensation could be addressed on a formal basis in New Zealand?

The interviews demonstrated a strong endorsement of ecological compensation. Most respondents acknowledged that it was conceptually sound and a valid tool of resource management. This level of support reflects similar studies that also show significant support for the concept, albeit tempered by ever-present concerns about practical implementation (Gibbons & Lindenmayer 2007; Hayes & Morrison-Saunders 2007; Memon & Skelton 2004; Murphy 2006; Rubec & Hanson 2009). The concept was clearly viewed as an improved approach to past environmental management, which was considered less likely to restrict adverse effects both in degree and location:

> *"It [ecological compensation] is the way of the future, the only sensible thing to do. If you are against ecological compensation, then you must interrogate why...because that is admitting things cannot improve" (Interview 8)*

Like for like

Responses to our interview question regarding the importance of like-for-like exchanges reflected that although similarity of exchange was seen as important, it is by no means 'non-negotiable'. Respondents attitudes to the importance of like-for-like reflects other studies which have shown that the like-for-like approach is viewed as one that may not be workable in practice and does not always generate the best outcomes (Hayes & Morrison-Saunders 2007; McKenney & Kiesecker 2010). The recognition of the importance of flexibility in applying like-for-like is also in general accordance with current perspectives which are increasingly providing for priority-based exchanges (McKenney & Kiesecker 2010). Of practical concern however is how the suitability of like-for-unlike exchanges is determined. While work is being undertaken on developing methods for comparing unlike exchanges, one has yet been accepted into common usage in New Zealand (Overton et al. 2013; Quertier & Lavorel 2011).

Formalising approaches

Most participants were of the view that a policy vacuum was a significant contributor to ineffectual outcomes of ecological compensation, which reflects assertions in the literature that further and more robust treatments of the concept would reduce repetitive litigation, achieving greater consistency within and between agencies, and improve implementation (Bekessy et al. 2010; Memon & Skelton 2004; Race & Fonseca 1996; Rega 2013). Addressing how the concept may be addressed in national level policy and guidance would seem to be the next significant challenge for New Zealand. Participants strongly favoured a statutory approach but held very mixed perspectives as to whether it would be appropriate for prescribed set methods to be set in policy for determining appropriate offsets or not. Rega (2013) identified the establishment of "sound but 'ready to use' methods and metrics" as one of two matters to be most urgently addressed with respect to ecological compensation in Italy. Conversely, many participants in our research voiced concern that the introduction of nascent methods would not keep pace with technical development of the field, thus potentially creating perverse outcomes. This mix of views is reflected in international experience where some jurisdictions choose to prescribe methods, with others expressly resisting, on the basis that prescribed methods would tend to constrain evolution of practice while a more flexible, principle-based approach tends to produce better outcomes (McKenney & Kiesecker 2010).

A National Environmental Standard ranked highest as the most appropriate legal tool to address ecological compensation in New Zealand, although a National Policy Statement and 'no response' ranked similar. While a full legal analysis of the appropriate method would be necessary, the preference of stakeholders is relevant. National Policy Statements and National Environmental Standards are tools available under section 43 of the RMA that enable central government to influence the wording and content of lower level planning instruments administered by local and regional government. Responses did reflect that the rules-based practicality of a National Environmental Standard and the policy level approach of a National Policy Statement are recognised as having similar value, so perhaps a combination of the two might be a useful approach. Around the world, there has been a proliferation of policy approaches to addressing ecological

compensation (Burgin 2008; McKenney & Kiesecker 2010; Memon et al. 2004; Rundcrantz & Skarback 2003) which New Zealand can draw from to inform domestic responses

Is there evidence of divergence in views across the range of sectors represented in the sample?

In several cases, the uneven and often low representation of sectors meant statistical tests for differences in views were not able to be carried out. We include raw response data to the five key open responses in the Supplementary material to demonstrate that although statistically significant differences were not common, some divergence was apparent from the raw frequency data. The relative lack of divergence among the sectors that was observed in responses to questions regarding implementation suggests that the key failings are well-recognised and widely understood by practitioners, regardless of sector membership. Divergence of views existed more with respect to the way in which the concept could be more formally addressed, although a desire for policy still captured majority support. The degree of disparity between responses across different sectors was certainly lower than expected, with most responses evidencing broadly similar perspectives on key matters. Different views in how the concept could be formally addressed suggest that wide consultation with stakeholders is likely to be an important element of successful policy development and implementation.

Ecological compensation has strong support in New Zealand, reflecting broad international acceptance of the concept. However, consistent with international experience, widespread concern about current implementation standards and a desire for a more formalised approaches are desired. It is our view, supported by the weight of the opinion sourced in the interview programme, that ecological compensation is a necessary tool in resource management in New Zealand, and holds promise if utilised credibly and with appropriate checks and balances in place. We suggest that a resource management context that does not explicitly and sufficiently support ecological compensation is unlikely to generate positive outcomes and adequately recognise the promise of the concept. We also suggest that a formal policy approach must occur in tandem with moves to address the

many implementation issues highlighted in the interview responses and the wider literature.

6.6 Funding

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6.7 Supplementary material

Supplementary material is included that includes five additional tables of data detailing the responses across sectors to the key questions, and the full text of in the order in which they were asked in the interviews.

6.8 Acknowledgements

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6.9 Supplementary data appendix

6.9.1 Supplementary data file 1- Interview questions

1	What is your understanding of the purpose of ecological compensation in an RMA context?*
2	What methods of implementing ecological compensation are you familiar with?* (read key ones and invite to add more)
3	What are the potential advantages or positive aspects of ecological compensation?
4	What are the potential disadvantages, negatives or risks of ecological compensation?
5	What are the barriers to successful implementation of ecological compensation?
6	Are you aware of an example of successful implementation of ecological compensation and what were the critical success factors?*
7	Are you aware of an example of unsuccessful implementation and what in your view, were the principal reasons it was not successful?*
8	'Like for like' exchange of values is one of the key premises of ecological compensation. Which of these best describes your perspective in considering how important similarities of exchange elements are? [Scale of 1 (not important) – 4 (non-negotiable)]
9	Are there ecosystems or ecosystem types in which ecological compensation should be provided for to a greater or lesser degree?*
10	What key considerations do you make in establishing the appropriateness of a compensation option?
11	National level policy guidance has been called for in relation to ecological compensation. What matters do you consider such

guidance should address?

11a. If policy guidance is developed, would you consider it appropriate for it to contain prescribed methods for quantifying mitigation/offsets? Why/why not?*

11b. If that guidance was produced would you consider it appropriate for it to be statutory as opposed to non-statutory, and (if any) which of the following legal tool/method would be the most appropriate to deliver this policy guidance?

12 The basis of the RMA is sustainable management. Does ecological compensation as a concept contribute to sustainable management?

13 Do you have any other ideas as to how the use or implementation of ecological compensation could be improved?*

14 To what extent do you support the use of ecological compensation under the RMA? [Scale of 1 (do not support) to 4 (generally support)]

ANY OTHER COMMENTS

NB: (*) question not subject to formal analysis

6.9.2 Supplementary data file 2 – Additional data

Advantages	Planning & Policy (21)	Enviro consult (28)	Enviro govt (27)	Enviro research (14)	Advocacy (5)	Business (15)	Law (6)	Total
Biodiversity benefits and the overall reduction in environmental impacts	28 (46.7)	43 (58.1)	37 (50.0)	19 (44.2)	8 (80.0)	16 (38.1)	6 (37.5)	157 (49.2)
Better integration of environmental considerations in development	14 (23.3)	12 (16.2)	21 (28.4)	8 (18.6)	2 (20.0)	5 (11.9)	3 (18.6)	65 (20.4)
Stakeholders benefits	5 (8.3)	7 (9.5)	3 (4.1)	4 (9.3)	0 (0.0)	7 (16.7)	2 (12.5)	28 (8.8)
Communication and relationship building (social outcomes)	1 (1.7)	6 (8.1)	2 (2.7)	5 (11.6)	0 (0.0)	4 (9.5)	1 (6.25)	19 (6.0)
Flexibility and innovation	4 (6.7)	3 (4.1)	4 (5.4)	2 (4.7)	0 (0.0)	3 (7.1)	2 (12.5)	18 (5.6)
Allows development to proceed	5 (8.3)	2 (2.7)	6 (8.1)	5 (11.6)	0 (0.0)	6 (14.3)	2 (12.5)	26 (8.2)
Other	3 (5.0)	1 (1.3)	1 (1.3)	0 (0.0)	0 (0.0)	1 (2.4)	0 (0.0)	6 (1.9)
Number of participants that didn't respond	0	0	1	0	0	0	0	
Total	60	74	74	43	10	42	16	319
Percentage total responses	18.80%	23.20%	23.20%	13.50%	3.10%	13.20%	5.00%	
Total number of themes identified	7	7	7	6	2	7	6	

Disadvantages	Planning & Policy (n=21)	Enviro consult (n=28)	Enviro govt (n=27)	Enviro research (n=14)	Advocacy (n=5)	Business (n=15)	Law (n=6)	Total (n=116)
Poorly planned exchanges	3 (4.4)	10 (9.8)	18 (18.4)	6 (8.6)	1 (6.7)	4 (8.2)	3 (10.3)	45 (10.5)
Poor security for gains/exchanges	11 (16.4)	12 (11.8)	14 (14.3)	10 (14.3)	2 (13.3)	10 (20.4)	7 (24.1)	66 (15.3)
Ecological limitations	8 (11.9)	17 (16.7)	5 (5.1)	6 (8.6)	0 (0.0)	1 (2.0)	5 (17.2)	42 (9.7)
Poor implementation mean aspirations are not met	6 (9.0)	8 (7.8)	4 (4.1)	8 (11.4)	3 (20.0)	5 (10.2)	1 (3.4)	35 (8.1)
Lack of transparency and misuse of the concept	14 (21.0)	17 (16.7)	13 (13.3)	7 (10)	3 (20.0)	8 (16.3)	4 (13.8)	66 (15.3)
Resource requirements	2 (3.0)	7 (6.9)	6 (6.1)	3 (4.3)	0 (0.0)	8 (16.3)	3 (10.3)	29 (6.7)
Lack of strategic planning underpinning usage	0 (0.0)	3 (2.9)	1 (1.0)	1 (1.4)	1 (6.7)	0 (0.0)	0 (0.0)	6 (1.4)
Lack of guidance, policy and tools	8 (11.9)	12 (11.8)	19 (19.4)	9 (12.8)	0 (0.0)	10 (20.4)	5 (17.2)	63 (14.7)
Additional pressure on biodiversity	11 (16.4)	15 (14.7)	15 (15.3)	12 (17.1)	3 (20.0)	2 (4.1)	0 (0.0)	58 (13.5)
Resistance to the concept and other communication issues	4 (6.0)	1 (1.0)	3 (3.1)	8 (11.4)	2 (13.3)	1 (2.0)	1 (3.4)	20 (4.7)
Total	67	102	98	70	15	49	29	430
Number of participants that didn't respond	0	0	1	0	0	0	0	
Percentage total responses	15.6	23.7	22.8	16.3	3.5	11.4	6.7	
Total number of themes identified	9	10	10	10	7	9	8	

Barriers	Planning & Policy (n=21)	Enviro consult (n=28)	Enviro govt (n=27)	Enviro research (n=14)	Advocacy (n=5)	Business (n=15)	Law (n=6)	Total (n=116)
Agency and operational failings	11 (12.2)	17 (12.9)	12 (10.2)	9 (14.8)	3 (17.6)	10 (14.9)	4 (18.2)	66 (13.0)
Appropriate science and expertise not available or used	8 (2.9)	9 (6.8)	10 (8.5)	5 (8.2)	1 (5.9)	4 (6.0)	2 (9.1)	39 (7.7)
Lack of willingness to pay/resource	12 (13.3)	15 (11.4)	13 (11.0)	5 (8.2)	0 (0.0)	10 (14.9)	3 (13.6)	58 (11.4)
Lack of guidance, tools and framework for decision-making	13 (14.4)	30 (22.7)	28 (23.7)	10 (16.4)	4 (23.5)	11 (16.4)	6 (27.3)	102 (20.1)
Poor use or misunderstanding/misappropriation of the concept	4 (4.4)	7 (5.3)	7 (5.9)	7 (11.5)	2 (11.8)	5 (7.5)	2 (9.1)	34 (6.7)
Lack of strategic planning	2 (2.2)	5 (3.8)	3 (2.5)	2 (3.3)	1 (5.9)	2 (3.0)	0 (0.0)	15 (3.0)
Lack of follow-up and security	18 (20)	21 (15.9)	16 (13.6)	7 (11.5)	2 (11.8)	9 (13.4)	2 (9.1)	75 (14.8)
Resource intensive to plan and carry out	11 (12.2)	13 (9.8)	4 (3.4)	3 (4.9)	2 (11.8)	5 (7.5)	2 (9.1)	40 (7.9)
Poor communication	5 (5.6)	6 (4.5)	7 (5.9)	8 (13.1)	1 (5.9)	8 (11.9)	0 (0.0)	35 (6.9)
Ecological limitations	6 (6.7)	9 (6.8)	18 (15.3)	5 (8.2)	1 (5.9)	3 (4.5)	1 (4.5)	43 (8.5)
Total	90	132	118	61	17	67	22	507
Number of participants that didn't respond	0	0	0	1	0	1	0	
Percentage total responses	17.7	26	23.3	12	3.4	13.2	4.3	
Total number of themes identified	10	10	10	10	9	10	8	

Key considerations	Planning & Policy (n=21)	Enviro consult (n=28)	Enviro govt (n=27)	Enviro research (n=14)	Advocacy (n=5)	Business (n=15)	Law (n=6)	Total (n=116)
Monitoring and follow-up/security is provided for	7 (9.3)	14 (15.2)	15 (15.6)	10 (24.4)	4 (23.5)	6 (11.5)	1 (9.1)	57
Strategic gain, considering spatial context	6 (8.0)	10 (10.9)	16 (16.7)	4 (9.8)	2 (11.8)	5 (9.6)	1 (9.1)	44
Value of what is being lost, significance etc	24 (32)	22 (23.9)	26 (27.1)	8 (19.5)	6 (35.3)	9 (17.3)	1 (9.1)	96
Guidance, policy, precedent	4 (5.3)	2 (2.2)	5 (5.2)	2 (4.9)	0 (0.0)	3 (5.8)	2 (18.2)	18
Resource requirements	3 (4.0)	5 (5.4)	2 (2.1)	2 (4.9)	0 (0.0)	8 (15.4)	0 (0.0)	20
Fair and appropriate exchange	20 (26.7)	27 (29.3)	23 (24.0)	12 (29.3)	2 (11.8)	12 (23.1)	6 (54.5)	102
Ecological constraints	7 (9.3)	6 (6.5)	5 (5.2)	1 (2.4)	2 (11.8)	3 (5.8)	0 (0.0)	24
Well managed process	4 (5.3)	6 (6.5)	4 (4.2)	2 (4.9)	1 (5.9)	6 (11.6)	0 (0.0)	23
Total	75	92	96	41	17	52	11	384
Number of participants that didn't respond	0	0	0	1	0	0	1	
Percentage total responses	19.5	24	25	10.7	4.4	13.5	2.9	
Total number of themes identified	8	8	8	8	6	8	5	

Guidance content	Planning & Policy (n=21)	Enviro consult (n=28)	Enviro govt (n=27)	Enviro research (n=14)	Advocacy (n=5)	Business (n=15)	Law (n=6)	Total (n=116)
Clear and specific principles (remove ambiguity from key concepts)	21 (26.3)	28 (28.6)	29 (30.2)	14 (25)	4 (25.0)	13 (25.5)	5 (27.8)	114
Worked examples, case studies, operational approach	7 (8.8)	6 (6.1)	8 (8.3)	3 (5.4)	2 (12.5)	1 (2.0)	0 (0.0)	27
Standardised decision-making framework	18 (22.5)	16 (16.3)	20 (20.8)	9 (16.1)	4 (25.0)	9 (17.6)	3 (16.7)	79
Tools and methods and guidance on expected detail	13 (16.3)	14 (14.3)	11 (11.5)	12 (21.4)	1 (6.25)	10 (19.6)	2 (11.1)	63
Acknowledge existing structures, sources of information and processes (integrate)	8 (10)	9 (9.2)	2 (2.1)	4 (7.1)	1 (6.25)	1 (2.0)	2 (11.1)	27
Appropriately define and resource respective roles	0 (0.0)	5 (5.1)	7 (7.3)	2 (3.6)	2 (12.5)	3 (5.9)	0 (0.0)	19
Flexible, open to innovation and use at different scales and in different situations	6 (7.5)	8 (8.2)	8 (8.3)	2 (3.6)	1 (6.25)	8 (15.7)	3 (16.7)	36
Security and monitoring/follow-up	5 (6.25)	8 (8.2)	11 (11.5)	8 (14.3)	1 (6.25)	4 (7.8)	1 (5.6)	38
Engagement and communication through drafting and review	2 (2.5)	4 (4.1)	0 (0.0)	2 (3.6)	0 (0.0)	2 (3.9)	2 (11.1)	12
Total	80	98	96	56	16	51	18	415
Number of participants that didn't respond	0	0	2	0	1	0	0	
Percentage total responses	19.3	23.6	23.1	13.5	3.9	12.3	4.3	
Total number of themes identified	8	9	8	9	8	9	7	

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Chapter 7

Synthesis

7.1 Research summary

This thesis has added to understanding of the use of ecological compensation in New Zealand under the Resource Management Act 1991 and contributed to the international literature on use of compensatory mechanisms for ecological harm. It has identified the levels of regulatory compliance with requirements (Compliance study: Chapter 4), the nature of those requirements (Practice study: Chapter 5) and the perspectives of stakeholders regarding the use of the mechanism now and in the future (Stakeholder Perspectives study: Chapter 6). Applying an empirical approach, it has quantified the current state of practice in New Zealand from the perspectives of reviews into compliance, an evaluation of practice and the views of practitioners and stakeholders, indicating opportunities for improvements and innovations. It has also provided an opportunity to compare and contrast the New Zealand experience with the international context and to contribute to the international fields of environmental impact assessment, regulatory implementation and policy development.

7.1.1 Compliance study

Key question 1: What are the levels of compliance with ecological compensation requirements in consents under the Resource Management Act 1991, and how might variation in compliance levels be explained?

Rates of regulatory compliance were shown to be 64.8% (Brown *et al.*, 2013) which is consistent with observations internationally that demonstrate that many requirements for ecological compensation are not met (Breaux *et al.*, 2005; Hornyak & Halvorsen, 2003; Matthews & Endress, 2008; Tonkin & Taylor, 2012). The literature suggested that rates of compliance are not uniform across different types of requirements, applicants and activities (International Network for Environmental Compliance and Enforcement, 2009; Ministry for the Environment, 2008; Shimshack, 2007). Tests were conducted for correlations with compliance, and included selected variables in the planning process that we expected would influence levels of compliance with the consent conditions. Results confirmed that, as expected, compliance was not uniform and that some variables in the planning process showed strong relationships with compliance (Brown, *et al.*, 2013). These findings suggest that a deeper understanding of the nature of compliance in the relevant jurisdiction can help guide agencies in addressing instances of non-compliance, by ensuring adequate resourcing of monitoring and enforcement activities. This thesis contributes to the New Zealand literature with the first systematic and empirical study of compliance with ecological compensation requirements. It also contributes to the domestic and international literature by demonstrating the non-uniformity of non-compliance, analysing the variables that correlate with actual levels of compliance and further demonstrating the critical importance of on-going monitoring in environmental impact assessment.

7.1.2 Practice study

Key question 2: How is ecological compensation considered in practice by agencies under the RMA, with respect to key implementation issues?

The use of ecological compensation as a policy tool in New Zealand is *ad hoc* and highly variable (Memon & Skelton, 2004). Using the framework outlined by McKenney and Kiesecker (2010) this part of the research demonstrated how

matters of equivalency, spatial proximity, timing, additionality, duration, compliance, currencies and ratios are addressed in practice in New Zealand, with respect to 110 sampled resource consents. This investigation is an objective analysis of the agreements presently being reached under the RMA. It provides suggestions for how the present implementation could be improved in respect of each issue identified in the planning process.

This investigation revealed considerable scope for improvement and innovation, including by demonstrating that a lack of guidance and standards for assessment has made monitoring of outcomes difficult, and consistency between decisions difficult to achieve. This thesis contributes to the New Zealand and international literature by developing a quantified understanding of the practice of ecological compensation within the current policy vacuum in New Zealand, while demonstrating the importance of clear goals when evaluating success or failure of implementation.

7.1.3 Stakeholder Perspectives study

Key question 3: What are the perspectives of stakeholders on the implementation of ecological compensation under the RMA and the possible improvements that are required?

The piecemeal application and implementation of ecological compensation in New Zealand continues. It seems the use of ecological compensation as a resource management mechanism is increasing in both frequency and profile. Engaging with practitioners and stakeholders involved in the implementation of ecological compensation was a very useful exercise and demonstrated the depth of knowledge and experience that exists in New Zealand. The interviews reflected broad agreement as to the promise and the concerns regarding the use of ecological compensation across the sectors and a strong appetite for research and discussion. Concern about the integrity of implementation were ubiquitous and most participants were of the view that formalization of the mechanism (either through policy or guidance) is a crucial step to increase the quality of implementation. This study is the first systematic collection of perspectives on the application and implementation of ecological compensation in New Zealand.

7.2 Research implications for ecological compensation in New Zealand

7.2.1 Insufficient on-going monitoring

This thesis has demonstrated that the obligations related to ecological compensation in consents are insufficiently monitored, with agencies allocating too little resource to on-going monitoring and enforcement. Poor follow-up results in greater risk of negative impacts on the environment and a failure to fulfil the expectations of the community with respect to the statutory roles of those agencies. The analysis further demonstrates that improved security of exchange is needed to better ensure that ecological compensation is carried out on a case-by-case basis. A range of existing tools are available to help secure exchanges, from ensuring practical and clearly worded conditions of consent, through to more formal tools such as RMA bonds and covenants. Better security of exchange is likely to require a combination of improved use of existing tools and the innovation of additional tools and strategies. Predictors of compliance exist with respect to variables in the planning process along with the nature of the applicant, condition and activity type. This information is important because it demonstrates the value of understanding the nature of non-compliance in a given area to assist in prioritising resources to monitor and address it.

7.2.2 Formalization of approach is needed

This research determined that ecological compensation is used commonly throughout New Zealand under the RMA and there is a clear appetite for its continuing place in resource management. However, the *ad hoc* and piecemeal application of the concept appears to be significantly limiting its potential to contribute to improved resource management and to enable effective monitoring. A formal approach would be a crucial opportunity to define the expectations of this policy tool and put in place clear and measurable goals for its use (Bekessy *et al.*, 2010; Memon & Skelton, 2004; Race & Fonseca, 1996; Rega, 2013). Clear goals and guidelines for applying the concept will also enhance the ability to monitor outcomes in the future and determine success or failure.

Furthermore, it is important to acknowledge that the present approach separating biodiversity offsets from the rest of ecological compensation may well be having perverse consequences. The focus of policy development at regional levels and the recent guidance in Draft prepared by the Department of Conservation is on 'biodiversity offsets'. These apparently distinct instruments are usually held to higher account in practice with respect to demonstrating 'no let loss' and 'like for like' conclusions. However, should the tests for those more rigorous thresholds not be met, there is little recourse for an agency or community. The regulatory context does not demand such tests are met, and the default becomes the loose application of some other measure of ecological compensation, a still open pathway that is characterised by rudimentary analysis and likely negative ecological consequences. This is not a suggestion to loosen requirements for biodiversity offsets: somewhat the opposite. It suggests that if significant environmental protection and enhancement is to be achieved with ecological compensation (its purported chief benefit) then the standards expected of offsetting (like for like, no net loss etc – see Chapter 5) must necessarily apply much more broadly to all instances of ecological compensation. The current declining condition of biodiversity in New Zealand makes an ongoing tolerance for poor exchanges leading to a consistent net loss of biodiversity, untenable.

7.2.3 Implementation improvements must underpin policy improvements

The present research has revealed significant issues with the implementation of ecological compensation under the Resource Management Act 1991 that are unlikely to be sufficiently addressed simply by the introduction of a formal policy approach. The Compliance study reflected significant levels of non-compliance, the Practice study highlighted areas for improvement and innovation. The Stakeholder Perspectives study then showed that stakeholders overwhelmingly highlight poor implementation as the chief constraint on the performance of ecological compensation. Throughout the study it was noted that poor information management by agencies was likely constraining outcomes.

When discussing potential case studies with agencies, it was clear that staff were unsure of how commonly ecological compensation was applied in consent processing. Chapter 4 (Compliance study) also showed that several cases that

were proposed to be included were removed from the sample due to insufficient information being present. Chapter 5 (Practice study) also noted that many cases contained insufficient information to compare exchanges and to determine equivalency. The introduction of a more formalised approach is unlikely to improve outcomes significantly unless it is coupled with improvements in underlying resource management systems by way of increased innovation, more research into methods and tools, and increased resourcing for monitoring and enforcement.

At present, the use of ecological compensation is not formally monitored. Monitoring and reporting of its use would provide a basis from which improvements could be made, and provide for auditing and review of decision-making. We recommend that ecological compensation agreements are specifically recorded and reported on an agency and preferably a national basis to enable review, monitoring and evaluation.

7.3 Directions for further research

7.3.1 Agency administration

The Compliance and Practice studies both reflected significant scope for improvement in the way ecological compensation is administered by agencies. The Stakeholder Perspectives study showed that 13% of responses highlighted agency and operational failure as a significant barrier to success of ecological compensation, and 10.5% of responses noted poor planning of exchanges as a common disadvantage. There are clear indications that agency resourcing, culture and behaviour have a significant impact on the processes of the determination of appropriate compensation, the formulation of agreements, and the prioritisation of follow-up and monitoring. Further research could examine the role of the agency in the field of ecological compensation and test predictions of agency and public choice theory in respect of the management of ecological compensation.

7.3.2 Retrospective requirements

Several of the case studies encountered were retrospective resource consents, issued to legitimise illegal activities. In this way, it would seem that proposals for ecological compensation as conditions of such consents are being requested by

agencies as an alternative to litigation. From discussions with agency officers and applicants, it was determined that the benefit of this approach was that the environmental effects received primary attention, because limited agency resources could be focussed upon addressing the damage rather than undertaking administration of prosecution. Analysing the manner in which ecological compensation is applied in this context would be useful; to shed light on how the outcomes of enforcement using a reparative pathway of compensatory works might differ from one where traditional prosecution is pursued.

7.3.3 Tools and methods

This thesis demonstrates that there is clear scope for development of further decision-support tools, methods for the assessment of ecological compensation, and assessment methods for supporting determination of compliance and success. The Stakeholder Perspectives study shows that stakeholders have very mixed views on the potential of prescribed methods in determining ecological compensation; however most participants agreed that further standardisation, tools, currencies and practical guidelines are essential. This reflects studies elsewhere which note the importance of the availability of sound and accepted methods to determine ecological compensation (Rega, 2013). The results showed that very few standard methods and currencies were in use at present in New Zealand. Further research could investigate the validity and reliability of existing tools, making improvements where necessary, and could contribute to creating robust and defensible new techniques. New tools should be accompanied by sufficient technical support, baseline information and guidance on appropriate use (Gardner & von Hase, 2012).

7.3.4 Ecological outcomes

The Compliance study assessed compliance with regulatory requirements which may or may not have included specific criteria to meet ecological outcomes. This research confirms that satisfactory compliance and ecological success are sometimes poorly correlated as is outlined in Matthews and Endress (2008). Research into the ecological outcomes being generated would be useful to demonstrate further the extent to which agreements for ecological compensation

are likely to be of benefit to the environment and how they might be evaluated (Breaux, *et al.*, 2005).

7.3.5 Improved security

Strategies and improved safeguards to enhance compliance levels and increase efficiency and effectiveness of on-going monitoring are necessary to improve the implementation of ecological compensation. The field of enforcement as it applies to the environment is typically poorly understood (Keane *et al.*, 2008), and follow-up of requirements in practice is particularly rare. Further research into post-approval implementation of ecological compensation is much needed, including improvement of tools and methods of securing exchanges and development of the understanding of drivers of non-compliance.

7.3.6 Delivery methods

The ad hoc application of ecological compensation in New Zealand is likely generating negative ecological outcomes, as it has in the United States and elsewhere (e.g. Salzman & Ruhl 2000). Further innovation in methods of delivery of ecological compensation is needed, particularly of those that provide ecological compensation in advance and that aggregate more than one ecological compensation effort. Ecological compensation secured in advance, assists in reducing uncertainty for all parties by requiring that gains be demonstrated at least in part prior to approval being given (Gardner & von Hase, 2012; Greer & Som, 2010). Innovation is already occurring, with mitigation trusts and other aggregated models of mitigation delivery appearing throughout New Zealand and being the main means by which off-site exchanges are currently managed (Brown, *et al.*, 2013).

Such approaches have been shown overseas to generate better ecological outcomes than many piecemeal projects, as biodiversity values are context-dependent (Breaux, *et al.*, 2005; Gardner & von Hase, 2012). As outlined in the Practice study, it is critical that establishment of landscape-level programmes includes reference to key implementation issues (McKenney & Kiesecker, 2010), and is subject to regular on-going monitoring and evaluation. There is ample scope to integrate consideration of ecological compensation with wider work

programmes informed by systematic conservation planning (Margules & Pressey, 2000).

7.4 Concluding remarks

This thesis has applied systematic, empirical assessment methods to characterise the recent application and implementation of ecological compensation under the RMA. It has demonstrated the importance of applied, empirical approaches to evaluating the outcomes of ecological compensation. In the Introduction, I showed that ecological compensation has significant inherent shortcomings. Theory predicts that poor policy, weak exchanges, and lax enforcement see permit approval placed ahead of environmental protection, and economic gain ahead of biodiversity enhancement. The three key studies of the present research have demonstrated that the expected concerns are materialising in New Zealand, and that change and action is needed to address this. The management recommendations discussed above would help to 'correct the context', making positive outcomes more likely. The suggestions for further research would enhance our understanding of ecological compensation in New Zealand also.

A formal and statutory policy framework will be an essential element of improvements, helping to set out expectations of ecological compensation and expectations of the stakeholders implementing the concept. Enhanced safeguards to ensure the security of exchanges agreed upon will be a critical dimension of any improvements. It is also suggested that calls to remove the possibility of considering ecological compensation in most cases, are likely to result in reduced compensation, not reduced adverse effects due to the degree of pressure for economic development and resource extraction. Ecological compensation relies on a strong resource management system that adequately resources assessment, negotiation and on-going monitoring of agreements. The present research provides robust evidence that significant improvement is needed for the potential of ecological compensation to be harnessed in New Zealand.

To continue implementing the mechanism in a policy vacuum, with limited controls on exchanges, with weak follow-up, is almost certain to waste the significant resource expended during planning processes and result in the on-going erosion of natural capital. Stronger standards for ecological compensation

are needed in both policy and regulation, and should be applied across the board to all forms of ecological compensation.

7.5 References

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Appendices

Appendix 1 – Field Sheet 1

GENERAL COVER SHEET – APPENDIX 1	
Site Number	Site Address
Map Ref	
Legal Description	Certificate of title #
Common Name	GPS entrance
Key contact details	
Applicant description	
Brief description of site and associated development	
Specific plan references of note	

Relevant consents under RMA issued				**Land Ownership Changes**
Code	**Agency**	**Main activity permitted**	**Date**	Old Owner/Date

Appendix 2 – Field Sheet 2

ECOLOGICAL ASSESSMENT – APPENDIX 2	
Site Number Date/Time	Site Address
Brief description of site	
Site Area	
Notable Features	
Additional site information from other sources with respect to ecological matters (i.e. LENZ etc)	
Changes to the wider landscape or catchment relevant to the development or immediate area	
Main use of the site prior	Main use of the site after

Appendix 3 – Field Sheet 3

QUESTION	Y/N	NOTES
Was there a significant operational process that the application was subject to that may have had an impact upon the compensation requirements?		
Was there a policy or plan provision, or one from another document (such as a Biodiversity Strategy) that specifically addressed compensation?		
If yes, did that have a material impact on the nature of the compensation required?		
Were independent hearing commissioners utilised in the planning process?		
Was the proposal notified?		
Was the proposal litigated?		
Was a professional ecologist used in any stage of the process to consider the relevant environmental effects?		
Was the issue of compensation broached early in the process?		
Was the compensation proposed by the applicant?		
Was the negotiation for compensation carried out with the processing planner present?		
Was the proposed compensation determined prior to granting of the consent?		
How was the compensation agreed upon (i.e. what type of process e.g. voluntary, covenant, consent condition etc)		
Were there monitoring requirements incorporated for the term of the compensation?		
Were there any special elements in the monitoring that are likely to have contributed to the success or failure (i.e. expert panels, PRPs)		

Appendix 4 – Field Sheet 4

<table>
<tr><th colspan="4">COMPENSATION ASSESSMENT – APPENDIX FIVE</th></tr>
<tr><td colspan="2">Site Number</td><td colspan="2" rowspan="3">Site Address/Name</td></tr>
<tr><td colspan="2">Consent Number</td></tr>
<tr><td colspan="2">Agency</td></tr>
<tr><td colspan="4">Activity Allowed/Nature of Adverse effect</td></tr>
<tr><td colspan="2">Date of Application</td><td colspan="2">Date of Granting</td></tr>
<tr><td colspan="4">Compensation negotiated (summary of activities to avoid – remedy – mitigate – offset)</td></tr>
<tr><td colspan="4">Avoid</td></tr>
<tr><td colspan="4">Remedy</td></tr>
<tr><th colspan="2">In kind</th><th colspan="2">Out of kind</th></tr>
<tr><td colspan="2">Mitigate</td><td colspan="2"></td></tr>
<tr><td colspan="2">Offset</td><td colspan="2"></td></tr>
<tr><td colspan="2">Onsite compensation</td><td colspan="2">Offsite compensation</td></tr>
</table>

SIX KEY IMPLEMENTATION ISSUES		
1. Equivalence of impact and gain		
2. Location of the compensation (spatial proximity)		
3. How 'additional' the compensation is, and what types of compensation is it?		
4. Timing of benefits of compensation vs. Impacts		
5. Offset duration and compliance (what types of duration, security, requirements are there?)		
6. How was the mitigation established or calculated?		
APPLIES TO AGREEMENTS OUTSIDE OF CONSENT ADDRESSED IN APPENDIX 2 (IE MoUs)		
Agreement ID		
Condition No:		Text
Grade 1 - 5		Notes regarding compliance with offset requirement
Agreement ID		
Condition No:		Text
Grade 1 - 5		Notes regarding compliance with offset requirement

Appendix 5 – Field Sheet 5

COMPLIANCE ASSESSMENT – APPENDIX SIX		
Site Number	Site Address/Name	
Date/Time of Visit		
	Contact Name	Contact Number
Agency		
Applicant		
Consultant/3rd Party		

Consents under RMA issued (Agency, year granted, year implemented)	Consents issued under other Acts (Agency, year granted)

Notes

Compliance spectrum (make detailed notes)

0 – No compliance/condition dismissed/changed
1 – Minimal level of compliance
2 – Below satisfactory level of compliance
3 – Satisfactory compliance

Consent Number		
Condition Numbers		
Condition No:		Text
Grade 0-4		Notes regarding compliance

Consent Number		
Condition No:		Text
Grade 0-4		Notes regarding compliance
Consent Number		
Condition No:		Text
Grade 0-4		Notes regarding compliance
Consent Number		
Condition No:		Text
Grade 0-4		Notes regarding compliance
Consent Number		
Condition No:		Text
Grade 0-4		Notes regarding compliance
Consent Number		
Condition No:		Text
Grade 0-4		Notes regarding compliance
Consent Number		
Condition No:		Text
Grade 0-4		Notes regarding compliance