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Stewardship and the Natural Resources Framework

New Zealand's natural resources are under increasing pressure from competing uses and are, in some areas, approaching limits. Management of our natural resources has been and will continue to be a complex and contentious intergenerational issue. This complexity arises because of the many interrelationships and interdependencies between environmental and social systems involved in natural resource management, as well as the legacy of past decisions. The contentiousness arises, in part, because natural resources are typically finite and shared, where people hold different values regarding their appropriate use.

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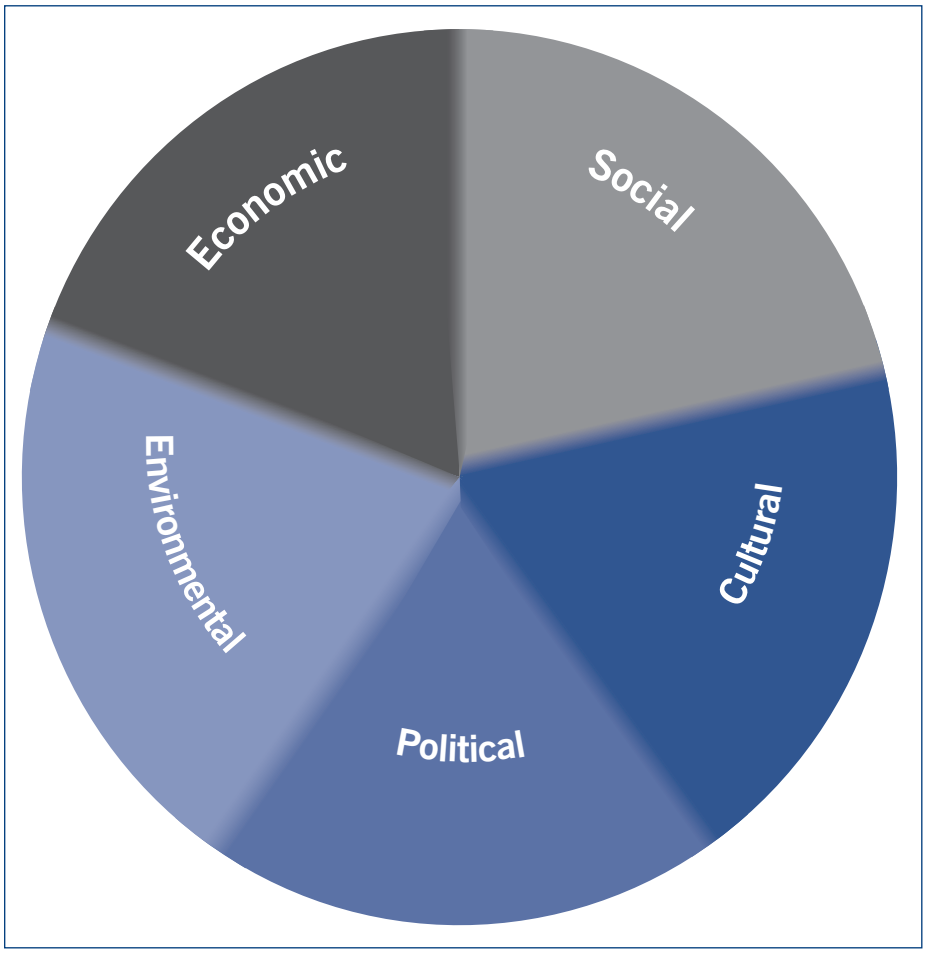
Chief executives of government agencies are responsible for the stewardship of their agencies, including the capability and capacity of agencies to offer free and frank policy advice to successive governments (State Sector Amendment Act 2013). Stewardship in an environmental context involves the wise use and management of natural resources over the long term. For government agencies responsible for natural resource policy, effective stewardship will require that they provide advice around the management of natural resources with a longer-term view in mind, and work collaboratively.

Collaboration is an important factor in achieving stewardship, as it is rare that a government agency on its own can address the complexity of natural resource issues. However, too often reactive policy dominates agency work programmes, crowding out longer-term analysis and limiting the ability of agencies to collaborate effectively. In

Figure 1: The five perspectives applied in the Natural Resources Framework



a recent review of the Ministry for the Environment the need was identified for a multi-disciplinary framework which made assumptions, analysis, priorities and trade-offs explicit. Such a framework would be able to address the complexity of natural resource issues and help underpin policy development across the natural resources sector (NRS)[1] over the longer term. In response, NRS chief executives committed to the development of a framework to provide a common analytical approach across agencies to address natural resource issues. The result is the Natural Resources Framework, which seeks to promote the stewardship and kaitiakitanga[2] of New Zealand's natural resources. It does this by helping NRS agencies to organise their analytical inquiry in an integrative way to produce robust and resilient policy advice to decision-makers.

The development of the framework began with an expansive search of international literature on natural resource policy frameworks and underlying concepts around natural resource issues. Engagement and collaboration with NRS agencies and researchers was also significant to its development.[3]

In the following sections, this article firstly outlines the underlying concepts and the supporting frameworks that have influenced the development of the Natural Resources Framework. Secondly, the structure and process of the framework are specified, and the six components that make up the framework are discussed. Each of the framework's components is then detailed thoroughly. Finally, the article concludes by offering a way forward for stewardship and the Natural Resources Framework.

Background

The Natural Resources Framework is premised on four underlying concepts. These concepts are supported by various natural resource policy frameworks that have collectively influenced the development of the Natural Resources Framework.

People

The first concept is that while environmental and social systems are interrelated and interdependent, natural resource issues typically arise from the way people behave and interact with the natural resource. Natural resource issues do not arise primarily from the natural resource base (Pahl-Wostl, 2009). It is people, through their complex interrelationships with natural resources, who shape the outcomes of natural resources over time. The Natural Resources Framework responds to this by putting people at the centre of analysis.

The Natural Resources Framework was influenced by the well-developed ecosystem services approach (Capistrano et al., 2006), which classifies the various benefits that accrue to people from natural resources and surrounding ecosystems, and the socio-ecological systems approach (Holling, 2001; Folke et al., 2005). The social-ecological systems framework developed by Nobel laureate Elinor Ostrom (2007, 2009) was also influential. Briefly, this framework structures inquiry around the interrelationships between environmental and social systems by providing a common analytical approach to promote dialogue between the natural and social sciences.

Institutions

The second underlying concept is that to understand the behaviour of people, the institutions that influence people's behaviour should be analysed and understood. Institutions are important because they provide powerful incentives for people to behave in certain ways and generally endure over time.

Specifically, institutions are the rules people follow that guide, provide opportunities for and constrain collective behaviour. Institutions help people understand how they should respond in different situations and can reduce uncertainty in making decisions. Some institutions are codifed in sets of formal rules, such as regulations, but many others are based on informal rules, such as social and cultural norms, underpinned by people's values and beliefs. In its focus on institutions and their analysis the Natural

Resources Framework was influenced significantly by the Institutional Analysis and Development Framework. This framework, developed by Ostrom (2005) and adapted by others (e.g. Fischer et al., 2007), is designed to organise and structure inquiry around institutions for improved policy analysis.

Multiple perspectives

The third underlying concept is that analysis requires multiple perspectives to reflect the diversity of people and their values, and the various ways of understanding natural resource and environmental systems. Different perspectives will result in different insights regarding the behaviour of people in relation to natural resources. Multiple perspectives also help avoid oversimplifications and blind spots by offering alternative means of understanding and analysing a natural resource issue.

Different perspectives require policy analysts to use different disciplines, and, as such, the framework supports a multi-disciplinary approach. The Natural Resources Framework does not assume that one discipline, institutional arrangement (i.e. particular set of rules) or policy option type is favoured over another.

The framework adopts five perspectives – social, cultural, political, environmental and economic – to ensure analysis is comprehensive and adequately accounts for the complexity and many important attributes of natural resource issues (see Figure 1).

While social, economic and environmental perspectives are generally well understood and accepted as representing the three 'pillars' typically promoted in sustainability frameworks (e.g. see Adams, 2006), two additional perspectives have been included, cultural and political. The addition of the cultural perspective allows people's behaviour and institutions to be better understood in a way specific to New Zealanders. This perspective should be interpreted as relating not solely to any one culture, but to the range of cultures represented in New Zealand. As partners in the Treaty of Waitangi relationship, however, NRS agencies have a responsibility to support iwi and Māori in performing their kaitiakitanga functions. This responsibility means agencies must consider carefully each perspective from an iwi and Māori point of view.

The political perspective provides insight into the political processes, institutions and agreements (e.g. international treaties) that shape New Zealand democracy, including its legitimacy and accountability. This perspective is intended to shed light on political institutions and processes encountered, rather than question the mandate of the government of the day.

Integrative thinking

A key challenge in analysing natural resource issues across multiple perspectives is bringing these perspectives together in order to find robust and resilient policy solutions. Integrative thinking, the fourth underlying concept of the framework, is applied throughout the framework to address this challenge. Integrative thinking differs from conventional thinking in attempting to bring together multiple perspectives and forms of analysis with the aim of finding creative resolutions to trade-off tensions that might not otherwise be seen (see Table 1) (Martin and Austen, 1999). Integrative thinking emphasises the possibility of promoting more 'inclusive' institutional arrangements (economy and the environment, rather than economy or the environment) (Acemoglu and Robinson, 2012), which are crucial for the wise use and management of natural resources over the long term.

The Sustainability Integration Framework and the Integrative Framework have influenced the development of the Natural Resources Framework here. The Sustainability Integration Framework offers a range of trade-off principles for consideration prior to any trade-offs being readily accepted (Gibson, 2006; Croal et al., 2010). The Integrative Framework provides a structured means to navigate and make space for multiple perspectives in policy analysis (Hirsch et al., 2011; Hirsch et al., 2013); that is, it attempts to bring, but does not force, integration and synthesis across perspectives. Accordingly, it also recognises the potential for dissonance between perspectives.

Table 1: The four stages of integrative thinking

Conventional thinking	Integrative thinking
Limited number of attributes considered	Many salient attributes considered
Simplified analysis of causality	Complexity of causal tendencies in analysis
Anaysis of Independent parts and only through a single perspective	Multiple perspectives analysed simultaneously, so that a 'complete' picture is visualised
Ready acceptance of unattractive trade-offs	Search for creative resolutions to trade-off tensions

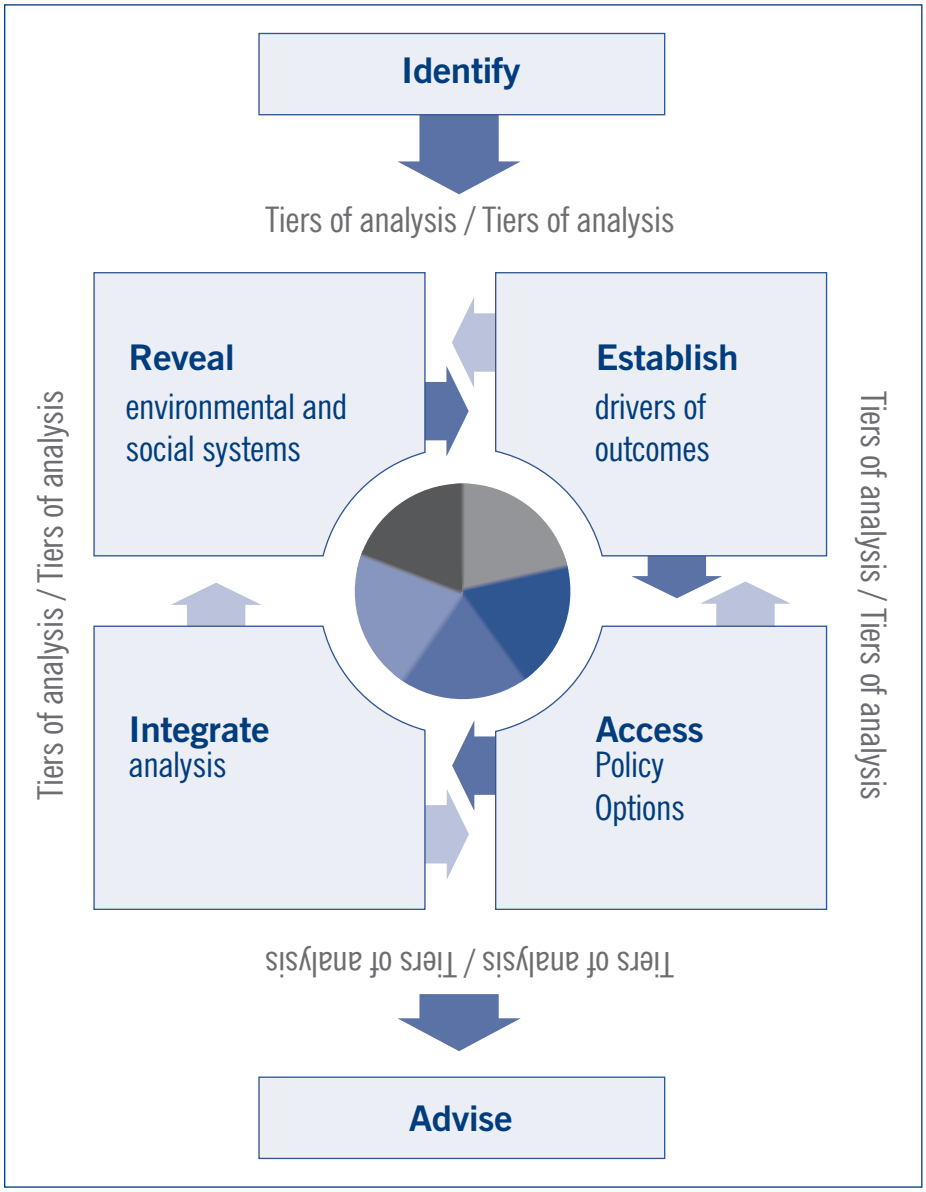
Source: adapted from Martin and Austen (1999)

Structure and process

The Natural Resources Framework consists of six components, with four analytical components framed by two procedural components. The framework is intended to be flexible and avoids providing an overly prescriptive process. Figure 2 shows the four analytical components – *Reveal*, *Establish*, *Assess* and *Integrate* – in the centre. These components are 'bookended' by the procedural components *Identify* and *Advise*. The four analytical components broadly map to the four stages of integrative thinking (see Table 1). The five perspectives – social, cultural, political, environmental and economic – are woven consistently throughout all analytical components to capture the diversity of values at stake.

The components of the Natural Resources Framework do not need to be worked through as a series of steps from *Identify* to *Advise*. Even where the framework is applied as a series of steps, the analytical components are designed to be able to work iteratively with each other. There are four ways the framework could be worked through. First, the framework could be used for in-depth policy analysis through the generation of new policy options by progressing sequentially

Figure 2: Components of the Natural Resources Framework



from *Identify* to *Advise*. Alternatively, any single component of the framework could be applied to complement existing policy analysis or development. Third, the framework could be applied in an exploratory way from *Reveal* to *Assess* across a range of natural resource issues to help set future priorities by indicating how well these issues are tracking towards stewardship and kaitiakitanga. Or the framework could be used backwards from *Establish* to *Reveal* to provide insights into the institutions and behaviour that have led to present and defined future outcomes.

The Natural Resources Framework has three common tiers of analysis that can be applied to each component.[4] These tiers are:

- task ('what');
- reasoning ('why');
- engagement and tools ('how').

The task tier and engagement and tools tier are both specifically tailored for each component. The reasoning tier, on the other hand, is the same for all components of the framework. The task tier outlines the component and provides a short background. Key tasks are then explained to help policy analysts understand the work required to complete the component. A list of questions has been formed to prompt policy analysts through each task. The reasoning tier considers why conclusions to tasks were reached. The aim of this tier is to ensure that the analysis undertaken within each component is transparent and robust so it can be trusted as a basis for developing policy. This tier requires the reasons and assumptions behind conclusions to be made explicit and the strength of the arguments made to be considered.

The engagement and tools tier addresses how the analysis could be undertaken through the use of possible analytical tools (e.g. cost-benefit analysis, multi-criteria analysis, scenario planning) and engagement points. Each component identifies useful engagement points and quantitative and qualitative tools to aid the analysis. This is to ensure that the information used and/or collected reflects both numerical values and lived experience.

Components

This article now considers each component of the Natural Resources Framework in more detail. The specific tasks of each component are discussed: brief descriptions of the key tasks in each component are indicated in Table 2. Importantly, the six components that make up the Natural Resources Framework are complementary to existing policy processes and frameworks, including regulatory impact assessments. The components can also be used to focus attention on parts of the policy cycle that are characteristically underdeveloped or under-explored.

Identify

The *Identify* component aims to clearly identify the natural resource issue, get an effective project design in place and ensure the mandate for analysis is secured upfront. An important part of this component is gaining agreement on what the framework will be used for and how NRS agencies will operate together and approach the work, including resourcing, engagement design and acknowledgement of the Treaty of Waitangi. As part of the Crown, NRS agencies must find ways to provide for the Treaty of Waitangi and understand the rights and interests of iwi and Māori. In the *Identify* component, the context needs to be understood well enough to provide an effective plan for how these matters will be recognised throughout the analysis, including engagement. This explicit

prompt underscores the significance of appropriately addressing the Treaty and the rights and interests of iwi and Māori at the outset to shape subsequent analysis and engagement.

Reveal

The *Reveal* component ensures that 'everything is put on the table' regarding the natural resource issue. Accordingly, this component is descriptive in its intent. Its emphasis is on describing the 'rules of the game'.

In the *Reveal* component a systems approach is emphasised to ensure the complexity of the natural resource issue is better appreciated. A systems approach allows the interrelationships and interdependencies within and between different systems to be identified and understood. Figure 3 illustrates the environmental and social systems, including the various embedded systems (ecosystem, natural resource system, political system, economic system and cultural system), and the interrelationships between people and the natural resource. Multiple perspectives typically would be used to reveal and understand the behaviour of the wide range of salient system attributes.

The environmental system is the outermost system boundary within which all other systems are embedded. In defining these boundaries, the disturbances that might affect the resilience and limits of the natural resource system and surrounding ecosystem attributes can be considered. These include the biophysical attributes of the natural resource, as well as the species and ecological processes that exist in relation to the natural resource.

In the *Reveal* component, the social system and the various systems (political, economic and cultural) embedded within it should also be explicitly described. In understanding these systems, emphasis is placed on determining the people involved (e.g. local government, central government agencies, resource users, iwi and Māori) and their values. In addition, rules and people's norms that shape behaviour across these systems can be revealed.

With a broad understanding of the environmental and social systems, the

Table 2: Key tasks for each component of the Natural Resources Framework

Component	Key tasks of each component
Identify	• Identify and agree the scope of the natural resource issue • Agree how the Treaty of Waitangi and iwi and Māori rights and interests will be provided for • Agree engagement design and how NRS agencies will operate and approach the analytical work
Reveal	• Describe the environmental system and the embedded natural resource system and ecosystem • Describe the social system and other embedded systems, including the Treaty of Waitangi, norms, rules and values of people involved • Reveal the interrelationships between the natural resource and people
Establish	• Analyse the incentives and behavioural drivers that people face over time • Analyse the effect on collective behaviour • Establish present and possible future outcomes including their associated uncertainties
Assess	• Assess status quo outcomes against agreed criteria • Craft new policy options and compare them with the status quo
Integrate	• Integrate perspectives and resolve the trade-off tensions identified by refining policy options • Categorise and filter policy options in accordance with their risk • Rank remaining policy options and indicate where trade-offs lie
Advise	• Advise decision-makers through the development of an agreed collective narrative • Ensure assumptions, limitations and trade-offs to be confronted are explicit

Figure 3: The Reveal component

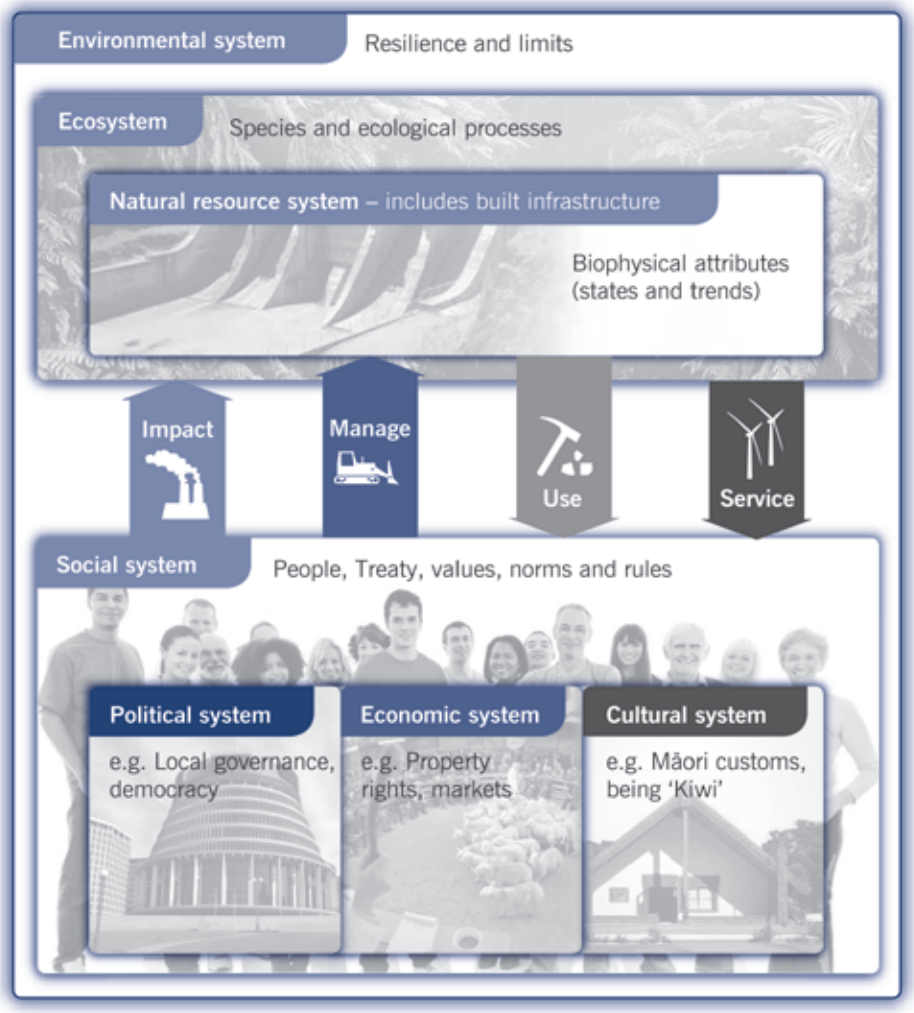
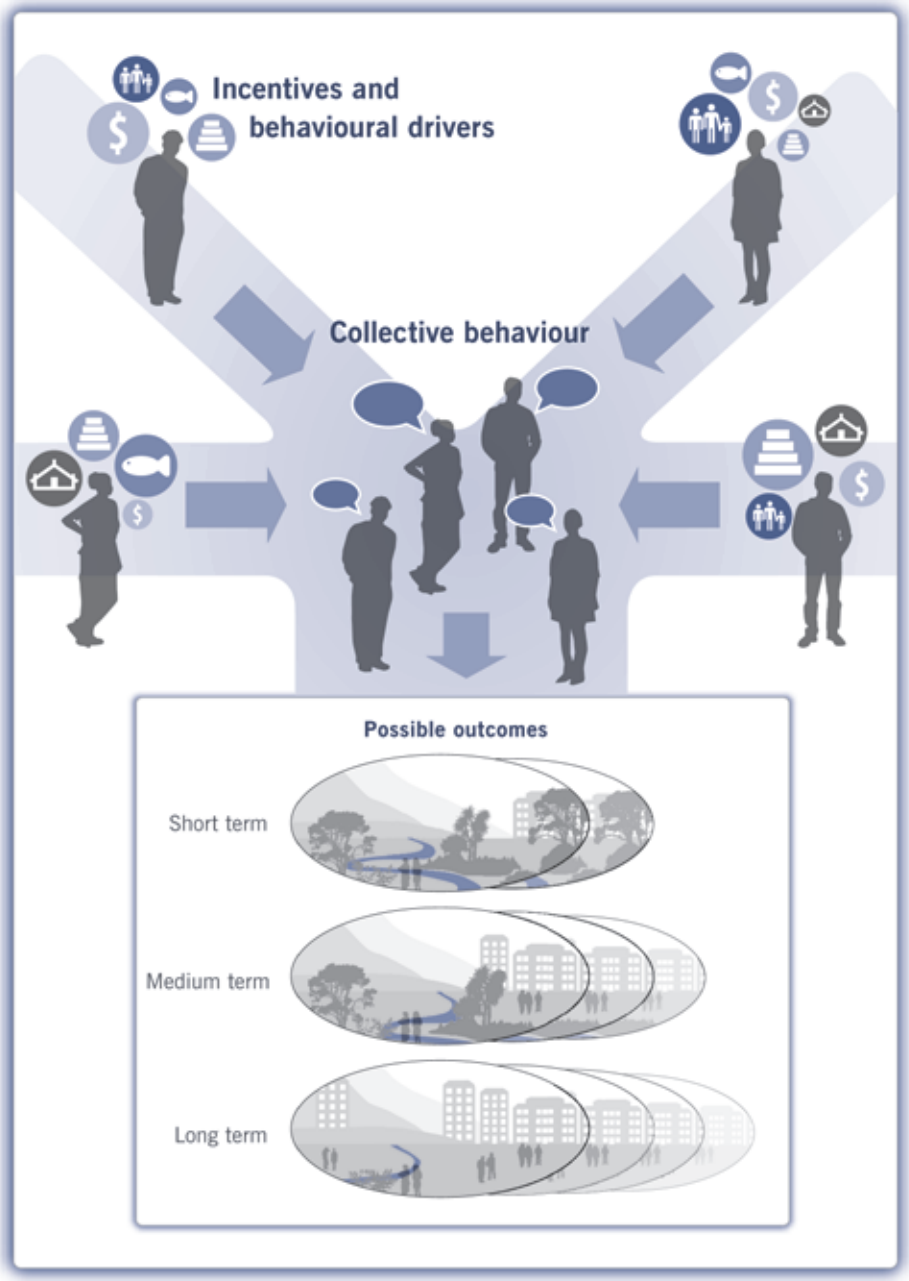


Table 3: The types of interrelationships between people and the natural resource

Interrelationship	Description	Examples
Manage	Interrelationship represents the direct management of the natural resource by people	Freshwater management rules
Use	Interrelationship represents the direct consumptive and non-consumptive use benefits (i.e. provisioning services) of the natural resource to people	Irrigation, hydro-power generation
Service	Interrelationship represents the non-consumptive use (i.e. cultural services, regulating services) benefits and non-use benefits (i.e. existence values) of the surrounding ecosystem to people	Recreational swimming, water purification from ecological processes
Impact	Interrelationship represents the indirect effects of people's behaviour on the surrounding ecosystem	Nutrient run-off

Figure 4: The Establish component



analysis focuses on understanding the interrelationships between the social systems and natural resource, including the surrounding ecosystem. These interrelationships are defined in four ways – *Manage*, *Use*, *Service* and *Impact* (see Table 3).

The *Use* interrelationship accounts for benefits that typically acquire a market value, given their private goods character. The Service interrelationship reflects other benefits that are more difficult to capture in the marketplace and are therefore often undervalued. Third-party effects can be accounted for through the *Impact* interrelationship, where the consequences of an action, such as pollution, would be revealed through a reduction in the benefits received by others (i.e. via the *Use* or *Service* interrelationship).

Establish

The *Establish* component focuses on an institutional approach to link people's actions to ensuing outcomes. Accordingly, in this component people's behaviour is brought to life analytically speaking by 'playing out' the revealed 'rules of the game' to establish future outcomes.

The future is not seen as simplistic, certain or deterministic; rather, this component seeks to emphasise the complexity of causal tendencies that drive outcomes. Therefore, this component promotes an 'every time this then *usually* that' logic, rather than a strong causal logic of 'every time this then that'. Adopting this logic of causal tendencies is important to capture both probable and possible future outcomes and to maintain integrative thinking that allows creative resolutions to be found in the following *Integrate* component.

People's behaviour is motivated by incentives and behavioural drivers, which are grounded in their values and the rules and norms they follow. Institutions can create powerful incentives and behavioural drivers for people to decide a course of action. People do not, of course, always comply with 'rules', especially when there are strong incentives not too. For example, there is a strong incentive for free-riding behaviour for common-pool resources and public goods, even where rules are in place.

The social space where people engage and form relationships with one another are also identified for close analysis in the *Establish* component. Here the influence of values, rules and norms that motivate people are played out in a collective sense and the transaction costs (e.g. engaging, meeting, bargaining, negotiating) of these interactions analysed. Once the actions and interactions of the people are analysed, policy analysts are in a good position to establish possible future outcomes (see Figure 4).

Future outcomes should be established over multiple timescales (i.e. short, medium and long term). This recognises the framework's emphasis on stewardship as well as immediate policy impacts. Any changes in the environmental system over the long term (e.g. climate change) and the systems embedded within it should also be considered when establishing possible future outcomes.

Assess

The *Assess* component helps policy analysts analyse the outcomes generated from the status quo against selected criteria from each of the multiple perspectives. New policy options can then be crafted to address behaviour and improve outcomes. Hence, policy interventions seek to add value to the management of natural resources and not necessarily simply to 'correct' market failures. For example, an assessment of the status quo may indicate that the biophysical limits of the natural resource are not well understood. A policy response which might add value, in this case, could be to improve how the information is made available to those who use and manage the natural resource.

In crafting policy options and projecting outcomes, it becomes possible to compare the outcomes from the options with those from the status quo against selected criteria. This comparison allows the gains and losses from implementing each policy option to be determined across each perspective and over the short, medium and long term. These tasks are reflected in Figure 5.

The *Assess* component is iterative and the *Establish* component should be revisited to better understand how the outcomes from newly-crafted policy options will perform over time. That is, newly-crafted policy options should be 'played out' to understand how incentives, behavioural drivers and institutions are changed and could influence ensuing outcomes.

Crafting new policy options is an important part of the *Assess* component. Ideally, each new policy option proposed should contain a broad mix of instruments (e.g. regulatory, information, industry standard and market-based instruments). Known limits could act as triggers for changes in the mix of instruments within each policy option. This adaptive mix will help policy options be more enduring over time given changing conditions or unexpected outcomes.

Criteria that represent a range of relevant perspectives (i.e. social, cultural, political, environmental and economic) are needed. Criteria need not be all of equal weight; their relative weight will

Figure 5: The Assess component

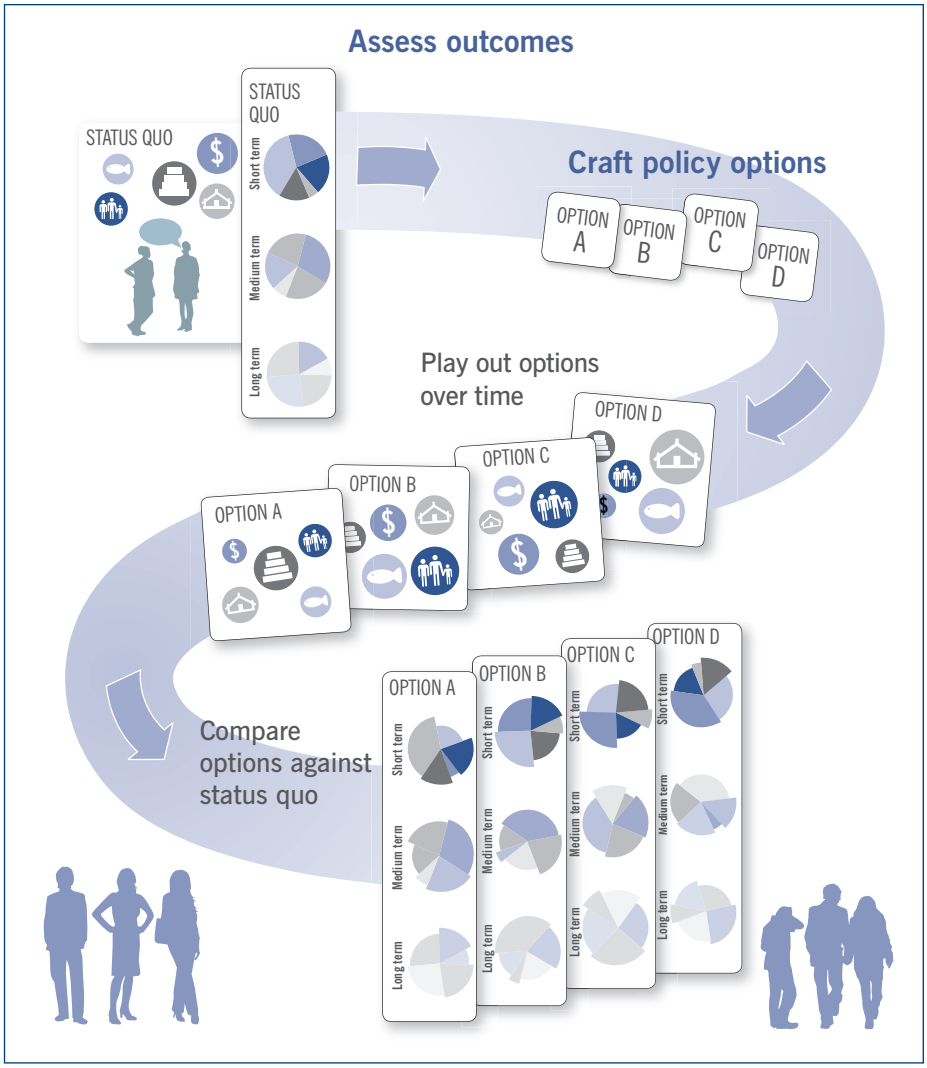
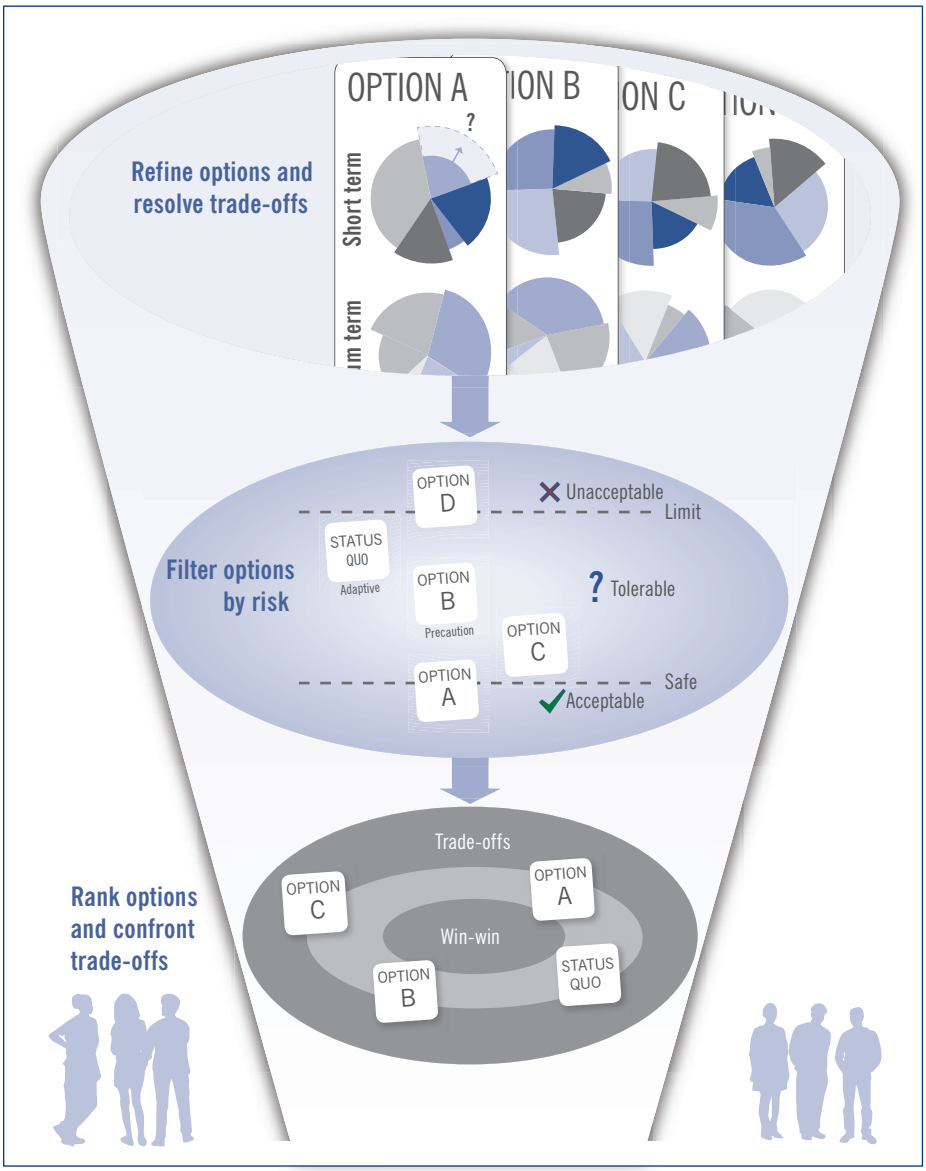


Table 4: Possible criteria for each perspective

Perspective	Criterion
Social	• Distributional equity • Community resilience • Intergenerational equity • Manaakitanga
Cultural	• Cultural diversity • Sense of place • National identity • Tikanga Māori
Political	• Accountability • Legitimacy • Political equity • Rangatiratanga
Environmental	• Ecological integrity • Strong sustainability • Environmental ethics • Mauri
Economic	• Efficiency • Cost effectiveness • Economic growth • Māori economic development

Figure 6: The Integrate component



depend on the type and expediency of the natural resource issue addressed. Table 4 indicates criteria that could be analysed for each perspective, including a Māori-related criterion that captures an aspect of kaitiakitanga. It is important to recognise that interrelationships exist between each of the criteria. For example, no matter how efficient an outcome is, if the outcome also significantly compromises another criterion then the option is unlikely to support stewardship. The framework presents a challenge to pay simultaneous attention to all selected criteria across the multiple perspectives (Adger et al., 2003). This promotes integrative thinking by retaining a more 'complete' picture in the analysis from which to resolve trade-off tensions and find robust and resilient policy solutions.

To make comparisons across perspectives to indicate the extent of gains and losses involved is difficult. It is likely that analysis of each perspective will be given in its own terms and measured either qualitatively or quantitatively. To allow comparison, it may be useful to make measurements and analysis consistent across the perspectives, as far as is practicable. However, putting all perspectives into a single common measure, for instance a uniform index, is contentious. Gains and losses within a criterion may be hidden, and values and perspectives may not be able to be reduced to a common measure. For example, Western science and mātauranga Māori exist with discrete, but legitimate, knowledge sets. The framework requires space to be made for different perspectives to be analysed and compared.

Integrate

The *Integrate* component brings together earlier analysis to refine policy options and resolve trade-offs, where possible, before filtering options towards a final set of ranked policy options. These key tasks are represented in Figure 6. This component, therefore, acts as a filter for identifying both a final set of policy options and where the trade-offs lie. Trade-offs can reflect compromises and the simultaneous existence of gains and losses across perspectives or scales of analysis (e.g. short-term gain versus long-term loss). Importantly, the capacity to creatively resolve trade-off tensions is the culmination of the integrative thinking that conceptually underlies the Natural Resources Framework.

The *Integrate* component emphasises the use of deliberative processes with the aim of achieving practical consensus among NRS agencies. Specifically, practical consensus is where the people involved in developing advice deliberate to attain a common understanding of the issue and collectively agree that they can 'reasonably and comfortably' live with the particular analytical direction taken. An attempt should be made to reach practical consensus throughout the *Integrate* component. Where practical consensus cannot be achieved, then alternative forms of analysis may be undertaken simultaneously. This alternative analysis may lead to different sets of policy options being developed.

The three key tasks of the *Integrate* component are now discussed in greater detail. First, policy analysts are prompted to understand trade-off tensions within and across policy options and to resolve them, where possible. The emphasis here is on not readily accepting trade-offs, but rather attempting to resolve and refine options to find mutually reinforcing gains and win-win solutions across all perspectives and scales. Despite the potential for creative resolutions, however, many supposed win-win solutions are not a win-win in hindsight; someone bears a loss. Typically, win-win solutions are wrongly identified because the

analysis was too optimistic and narrow. This highlights the significance of the previous components in keeping analysis sufficiently wide to more effectively resolve trade-off tensions.

When the ability to resolve trade-off tensions diminishes, a risk management approach is developed to categorise and assess policy options to determine whether the outcomes through practical consensus are acceptable, tolerable or unacceptable. This approach allows options to be carefully filtered and further refined by analysing and making explicit any risks, with the associated limits, uncertainties and outcomes. Where the outcome of a policy option is projected to break a limit, it may be treated as an unacceptable risk and be removed from the option set. Where the outcome is projected to be close to a limit or relatively near multiple limits, it may be treated as a tolerable risk that can be managed or further refined. Alternatively, where an outcome is not nearing any limit it may be treated as 'safe' and an acceptable risk.

Finally, policy analysts are prompted to rank the final set of policy options and confront the trade-offs for each option. The ranking could be achieved through various decision rules (e.g. maximum net gains, least risk) to recommend an agreed set of policy options.

Advise

In the *Advise* component, analysis undertaken is collated in order for a collective narrative to be developed. Specifically, the collective narrative is an agreed and shared policy 'story' that encompasses the nature of the natural resource issue addressed, the policy options considered and the likely outcomes over the long term in keeping with stewardship and kaitiakitanga. The trade-offs to be confronted as well as any assumptions and limitations in the analysis are made explicit in the narrative.

The development of an agreed collective narrative is important to address policy issues over the long term across agencies. A collective narrative provides opportunities for NRS agencies to transcend the work programme of a single government agency and explore a more complete set of policy options. Overall, the collective narrative allows the opportunity for NRS agencies to provide collective free and frank advice to the best of their abilities.

The collective narrative does not need to be a single recommended policy option among an agreed final option set. Rather, if practical consensus is not achieved in the *Integrate* component, then the collective narrative may indicate multiple strands of analysis that lead to alternative recommended policy options and/or an alternative final option set. The collective narrative can accommodate several alternative pathways towards stewardship. However, differences between NRS agencies should be articulated clearly.

Conclusion

The Natural Resources Framework is a novel framework which seeks to promote stewardship and kaitiakitanga of New Zealand's natural resources. These objectives will not be achieved without new ways of thinking and of understanding the complexities of natural resource issues.

For stewardship to be successful, the policy analysis of natural resource issues requires a long-term multi-disciplinary approach (Driscoll et al., 2012).

Specifically the framework is seen to encourage stewardship as it provides NRS agencies with a common analytical approach that puts people at the centre of analysis, promotes analysis across multiple perspectives and timescales, and is underpinned by integrative thinking. Undertaking these forms of analysis is foreseen to provide more robust and resilient policy advice and promote the wise use of natural resources over the long term. These are significant developments, as the framework challenges the use of a single perspective to drive policy analysis beyond conventional thinking. Relying on a single perspective masks the full complexity of natural resource issues and may result in poor policy outcomes and unwelcome surprises.

The framework is expected to evolve and change over time. The application of the framework will inevitably be the real test for whether it informs policy development and allows NRS agencies to collectively track on their journey towards stewardship.

1 The NRS is headed by the chief executives of seven agencies – chaired by the Ministry for the Environment's chief executive – who act as a leadership team for natural resources policy work in central government. These agencies are the Ministry for the Environment, the Ministry of Business, Innovation and Employment, the Ministry for Primary Industries, Land Information New Zealand, the Department of Conservation, Te Puni Kōkiri and the Department of Internal Affairs.

2 Kaitiakitanga is the customary practices by which iwi and Māori manage the environment and their relationships with it, based on a Māori world view.

3 Engagement included an initial workshop with NRS chief executives, as well as regular updates and final sign-off, regular monthly collaborative meetings with representatives from all NRS agencies, cross-agency workshops with NRS officials, a workshop and a targeted meeting with researchers from New Zealand universities and Crown research institutes, and discussions with international academics.

4 For more information about the tiers and components of the framework see Natural Resources Framework: guidance for users (Ministry for the Environment, 2013) and supporting documents at www.nrs.mfe.govt.nz

References

Acemoglu, D. and J. Robinson (2012) *Why Nations Fail? the origins of power, prosperity, and Poverty,* New York: Crown Publishers

Adams, W.M. (2006) *The Future of Sustainability: re-thinking environment and development in the twenty-first century*, report of the IUCN Renowned Thinkers Meeting, Gland: International Union for the Conservation of Nature, http://cmsdata.iucn.org/downloads/iucn_future_of_sustanability.pdf

Adger, W.N., K. Brown, J. Fairbrass, A. Jordan, J. Paavola, S. Rosendo and G. Seyfang (2003) 'Governance for sustainability: towards a "thick" analysis of environmental decision-making', *Environment and Planning* A, 35, pp.1095-110

Capistrano, D., C.K. Samper, M.J. Lee and C. Raudsepp-Hearne (eds) (2006) *Ecosystems and Human Well-Being: findings of the sub-global assessments working group for the millennium ecosystem assessment,* Washington, DC: Island Press

Croal, P., R.B. Gibson, C. Alton, S. Brownlie and E. Windibank (2010) 'A decision-makers' tool for sustainability-centred strategic environmental assessment', *Journal of Environmental Assessment Policy and Management*, 12, pp.1-27

Driscoll, C.T, K.R. Lambert, F.S. Chapin, D.J. Nowak, T.A. Spies, F.J. Swanson, D.B. Kittredge and C.M. Hart (2012) 'Science and society: the role of long-term studies in environmental stewardship', *BioScience*, 62, pp.354-366

Fischer, A., L. Petersen, C. Feldkotter and W. Huppert (2007) 'Sustainable governance of natural resources and institutional change: an analytical framework', *Public Administration and Development*, 27, pp.123-37

Folke, C., T. Hahn, P. Olsson and J. Norberg (2005) 'Adaptive governance of social-ecological systems', *Annual Review of Environment and Resources*, 30, pp.8-33

Gibson, R.B. (2006) 'Beyond the pillars: sustainability assessment as a framework for effective integration of social, economic and ecological considerations in significant decision-making', *Journal of Environmental Assessment Policy and Management*, 8, pp.259-80

Hirsch, P.D., W.M. Adams, J.P. Brosius, A. Zia, N. Bariola and J.L. Dammert (2011) 'Acknowledging conservation trade-offs and embracing complexity', *Conservation Biology*, 25, pp.259-64

Hirsch, P.D., P. Brosius, S. O'Connor, A. Zia, M. Welch-Devine, J.L. Dammert, A. Songorwa, T.C. Trung, J.L. Rice, Z.R. Anderson, S. Hitchner, J. Schelhas and T.O. McShane (2013) 'Navigating complex trade-offs in conservation and development: an integrative framework', *Issues in Interdisciplinary Studies*, 31, pp.99-122

Holling, C.S. (2001) 'Understanding the economic, ecological, and social systems', *Ecosystems*, 4, pp.390-405

Martin, R. and H. Austen (1999) 'The art of integrative thinking', *Rotman Management*, Fall, www.rotman.utoronto.ca

Ministry for the Environment (2013) *Natural Resources Framework: guidance for users*, Wellington: Ministry for the Environment, www.nrs.mfe.govt.nz

Ostrom, E. (2005) *Understanding Institutional Diversity*, Princeton: Princeton University Press

Ostrom, E. (2007) 'A diagnostic approach for going beyond panaceas', *Proceedings of the National Academy of Sciences of the United States of America*, 104, pp.15182-7

Ostrom, E. (2009) 'A general framework for analyzing sustainability of social-ecological systems', *Science*, 325, pp.419-22

Pahl-Wostl, C. (2009) 'A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes', *Global Environmental Change*, 19, pp.354-65

State Services Commission (2012) *Formal review of Manatū Mō te Taiao Ministry for the Environment (MfE),* Wellington: State Services Commission, www.ssc.govt.nz

Other Items of Interest

Governance of a complex System: Water

Elizabeth Eppel

A working paper on the governance of fresh water in New Zealand is available online as a free download on the IGPS website (www.igps.victoria.ac.nz).

New Zealand is evolving a new policy for fresh water and how we might better govern this vital resource. The paper discusses the complex nature of water governance. It also examines some current New Zealand experiments in the practice of water governance which might be informative of what the processes of governance of complex systems like fresh water will look like when they are in action.

These are not familiar governance processes to most New Zealanders; politicians, public servants and general citizens alike should familiarise themselves on this important and life sustaining issue.

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