

Biodiversity Collaborative Group

Introductory reading:

Incentives and interventions for biodiversity management

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Document purpose

This report provides an overview of the use of incentives and interventions, to support the work of the Biodiversity Collaborative Group. It focusses on existing practice relating to biodiversity conservation to inform the development of an NPS and any complementary measures which may be developed alongside it. By drawing from a range of examples, mostly from New Zealand, we hope to provide a useful context and reference point for the group's work and the development of policy options.

This is not an exhaustive list of all the interventions and incentives available, but focusses on providing a concise overview of existing knowledge relating to biodiversity conservation to support the development of an NPS and complementary/ supporting measures. Additionally, this document is not a review of the effectiveness of each of these types of interventions and incentives. Rather, it provides an overview of the general advantages and disadvantages of using a particular approach, and then highlights some examples.

As discussions progress, the Group may decide to commission more specific information on key areas. For these topics, the Group would benefit from hearing directly from experts or those leading programmes, such as councils, industry groups and community groups.

Some incentives, interventions and programmes are out of scope for this document, where we believe information would best come directly from those leading or knowledgeable about particular programmes. We have intentionally left the work of DOC and MPI out of this report. DOC, MPI, and councils are driving most of the existing complementary measures, and have all indicated they are willing to discuss these topics with the group.

1 Introduction

Councils have a mandate under the Resource Management Act 1991 and the Local Government Act 1974, to provide non-regulatory methods for protecting and maintaining biodiversity. These methods can complement the rules-based approaches in the plan or stand alone, provided that they are effective. Non-regulatory approaches often rely on some kind of incentive, financial or otherwise, for their uptake. They provide the impetus for behaviour change in a number of ways, from providing resources, technical support or a financial advantage through to recognition by peers or in the marketplace. Non-regulatory methods are valuable in encouraging awareness and responsibility, and raising the value of biodiversity assets throughout the community (Murray *et al.*, 2014).

The incentives and interventions highlighted in this document are generally non-regulatory, although some have a legislative or regulatory frame to ensure long-term benefits are achieved. The types of interventions covered include:

- restoration and protection projects that are community led or in covenants
- financial incentives, funding and rates relief
- industry initiatives (certification, codes of practice and encouraging farmer behaviour)
- education, training and support to the public or targeted audiences
- behavioural insights approaches to interventions that ensure behaviour change of individuals

The report by Beca and Wildlands (2016, pages 17-18) reviewed some of the types of non-regulatory approaches for biodiversity management, in 24 regional and district plans, noting that many of those non-regulatory methods listed above are also used in plans as a way of implementing objectives. They found that one of the more common approaches was to work directly with landowners for education, property advice and to identify biodiversity on private land through providing ecological assessments. This sometimes works alongside rules in the district plan, whereby councils have a better understanding of the biodiversity in an area and can ensure significant areas are assessed if a landowner proposes clearance or modification.

A major challenge across all of these interventions and incentives is that it is easy to measure activities (such as trapping and fencing) but much more difficult to measure biodiversity outcomes from incentives or interventions. Margoluis *et al.* (2009) state that challenges in evaluating conservation projects include:

- Sphere of influence is often narrower than the desired outcome, e.g. projects aim to influence individuals, communities or government but impact is measured through ecosystem impacts
- Conservation is undertaken in complex settings
- Available data is often not aligned with project goals and it is costly to gather more data
- Evaluation might not be included in the design of the project, so there is no baseline
- Expertise in social and biological sciences are needed for conservation project evaluation
- There are significant time lags between interventions and conservation impacts

We have not reviewed the effectiveness of all of these interventions and incentives, but have provided an overview of the general advantages and disadvantages of using a particular approach, with some examples. Some of the examples of interventions and incentives in this report do have evaluation and monitoring programmes (and if so, the outcomes are included in this report). However, most evaluations are site-specific and there are very few, if any, national level evaluations of the effectiveness of the interventions or incentives.

2 Community-led restoration and protection

In this section on community-led restoration and protection, we are referring to covenants, sanctuaries and community restoration programmes. The framework and support for these types of restoration and protection projects vary greatly, but they all have the common goal of protecting habitat and native species and are driven by communities or individuals, rather than led by industry or government. There are many areas where covenants, sanctuaries and community restoration projects all apply, overlap or are connected. For example, many sanctuaries and covenanted areas rely on community volunteer groups to restore or maintain planting and habitat.

Restoration projects and protected areas often arise because residents in the area are motivated to take action and protect biodiversity in a place that is accessible and/or of local importance. The dedication of local residents and volunteers is often the key to success of such projects. Because they often arise in this way, they are not always strategically placed to get the best biodiversity outcomes. Nonetheless, these restoration projects and protected areas can have the following benefits:

- **Maintain habitat** for flora and fauna, or offer new habitat to aid dispersal of new populations
- Create **corridors**, providing connectivity between major habitats, so that fauna can migrate between areas and species can increase their population and spread out to find new habitat and food. Even if small, restored and protected areas can provide important corridors and connectivity between more major habitats, such as public conservation land.
- Create a **'halo' effect**, whereby biodiversity that is maintained or protected in one area eventually begins to spread to the surrounding areas. For example, Zealandia in Wellington (formerly the Karori Wildlife Sanctuary) is recognised as playing a major role in the eightfold increase of tūi in Wellington between 2001 and 2008, alongside other interventions in the city's parks (Dominion Post, 2008). There have also been reports of 30-40 tīeke/saddleback breeding just outside of the sanctuary. These are the only tīeke/saddleback to be breeding on the mainland outside of a sanctuary area, after they were declared extinct on mainland areas in 1910 (Dominion Post, 2017). The halo effect relies on there being suitable habitat outside of the restored or protected area where pest species are effectively managed.

Covenanted areas, sanctuaries and community programmes may choose **pest control** as a key focus for their work. Predator Free New Zealand Trust aims to support and connect community groups, landowners and iwi, as part of the Government's goal for a predator free New Zealand by 2050. They provide resources, research on pest control and information on funding sources, so that local communities can share knowledge and learn from what works.

Legal status of land for biodiversity protection is an important factor in what is protected and how it can be enforced. Landcare Research prepared a report on legal biodiversity protection for the Regional Councils' Biodiversity Monitoring Working Group (Rutledge, 2016). They grouped legal protection of land into the following categories:

- High legal protection as areas where the main purpose is biodiversity protection

- Moderately high legal protection where protection is the main purpose but shared with less compatible purposes, such as recreation
- Moderate legal protection where protection is desired but subject to compatibility with other purposes or only some aspects of biodiversity protection are targeted
- Moderately low legal protection, where some protection is achieved but is secondary to other goals
- Low legal protection, where biodiversity protection is an indirect result of other activities

The type of legal protection can impact on how community-led protection and restoration projects are managed, who funds them, and how many management actions can be enforced.

2.1 Covenants

Covenants generally operate to protect and enhance existing habitat (or restore previous habitat) for indigenous flora and fauna. There are four different types of covenanting regimes that sit within a legislative frame under:

- The Reserves Act 1977
- The Queen Elizabeth II National Trust Act 1977
- The Conservation Act 1987
- Te Ture Whenua Māori Act 1993

QEII covenants are purely voluntary to enter into, but binding in perpetuity once established. Various types of covenants can also be used in a regulatory setting, where covenants are required as conditions of consent for a development, or are offered as an alternative to seeking consent under plan rules.

The University of Waikato Institute for Business Research (2017) prepared a report for the QEII National Trust, about the investment in covenanted land. Their results indicate that the total number of covenants registered was 4,226 between 1977 and 2016, covering 167,000ha. Landcare Research (2012) stated that there were around 199 Ngā Whenua Rāhui kawenata (covenants) on Māori land, covering 170,000 ha. Covenants vary greatly in size, purpose and term, with QEII covenants ranging from 0.1 to 21,909 ha and protecting areas in perpetuity, while other mechanisms such as Ngā Whenua Rāhui have a 35 year term. Some covenants have management plans that must be adhered to.

The benefits of covenanting are that:

- The land is protected in perpetuity (for QEII) or for long periods into the future (under other covenanting regimes), regardless of changes in land ownership. As the positive outcomes for biodiversity restoration often require decades to be achieved, covenants ensure that protected areas on private land are given sufficient time to demonstrate biodiversity benefits.
- Covenanted areas can be initiated by the landowner, meaning that there is buy-in and commitment to maintain the area.

- Covenants may add connectivity and form landscape linkages between regional or national parks, meaning that populations can disperse and migrate more easily (e.g. birds finding new habitats where food is more abundant).
- Covenanters are often eligible to apply for funding and expert advice to support the management of covenants from funds such as the DOC Community Fund.

Establishment costs for all QEII covenants are estimated by the University of Waikato Institute for Business Research (2017) to be \$217 million (in 2016 dollars). The costs of covenanting include:

- Legal costs to establish.
- Establishing the covenanted area, such as fencing, weeding, trapping, restoration planting, restoring wetlands and waterway protection. The Waikato study suggests fencing presents the highest cost for establishing QEII covenants, at 30% of the establishment cost.
- Maintenance costs to comply with the conditions of the covenant. These costs are estimated to be \$25 million per year, nationwide, across all QEII covenants.
- Opportunity costs, that the restrictions imposed by the covenant mean that opportunities to earn from that land are lost. The Waikato study on QEII covenants suggests that 53% of respondents to their survey stated that the covenanted land could be used for other purposes if not covenanted. They estimated the opportunity cost of land covenanted under QEII to be between \$443-638 million.

Central Government, through Vote Conservation, commits around \$4 million to QEII covenants annually, with another \$1 million coming from donations, member subscriptions, contestable funding bids, and other grants.

The 2015 Survey of Rural Decision Makers (Brown, 2015) involved more than 3,000 people, including more than 2300 commercial farm owners and farm managers. The following two graphs demonstrate the proportion of respondents who have covenants to permanently protect land, by industry and by region.

The survey found that the main reasons for not entering land into a covenant were:

- there was no appropriate habitat (42 % of respondents)
- loss of property rights (26 %)
- regulations and compliance (30 %)

(Note 28 % did not respond, and these figures add up to more than 100 % as respondents were able to tick all answers that applied).

Have you entered into a covenant to permanently protect all or part of your land?

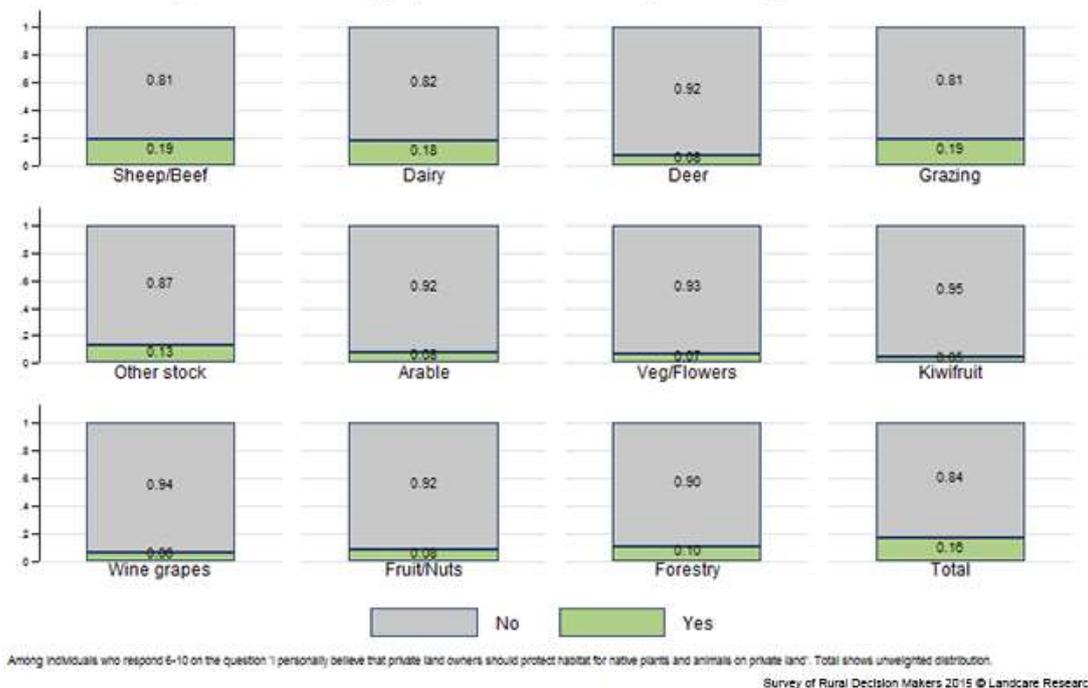


Figure 1. Covenant to permanently protect land - Enterprise

Have you entered into a covenant to permanently protect all or part of your land?

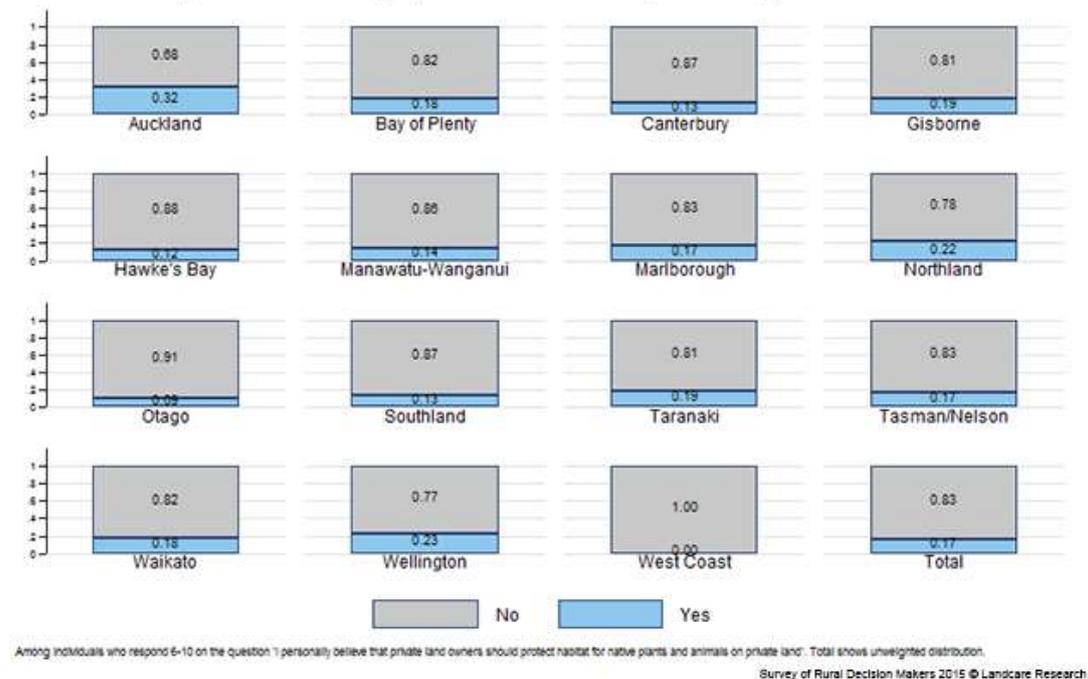


Figure 2. Covenant to permanently protect land - Region

2.2 Sanctuaries

Sanctuaries of New Zealand Inc. lists 85 sanctuaries in New Zealand. The total land area is unknown, but at June 2014, Landcare Research identified 55 sanctuaries across New Zealand, totalling 48,000 ha. Most are partnerships between local communities, iwi, DOC, councils and others.

Sanctuaries of New Zealand Inc. was formed in 2013 to provide a network of sanctuary management groups to learn from each other. These sanctuaries all aim, within their areas, to:

- Eradicate all pests, or achieve close to full eradication
- Reintroduce indigenous species, including rare or endangered species
- Involve local communities in the restoration needed to create the sanctuaries

Some of the main issues for biodiversity management within sanctuaries include:

- Pest control – pest-proof fences, ongoing intensive management of pests and reducing the risk of reinvasion of pests
- Use of natural barriers, i.e. isolated areas that are either naturally have less predators or are easier to exclude predators from (e.g. peninsulas and near-shore islands)
- Translocations of species
- Monitoring and evaluating outcomes

The cost-effectiveness of pest-proof fences is widely debated (e.g. see Scofield *et al.*, 2011; Scofield *et al.*, 2012; Innes *et al.*, 2011). DOC (2001, p.17) stated that “Fencing is definitely a cost-effective pest control option for peninsulas and reserves of 5000 ha or more”, but less cost-effective for small areas when compared to other pest management methods.

The success of sanctuaries as a means of conservation depends on the various methods used within the sanctuaries and the intricate relationships in the ecosystem. For example, Robertson and de Monchy (2012) investigated five sanctuaries where kiwi protection was the main goal. The findings were that success varied, partly depending on the relationship between predators and kiwi, which were influenced by local environmental conditions. For example, stoat trapping work had a positive impact on the survival of kiwi chicks at some sites. However at other sites, stoat removal led to an increase in rat predation, with no overall discernible benefit for kiwi chick survival rates.

2.3 Community restoration programmes and volunteering

Community restoration programmes are led by the community to restore habitat and/or to reduce predators for indigenous flora and fauna. Often these are designed for one particular outcome (e.g. supporting the return of one species of bird) but generally have multiple benefits for biodiversity (e.g. Project Halo in Hamilton targets tūi but has huge benefits for other species dependent on the same habitat type). Community restoration programmes may arise following a community management plan or strategy, or may be ad hoc and led by keen residents of an area. They may be on council land, other public land, or private land.

Community restoration programmes are often registered as incorporated societies or charitable trusts, which enables them to apply for community grants or funding from councils and philanthropic societies. Councils and DOC frequently offer other support as well, such as funding, resources or expert advice. Support, funding and leadership can also come from organisations like Forest and Bird (2011), WWF (n.d.), Landcare Trust (2016) and Conservation Volunteers New Zealand (n.d.).

The Parliamentary Commissioner for the Environment (2017) in the latest report on birds, recommends that community groups need to be supported with a regional hub for administrative and coordination tasks, which are not currently funded through most community grants. The report also highlighted the need for longer-term funding to ensure the biodiversity benefits are realised, as three years (a common term for funding) is not long enough to deliver biodiversity outcomes.

These types of projects are most often run by volunteers. Statistics New Zealand (2013) has reported that the number of environmental non-profit institutions was 1850 in 2013 (encompassing any that have a direct relationship with wild or domestic plant or animal life, or the physical environment). This is a rise from 1,310 in 2004, although these statistics may be much more, given the difficulty identifying informal environmental groups. These groups rely on volunteers – approximately 88% of these groups rely solely on volunteers to function.

Jean Fleming has undertaken research on why people volunteer in conservation projects. She suggested that drivers for volunteering were for the benefit of the environment but also that a sense of community and belonging was important, as well as meeting new people, learning new things and contributing to society (Forest and Bird, 2017). More than a third of respondents were retired, and more than 4% of respondents were farmers.

2.4 Example: Kiwi Coast, Northland

The Kiwi Coast Corridor is a project on 195 km of Northland's east coast that links together iwi and hapū, forestry companies, government agencies and other organisations. Over 80 entities are involved in the Kiwi Coast Corridor, and animal pest control is undertaken on approximately 120,293 ha of private and public land (Kiwi Coast, 2017).

The focus of the Kiwi Coast Corridor is kiwi recovery through restoring habitat and reducing predators for local kiwi populations. Many of the entities involved do not have kiwi recovery as a core goal, but their actions benefit kiwi (such as through biodiversity restoration, animal and plant pest control, education, riparian and wetland planting, and translocation of threatened species).

They also recognise that their focus on kiwi recovery will benefit other native species as well - one of their goals is to encourage the return of species that no longer reside in the area such as kākā, kākārīki and bellbird/korimako (Kiwi Coast, 2017).

Their 2016 annual report states they work to decrease the gaps between projects and take a strategic approach to supporting collective efforts across the region (Tyson *et al.*, 2016). Their activities include deploying new predator traps, ensuring time is spent on servicing traps, and running workshops for the public on kiwi protection and dog control. Predator control in the area is

immense – in 2015, 52,091 animal pests were removed by groups involved, with over 1000 pests removed weekly.

The Kiwi Coast project is supported by Reconnecting Northland (a partnership between WWF-New Zealand and NZ Landcare Trust) and also funded through the Tindall Foundation and Foundation North. The total operating budget for the 2015/16 financial year was \$163,875. Half of this was spent on predator control and trapping. The remainder was spent on coordination and strategic planning, monitoring, workshops and communications. This does not include the spending from the 80 plus entities that come under the umbrella of the Kiwi Coast project.

Monitoring through listening for kiwi calls suggests that kiwi are declining in some parts of Northland (western and northern areas), but that along the Kiwi Coast, kiwi populations are generally stable (southern) or increasing (eastern). They also have other indicator species that they are monitoring to measure the wider impacts of the project (indicator species selected include pāteke, kākā and bellbird). Note that while the project has a monitoring plan, kiwi chicks do not call until 2-3 years old, and are not picked up in this monitoring. This means the Kiwi Coast project may not know the impact they are having on increasing kiwi breeding for a few more years.

2.5 Example: Cape Sanctuary, Hawke's Bay

The Cape Sanctuary in Cape Kidnappers, Hawke's Bay, is an area of 2500ha, with just over 10km of fencing (Heyward, 2015). The area within the sanctuary comprises around 75% farm land, and notably, there is very little native forest represented. The sanctuary is on three private properties, and collaboration between landowners, local volunteers and DOC has been critical to the project.

While the fence is predator proof and extends most of the way across the cape, it is not complete at the two coastal ends of the fence. This means that pest control is critical to maintaining/increasing native bird populations and being able to reintroduce other species to the area. Two staff and volunteers set and check the 1,400 traps for mustelids (stoats, ferrets and weasels) and the 2,200 bait stations for rodents (rats and mice). Possums have been reduced to low levels within the sanctuary.

They have had some major successes in reintroducing native birds to the area. Birds that have been reintroduced include tomtit, whitehead, rifleman, robin, brown kiwi and pāteke/brown teal, and all of these are now breeding within the sanctuary. The sanctuary is also reintroducing coastal birds, in particular, seabirds that live at sea but breed on land. Most of these had disappeared from the sanctuary area prior to their reintroduction from 2008 onwards. Grey faced petrel and Cook's petrel have been reintroduced to the area, and nesting boxes for little blue penguin have been placed to offer safe habitat. Variable oystercatcher and dotterels are now also seen on the coast.

Unfortunately, inaccuracies in predator tracking resulted in the introduction of tīeke/saddleback not being as successful as expected. In April 2013, 120 tīeke / saddleback were released into the sanctuary, but by October less than 20 of the birds had survived, likely due to a rat colony that had not been detected through the tunnel tracking method. These rats were then trapped or poisoned,

and tīeke/saddleback still remain in the sanctuary. However, this highlights that monitoring methods for predators are still experimental and there needs to be more research and understanding about the safe level of predators for particular native birds (p. 54, Parliamentary Commissioner for the Environment, 2017).

The sanctuary is now part of the wider “Cape to City” project, led by a governance group comprising the Hawke’s Bay Regional Council, DOC, Landcare Research, Poutiri Ao ō Tāne and a farming representative. The Cape to City project was launched in 2015 and aims to create a biodiversity corridor along the coast from Cape Kidnappers to Havelock North. They are aiming to restore native species and undertake pest control on 26,000 ha of mostly primary productive farmland. For more information, please see the Cape to City website <http://capetocity.co.nz/about/>

3 Mātauranga Māori in biodiversity management

While there are many different definitions of traditional ecological knowledge, it is generally accepted that the term refers to insight gained from detailed observation about people and their relationship with the environment which is passed down through generations (Berkes, 1999). In this way it continually evolves through time, incorporating new information gained from changing contexts. A key feature of traditional ecological knowledge is its holistic approach to understanding ecosystem components and processes, as opposed to traditional science, which has evolved to study these parameters in isolation (Berkes, 2009).

As a signatory to the Convention on Biological Diversity 1992, New Zealand must 'respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge innovations and practices' (Convention on Biological Diversity, 1992). Here, traditional ecological knowledge is underpinned by Mātauranga Māori, te ao Māori and Māori values, including, but not limited to: whakapapa, tikanga, kaitiakitanga, mana, ki uta ki tai, taonga tuku iho, mauri, ritenga, wairua, wairuatanga, and tea o turoa (Harmsworth and Awatere, 2013) and traditionally passed via tohunga (experts) and wānanga (schooling).

Increasingly biodiversity management is acknowledging Māori as holders of knowledge, alongside ecologists and land managers. In recent decades, a complementary approach to science and management has evolved which includes Mātauranga Māori in design and implementation, where appropriate (Harmsworth and Awatere, 2013). It is important to note that these approaches are not aiming to blend traditional ecological knowledge with science, but recognise that they are mutually supportive and often reach the same conclusions.

3.1 Cultural health frameworks

Cultural health frameworks are co-designed by tangata whenua and scientists to provide iwi or hapū with a monitoring system to show ecosystem condition and trend through time and usually include a measure of overall health or mauri of the ecosystem (Walker, 2012). Individual frameworks differ, however they generally include a mix of quantitative and qualitative data including cultural elements/ attributes that are values are used to assess the integrity of the entire ecosystem, rather than a single attribute or species, with tohu (indicators) often used to represent keystone species.

Walker (2012) suggested the process for developing a cultural health framework includes the following steps:

- Engage with iwi
- Develop a ngā atua kaitiaki framework
- Populate framework with contemporary issues, traditional narratives and scientific measures
- Identify potential indicators
- Develop protocol and test tool onsite with iwi

To date, cultural health approaches have been used in a range of ecosystems including river (Harmsworth *et al.*, 2011), wetland (Harmsworth, 2002; Robb, 2014), forest (Chetham, Shortland and Repo Consultancy Ltd., 2013) and marine environments (Schweikert *et al.*, 2012).

The benefits of using a cultural health framework include:

- Opportunities for tangata whenua to exercise kaitiakitanga and participate in resource management
- The potential to create a meaningful connection between tangata whenua and resource managers
- The robust data collected by tangata whenua can be used to facilitate the integration of cultural values and perspectives into resource management plans

Because knowledge is collected and passed on at catchment or site scale and interpreted in relation to values identified by a particular hapū, it may be inappropriate to use the same indicators in other areas or infer national level trends about biodiversity (Lyver *et al.*, 2016). These authors also identified limitations to using field-survey or interview-based approaches in isolation, recommending a combination of the two approaches according to indicators identified by the community.

3.1.1 Example: a cultural health index for streams and waterways

The Cultural Health Index (CHI) is a tool developed by iwi and scientists to acknowledge and include Māori values in waterway assessment and management. The index allows iwi/hapū to assess the cultural and ecological health of a stream or catchment of their choosing and then communicate this information to water managers in a way that can be understood and integrated into resource management processes. All aspects of the CHI take a whole-of-catchment approach and are grounded in an iwi perspective of stream health and apply cultural values determined by the iwi/hapū. The overall CHI score is made up of the three linked components – site status, mahinga kai and stream health.

Ngāi Tahu and Ngāti Kahungunu provided information on the suite of indicators used assess the health of waterways in the Taieri, Hakatere and Kakanui Rivers and the Tukituki River respectively (Tipa and Teirney, 2006). The Taieri and Kakaunui rivers within the Ngāi Tahu rohe and the Tukituki River in the rohe of Ngāti Kahungunu are all single channel, rain-fed rivers. The Hakatere in the Ngāi Tahu rohe is a braided rain and snow-fed river. This information was then developed into a framework that could be used by kaitiaki to monitor their freshwater streams.

The framework was then tested in other catchments to determine if the cultural health stream measure would change for different types of streams in the rohe of other iwi. The resultant CHI was able to be used across the landscape by different iwi with guidelines produced to assist in identifying monitoring sites and data collection and analysis.

Despite the lack of western scientific measures corresponding to stream site status or mahinga kai, cultural stream health can be compared to other non-cultural stream health measures currently in use. The cultural stream health measure is made up of attributes that encompass the whole

catchment and is highly correlated with other widely used measures such as the Macro Invertebrate Index, which is based on samples of invertebrates from the riverbed. That these two very different measures produced similar results gives added confidence that the CCHI is a robust tool.

3.2 Local management tools

Ritenga is a system of rules, protocols and customs that govern the use of an area, including tapu, rāhui and noa (Harmsworth and Awatere, 2013). By employing local management tools such as rāhui (temporary closures), mātaimai and taiāpure, tangata whenua can exercise kaitiakianga to manage resources sustainably (Te Tiaki Mahinga Kai, n.d.). Traditional ecological knowledge is used to determine when and for how long to implement these tools at a local scale, acknowledging that ecosystems and use of resources differ between regions. These tools are often broader than the application of local laws, with many approaches including complementary education, advocacy and research of the resource under protection.

3.2.1 Mātaimai Reserves

Mātaimai Reserves are used in lakes, rivers, estuaries and coastal areas and represent agreements either within tangata whenua to manage recreational fishing or between multiple stakeholders to prohibit commercial take to facilitate customary food gathering. While these reserves are not primarily proposed to manage biodiversity, they can be implemented in such a way as to meet the criteria for a Marine Protected Area (Department of Conservation n.d.). The criteria for establishing a Mātaimai Reserve is described in the Kaimoana (Customary Fishing) Regulations 1998 and Fisheries (South Island Customary Fishing) Regulations 1999 (the South Island Regulations) and apply to the waters of the North Island and the Chatham Islands, and the fishing waters of the South Island and Stewart Island respectively (Ministry of Fisheries, n.d.). In installing a Mātaimai Reserve the Minister for Fisheries appoints Tangata Tiaki (Māori fisheries guardians) who propose bylaws to manage customary and recreational fishing to exercise kaitiakitanga (Ministry of Fisheries, n.d.). At the time of writing there are over 30 Mātaimai Reserves in place.

3.2.2 Taiāpure

Taiāpure are applied in estuarine and near-shore coastal waters of significance to iwi or hapū either as a source of food or for spiritual or cultural reasons, to allow for “the recognition of rangatiratanga and of the right secured in relation to fisheries by Article II of the Treaty of Waitangi” (Fisheries Act, 1996, s174). At the time of writing there are ten Taiāpure in place.

Management committees are established under a taiāpure which provide advice and give recommendations to the Minister for Fisheries regarding regulations to help manage the fishery. In contrast to Mātaimai Reserves, fishing is still allowed within the boundaries of a taiāpure, with regulations in place to prevent overfishing. Te Rūnanga o Ngāi Tahu (2007) states that regulations may be based on the following:

- Species that can be taken
- Methods of take

- Quantities taken
- The time of year of take
- Size limits of species to be taken
- The area from which species can be taken

While establishing a taiāpure ensures sustainability in fish stocks for food and protection of significant cultural sites, it often serves to protect the ecological integrity and mauri of a site.

3.2.3 Rāhui

A rāhui is the temporary closure of a site or the use of a resource, often because it is in danger of depletion or sacred. By putting in place a temporary rāhui to limit the use of the resource, it is given time to recover from key human pressures. The use of rāhui has evolved through time. Rāhui were originally installed by a chief or tohunga and were emplaced to restore a resource, mark ownership or following loss of life (Maxwell and Penetito, 2007). This paper focuses on the modern use of rāhui to protect taonga and allow for the recovery of a resource and its associated mauri. Modern rāhui can be voluntary or enforceable, denoting seasonal limits on harvest for example, or longer lasting restrictions. The length of time that a rāhui is in place for can vary according to the time taken for stocks to replenish (Maxwell and Penetito, 2007).

3.2.4 Example: annual harvest of tītī

The tītī (sooty shearwater, muttonbird, *puffinus griseus*) is a common, migratory shorebird found in coastal areas south of Banks Peninsula, with the largest colonies found near Stewart Island (New Zealand Birds Online, n.d.). The seasonal harvest of tītī by Rakiura Māori is important as it creates social unity among the hapū, facilitates the sharing and building of traditional ecological knowledge and would have traditionally been a part of their mahinga kai cycle (Kitson and Moller, 2008). Tītī are harvested by Rakiura Māori during two periods: *nanao* (the beginning and mid-late April) where chicks are removed from burrows during the day, and *rama* (late April to mid-May) where chicks are caught on the ground at night (Kitson, 2003).

While abundant, Tītī are in decline due to bycatch (Uhlmann, Fletcher and Moller, 2005), climate change (Veit *et al.*, 1997), predation (Harper, 2006) and customary harvesting (Scott *et al.*, 2008), so in 1994, Rakiura Māori initiated a research program – Kia Mau Te Tītī Mo Ake Tōnu Atu (Keep the tītī forever) – to assess the long-term sustainability of the harvest (Kitson, 2003). Gathering information on the sustainability of the current level of take to guide future harvests, determining relationships between tītī abundance and other environmental factors such as climate change, food webs, predators, bycatch and pollution, and comparing this information to Mātauranga Māori were key aims of the project (Kitson, 2003). This research has led to attempts to eradicate rats (McClelland *et al.*, 2011) and weka from the islands and an assessment of the consumption of kaimoana during the tītī harvest.

The harvest of tītī by Māori on the Rakiura Tītī Islands is informed by traditional ecological knowledge and a system of customary practices (tikanga) to ensure sustainability. There are rules in place regarding access, the timing, duration and method of the harvest, which birds can be taken

and habitat protection (Kitson and Moller, 2008) to ensure preservation of mauri. Kitson (2003) recorded the following principles underpinning the rules identified annually at the Permit Day hui:

- Access to the islands is governed by birth right, with individuals with certain ancestral linkages permitted and those without prohibited. Applications for access to the islands to harvest are assessed at an annual Permit Day, however the method and rules for site selection on each island differs.
- Adult tītī are not taken, only the chicks are harvested. This practice ensures the retention of breeding stock.
- Only chicks that are an adequate weight are harvested then handled carefully to avoid wastage;
- Many harvesters will not take more chicks than needed.
- Certain methods of killing and trapping chicks during rama have been informally prohibited to reduce wastage and prevent unnecessary harm to the birds.
- The site must be looked after; no bird remains are to be left at the site, burrows are cleaned of debris and leaf litter and dead wood removed if suitable.
- There are restrictions on felling trees for firewood, with fallen trees preferred to standing timber and fires carefully managed. Trees that are heavily used by tītī are retained, even if dead.
- Disturbance to vegetation and breeding sites is minimised, with harvesters aiming to use existing tracks.
- The extraction of chicks from burrows during nanao is performed as to minimise disturbance, and repairs made if the burrow is damaged. These practices enable the burrow to be reused next season.
- Harvest does not occur if it is raining to ensure that burrows remain intact.
- Birds only can be taken during nanao and rama. A rāhui is emplaced at the end of the season to ensure that adult tītī are not disturbed during mating or nesting.

4 Financial and resource incentive programmes

Financial and resource incentive programmes can facilitate biodiversity management by offering economic benefits to landowners and businesses. Incentives can complement education, engagement or a more traditional regulatory approach by promoting behaviour change and innovation to achieve better biodiversity management, rather than relying on compliance with rules which may be seen to constrain options for landowners. A choice of incentives is desirable, combined with more direct rule-based measures.

Financial and resource incentives for biodiversity may take the following forms:

- Rights of ‘exchange’ such as transferable development rights
- Rates rebates
- Funds and grants
- Provision of free or subsidised resources
- Payments (for example for ecosystem services)

MPI offer a range of incentives aimed at improving land management and carbon sequestration that may have positive biodiversity effects, while some councils offer financial and resource incentives that directly target improved biodiversity outcomes. MPI and councils, as active observers, may wish to provide the Group with more information on these topics if there is sufficient interest.

4.1 Rights of exchange (transferable development rights)

The ability to subdivide land and sell it on a separate title is a valuable asset, especially in high-growth regions. Council plans can provide additional subdivision privileges in exchange for a landowner legally protecting an area of ecological value or undertaking a minimum area of revegetation using native species. The number of extra (or ‘bonus’) lots usually depends on the size of the area being protected, and varies between councils and habitat types. In this sense they are effectively a regulatory mechanism but not one which is rule-based, i.e. the uptake is voluntary. Typically the form of legal protection has been via a consent notice rather than a covenant under the Queen Elizabeth II National Trust Act 1977, Reserves Act 1977 or Conservation Act 1987 (Quality Planning, 2017).

To qualify for a subdivision privilege, the area to be protected needs to be of sufficient ecological quality. Councils may assess this through the use of general criteria and evaluation of a report from an approved ecologist. In some cases more detailed guidance is given about when transferrable development rights may be considered in the process.

4.2 Rates relief and rebates

Property owners may be offered full or partial remission from council rates as an incentive to maintain the heritage values of their buildings and land, including biodiversity values. Other forms of rates relief are also possible, including postponing or freezing rates, or using a pre-determined differential system for significant natural areas. Relief from council rates spreads the cost of

conservation over all the ratepayers in an area and is a popular tool, being used by around two-thirds of New Zealand's councils (Johnston, 2007).

Rates relief is an attractive tool for recognising the costs of maintaining biodiversity in a tangible and visible way. It is flexible, relatively easy to administer and avoids direct costs to councils (who instead bear the opportunity cost of not receiving full rates). However this can also result in pressure from other ratepayers to discontinue relief schemes in order to minimise overall rate increases.

Some overseas countries offer centralised tax relief on either income or property tax (Pickard and Pickerell, 2007). Waiving of consent fees for maintenance or restoration work is also used. It applies more readily to heritage buildings, but could be an option for large scale pest control that is not already a permitted activity.

Councils also often discount the cost of invasive weed control on private land, provide annual rates relief for covenanted or protected areas, and provide funding for fencing and restoration planting. The Kāpiti Coast District Council and Matamata-Piako District Council are examples of territorial local authorities which provide access to a range of financial incentives including: grants, rates relief, fencing and planting subsidies (see Beca/Wildlands Report, Appendix B p 26 (Kāpiti) and Appendix D p 20 (Matamata)).

4.3 Funds and grants

Contestable funds managed by central government, district and regional councils offer protection and enhancement funding for priority ecosystems and habitats. While valuable as a financial boost to help motivated community groups undertake specific restoration activities, such as weed control, tree planting or fencing, the short-term nature of some funding schemes can be limiting. For example, if ongoing maintenance of a site is required and is unable to occur without financial or resource support provided by a grant, the site may degrade and volunteer retention could suffer in the interim.

4.3.1 Example: Freshwater Improvement Fund

This is a major government fund committing \$100 million over 10 years to improve the quality and availability of water (lakes, rivers, streams, groundwater and wetlands). The fund focuses on major projects (≥\$400,000) in vulnerable catchments that are showing signs of stress but have not yet reached a 'tipping point', as it is more cost-effective to prioritise these over severely degraded waterways. Increased biodiversity is one of several possible co-benefits that the project must demonstrate to be eligible for assistance.

4.4 Provision of resources

Managing biodiversity can be expensive for landowners. Restoration activities and weed/pest control come with significant costs which tend to be ongoing. One way to incentivise the protection of indigenous ecosystems is to directly provide resources to help manage them. Many councils offer

resource incentives and by buying in bulk or using local suppliers, these can be more cost-efficient than purchases by individual landowners, reducing potential barriers to participation.

Pest and weed control is probably the main area where resources (e.g. herbicides, loan traps and baits) are provided either free of charge or at subsidised cost. Assistance with fencing and supplying locally-grown plants are other ways in which biodiversity management is incentivised.

4.5 Payments for access or services

Payments for ecosystem services are financial incentives offered to landowners in exchange for managing their land in a way that allows benefits provided by ecosystems to flow to households, communities, and businesses. Payments for ecosystem services are diverse, taking many forms, but generally require a system of governance to provide a financing and payment mechanism. They can be made through public and voluntary schemes, contractually, and by offset or cap-and-trade mechanisms. Payments for ecosystem services can also benefit the development of regional economies. We are not aware of any payment for ecosystem services in operation in New Zealand at present.

5 Industry-focused initiatives

Industry codes of practice, certification programmes, land management plans and farm plans may overlap or connect, but also may be standalone. For example, adhering to an industry code of practice might mean having a farm plan, while industry codes of practice could form part of independent certification. Each of these actions can be voluntary or required by an industry organisation, processor/marketer (e.g. dairy company or meat processor), council or government agency to comply with rules and regulation. A driver for any of these actions may be social licence to operate (the ongoing support or acceptance of the community surrounding the industry), as well as the global market and consumer preferences that drive particular practices.

This section gives an overview and examples of industry codes of practice and certification programmes, industry and government co-regulation, and farm plans. There is not sufficient information available to assess how each of these work in the biodiversity management context, so examples vary in subject matter.

5.1 Industry codes of practice and certification programmes

Industry codes of practice

Industry codes of practice are designed by industry to set common standards for the industry, often promoting good practice. They can be voluntary or regulated by the industry groups, and the industry generally takes a lead in monitoring and enforcing compliance. The Sustainable Dairying: Water Accord is an example of an industry code of practice that standardises specific aspects of good farming practice to deliver water outcomes. It makes commitments on what practice changes will be achieved within defined timeframes.

Certification programmes

Certification programmes can formalise industry codes of practice, or be developed by an independent body. Certification is generally independently audited to ensure compliance. Being certified is often promoted by the company or brand, as consumer preferences can drive demand for sustainable practices. Independently audited certification includes programmes like BioGro (NZ Certified organics), SPCA Blue Tick (free range eggs), Energy Star rating (energy efficient appliances) and ISO 14000 standards for environmental management that can be picked up by any company or organisation.

There is often overlap between industry codes of practice and certification programmes. The main benefits of these programmes are:

- The industry or independent body takes ownership of the problem/solution, which creates greater buy-in by the industry.
- Reporting requirements often mean that decisions about good practice are explicit and transparent, which can encourage better decision-making.
- There is no or low cost to government and taxpayers.

- There is more flexibility than government regulation, which means that industry codes of practice can respond more quickly to advances in technology or new information.

Some of the disadvantages can be:

- Industry may not strike the right balance between workability for the sector and delivering benefits to the public or environment.
- Market-driven assurance programmes may not deliver adequately on aspects of importance to local communities e.g. international consumers may be more interested in food safety, staff working conditions and animal welfare than water quality in New Zealand.
- Requires an industry to have a certain level of administrative capacity (e.g. systems for monitoring, recording and reporting performance of individual farmers), cohesiveness and agreement.
- May not be legally binding/enforceable if not complied with. In some cases, processors can refuse to accept products from non-compliant farms (e.g. Fonterra's supply agreements), and in other cases, irrigation water supply can be cut off from non-complaint farmers (e.g. under the North Otago Irrigation Scheme agreements with scheme members).

5.1.1 Examples: Farmer and marketer initiatives

Some farmers and marketers have developed branding that incorporates environmental management assurances. The following are just some of these examples.

Taupō Beef (producers) / Harmony (distributors)

The Taupō Beef brand includes Glen Emmreth Farm and Hurakia Station (a Māori Trust Farm). The business is currently focused on the local market, and has the Waikato Regional Council “environmental tick” in its labelling, indicating that the farms operate under the Taupō catchment nitrogen cap. Harmony sells organic and/or free range New Zealand meat (including Taupō beef and lamb) to cafes, restaurants and organic food retailers. Harmony meats are committed to ethical and sustainable produce (Harmony 2017).

Fonterra's Supply Agreements

Farmers supplying milk to Fonterra must meet requirements set out in the Suppliers' Handbook. Environmental requirements cover effluent management, stock exclusion from waterways, bridging or culverting stock crossings, and supply information to enable Fonterra to model nitrogen loss. Farmers that do not meet the requirements must work with Fonterra to develop and implement an Environmental Improvement Plan within specified timeframes. Under the terms of the supply agreement, Fonterra may suspend collection of milk if requirements are not met.

Synlait's Lead with Pride

Canterbury-based dairy processor Synlait encourages best practice with its Lead With Pride certification, which recognises and financially rewards certified suppliers (Synlait, 2017). Certification requires that farmers achieve standards for water and irrigation management, improved biodiversity, soil quality, greenhouse gas emissions and energy management, along with animal health and welfare, milk quality and social responsibility aspects. All suppliers must meet minimum

standards, and certified suppliers (ISO 65) meet higher standards and are paid a premium, with a further premium paid when certification is maintained for 12 months or more.

Alliance's Pure South brand

Alliance Group is a meat processing company based in Invercargill. The Pure South™ brand has an environmental awareness programme including a hoofprint® programme that allows farmers to calculate their greenhouse gas emissions. The company operates an ISO 14001 and Enviromark NZ Environmental Management System and works to improve their environmental impact (Pure South, 2013).

5.1.2 Example: NZ Good Agricultural Practice for Horticulture

Horticulture's Good Agricultural Practice (GAP) schemes promote the safe and responsible production of fruit and vegetables in New Zealand (NZGAP, 2017). Accreditation to one of the schemes is necessary for supplying many local and overseas markets. Just under 90 % of New Zealand's commercial scale growers are accredited to one of three GAP schemes operational in New Zealand. In New Zealand three schemes are operated by and under GlobalGAP and achieve consistency through the NZ Technical Working Group.

NZGAP (one of three schemes) offers an Environmental Management System (EMS) add-on to manage natural resources, including:

- Protection and sustainable use of land and water
- Responsible use of agrichemicals and fertilisers
- Waste management
- Biodiversity, such as wildlife management and conservation plans
- Waste, emissions and energy.

This add-on is at present being offered to growers in Canterbury with plans to progressively offer it to all growers in New Zealand. The NZGAP Environmental Management System (EMS) encompasses a number of elements including EMS guidelines, property maps, the farm environment plans, environmental risk assessments, guidelines for good and best management practises, compliance criteria, and the grower/third-party auditor checklist.

5.1.3 Example: Sustainable Winegrowing New Zealand

New Zealand Winegrowers is the national organisation for New Zealand's wine and viticulture sector. There are approximately 850 grower members and 700 winery members. They were established in 2002, with a range of functions: advocacy on behalf of the sector (locally and globally), a global marketing platform, sector-wide events and awards, and leading sustainable production practices (NZ Winegrowers, 2017). Sustainable Winegrowing New Zealand is an industry certification programme led by NZ Winegrowers. This aims to ensure members meet recommendations and guidelines issued by the International Organisation of Vine and Wine, and there is an external audit structure.

The programme was designed to provide a 'best practice' model, ensure better quality control of wine, and assure consumers that products are sustainable with minimal impact on the environment. As stated in their 2016 report (NZ Winegrowers, 2016), 98% (or 35,558ha) of New Zealand's vineyard area is now certified under Sustainable Winegrowing New Zealand. This is a very high certification rate, especially given that the scheme is voluntary. The pillars of sustainability that are included in this certification are: biodiversity, pest and disease management, reducing waste, soil management, efficient water and energy use, and supporting employees and businesses.

The biodiversity component of the certification includes (NZ Winegrowers, n.d.):

- Biological processes instead of chemical insecticides and pesticides for pest and disease management (e.g. the use of native hawks and falcons to drive away flocks of smaller birds that would otherwise eat ripening grapes).
- Vineyard cover crop, providing nectar for beneficial insects, and habitat for microorganisms.
- Native groundcovers to suppress weeds under vines.
- Enhance habitat for beneficial fauna that can help with pest/weed/disease control, such as headlands and windbreaks.

Other projects supported by the NZ Winegrowers include: planting natives at the end of vineyard rows, native forest schemes, creating wildlife corridors, reintroducing native species, and protecting or restoring natural wetlands.

5.1.4 Example: Forest Stewardship Council

The Forest Stewardship Council (FSC) was established in 1994 to promote responsible management and the sustainable use of forests. It is a non-profit organisation, operated by forest management companies, retailers, environmentalists and indigenous people's organisations (FSC, n.d.).

The FSC provides two types of certification, to cover both sustainable forest management practices and for tracking forestry products in the supply chain. Forest managers and supply chains are audited by FSC accredited auditors, but not FSC itself in order to maintain independence between the setting of standards, operators seeking accreditation and auditing (FSC NZ, n.d).

Principle 6 of the international certification is the most relevant to biodiversity: Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest (FSC NZ, 2013). There are ten associated criteria in the international standards (FSC, 2015) with this principle that cover aspects such as:

- Assessing environmental values and risks in the area, at the level of detail, scale and frequency that is relevant to the level of risk from forestry management.
- Identifying and implementing actions to prevent negative impacts on environmental values, and mitigate or repair where impacts occur.
- Protecting rare and threatened species and their habitats, through conservation, protection and connectivity areas, and/or other measures.

- Identifying and protecting representative sample areas of native ecosystems, or restoring areas to more natural conditions.
- Preventing loss of biodiversity and maintain existence of indigenous species.
- Protecting or restoring natural waterbodies and waterways, as well as avoiding, remedying or mitigating impacts to water quality.
- Maintaining and restoring the landscape values in the region.
- Not converting natural forests to plantations (with few exceptions).

A finer level of detail on indicators that criteria have been met and guidance for foresters is developed at the national level. New Zealand's national standards with the FSC NZ were developed by a Standard Development Working Group involving a wide range of organisations (FSC NZ, 2013).

5.2 Industry and government co-regulation

One way of increasing the compliance of industry self-regulation is to have industry and government co-regulation. This involves government oversight or ratification of self-regulatory instruments.

The benefits are that co-regulation may:

- Be more likely to achieve targets and goals than self-regulation alone
- Set strong monitoring standards
- Result in greater buy in with co-operation on both sides
- Be a form of industry "agreement" that is legally binding.

However, there is a high administrative cost to monitor industry, it requires an industry to have a certain level of cohesiveness or agreement, and might not progress if agreement can't be reached. One example is the NZ Stock Exchange (industry body that) regulates the activities of the stock market and is overseen by the Securities Commission (government regulator).

5.2.1 Example: Organic produce and MPIs Official Organic Assurance Programme

Exports of organic produce under MPIs Official Organic Assurance Programme require certification with an MPI registered industry scheme, as well as MPI's organic standard (MPI, n.d.). Organic operators that export must:

- Comply with standards outlined in MPI organic standard OP3, which includes development of an Organic Management Plan, training of staff, and ongoing performance measures. The Organic Management Plan covers the day-to-day management of producing, harvesting, processing, packing, storing, transporting and exporting organic products.
- Comply with market access requirements and technical rules where applicable for overseas markets (European Union, Switzerland, Taiwan, or Japan in particular).
- Be registered as an organic operator with an organic Third Party Agency recognised by MPI, such as AssureQuality or BioGro. Operators must also regularly report on activities to the Third Party Agency, including incidences with non-compliance.

5.3 Farm plans

Generally speaking, farm plans can be voluntary, encouraged or required as part of council rules and consents. We do not have data available to provide a national overview of farm plans for biodiversity management. Erosion management has often been a driver for farm plans, and is used in this section as an example of how farm plans can be implemented.

The purpose of farm plans for erosion management has been to increase good management practice (GMP) and reduce sediment discharges. Analysis by MfE in 2016 suggested that 6 regional councils required farm plans in specific circumstances and 8 councils were encouraging farm plans on a voluntary basis. Support for these farm plans can include some funding support, templates, or council either preparing or providing advice on preparing farm plans.

Three examples are provided below:

- Dairy NZ and Beef and Lamb support for farm plans and relevant biodiversity aspects
- A study undertaken in Horizons on farm plans for water management purposes
- An example from Australia, whereby property vegetation plans are voluntary to enter into, but are legally binding for the term of the plan

5.3.1 Example: Dairy NZ and Beef and Lamb support for farm plans including biodiversity

Both Dairy NZ and Beef and Lamb offer templates or support for their members to develop farm plans, which include some biodiversity aspects.

Dairy NZ (2014) offer Sustainable Milk Plans in Canterbury, which have been approved by Environment Canterbury to comply with rules in the Land and Water Regional Plan. They also offer Sustainable Milk Plans to support farmers in Waikato. Members sign up through Dairy NZ, send information through to a consultant, who then visits the farm to develop the plan.

The objective in the waterway and biodiversity management section is: “To manage wetlands and water bodies so that stock are excluded as far as practicable from water, to avoid damage to the bed and margins of a water body, and to avoid the direct and indirect input of nutrients, sediment, and microbial pathogens.” For biodiversity management, the guide suggests that the plan include any information about:

- Any water quality monitoring data
- Riparian management plan
- Record of planting and fencing
- Pest management

The Waikato Region provides an example of where industry organisation’s farm plans are incorporated into the regional framework for water management. The Waikato Regional Council’s proposed plan change, rule 3, states that farms that are registered to a certified industry scheme are permitted activities. Some farming activities do not fall into this category, but the permitted activity status does apply to properties that are registered to an industry scheme approved by the council,

that have submitted their farm plans, and that have stock excluded from waterways. (Waikato Regional Council, 2016). Dairy NZ and Beef and Lamb are approved industry schemes.

Beef and Lamb provide templates for voluntary Land Environment Plans (2015), and templates specific to meeting council requirements in Waikato, Canterbury and Hawke's Bay (2016). These all include sections on biodiversity.

In the Land Environment Plans, the following information is sought to assess what can be done to improve biodiversity outcomes:

- Stock access to native bush blocks for grazing, as this prevents regeneration by eating new growth and can degrade soils.
- Stock access to streams and wetlands, which damages in stream and riparian habitat.
- Any regular pest animal control programmes for possums, rats, mustelids, pigs and goats, as these are the biggest threats to indigenous biodiversity, and can also affect productivity.
- Any weed control on the property (in both pastoral and natural areas), as weeds can invade bush and wetlands, displacing native species.
- Draining of wetlands, as wetlands are rare habitats and also beneficial in filtering sediment and nutrient discharges.
- 'Hung/perched' culverts (where the outlet is elevated above the downstream water surface), which prevent native fish passage and reduce the available habitat.

Similarly, prompts in the template for Hawke's Bay for biodiversity management include providing information about:

- Legally protected wetlands on farm identified and protected
- Legally protected areas of indigenous biodiversity on farm identified and protected
- Weeds and pests within protected areas are managed
- Enhancement programme in place for identified areas of indigenous biodiversity
- Plant shade trees away from waterways
- Riparian planting

The voluntary Land Environment Plans include a template for actions to be taken:

- Ranking actions in order of priority
- Detail the issue of concern
- Response specified to minimise or manage the issue
- Estimate cost
- Time-frame to be completed in
- Progress

5.3.2 Example: Whole Farm Plans for SLUI and nutrient management, Horizons Regional Council

Recent research by AgResearch (2016) explores the impact of Whole Farm Plans (WFPs) as implemented by Horizons Regional Council: specifically, the voluntary Sustainable Land Use Initiative (SLUI), and Dairy Environmental (Nutrient) Plans that are part of consent requirements for intensive farming in the One Plan. It examines farmers' views on how these plans contribute to the environmental, economic and social sustainability of their farm businesses, and to their local community; and why some farmers resisted signing-on to SLUI. It also explores the perspective on Farm Nutrient Plans and regulatory controls held by dairy farmers who are not yet required to have such plans.

The main findings in relation to SLUI plans were:

- Financial incentives (primarily in the form of subsidies) were identified as a key driver of the uptake and implementation of plans.
- Strong relationships based on trust and mutual respect between council's Field Officers and farmers was found to be fundamental for successful plan uptake.
- Where Whole Farm Plans are viewed as aligned with farmers' own priorities for their farms, farmers are more likely to implement the changes written in the plan.
- Further work would be useful on how whole farm plans can be used as a platform for evolving on farm economic and social needs, as well as contributing to regional economic growth and social wellbeing.

Other interesting findings are:

- It is unclear whether WFPs (whether SLUI or Dairy Nutrient Plans) have increased farmers' environmental awareness and their long-term willingness to promote environmental works on their farm.
- There is a need for more information and demonstration that environmental works (whether in the hills or on the flats) have positive results. More visible evidence and case studies have a powerful impact on farmers' perception of the value of these works.
- All farmers interviewed objected to an apparent lack of acknowledgement by scientists and regional authorities of any environmental works they had done voluntarily or proactively prior to council requirements. This influenced their perception of farm plans.
- SLUI signatories stated that the plans had contributed to on-farm profitability and had wider, beneficial economic effects.

5.3.3 Example: Property vegetation plans in NSW

New South Wales has a programme for Property Vegetation Plans that are voluntary for landowners to enter into, but are legally binding for the term of the plan. These plans are negotiated between the landowner and the Local Land Services, who visit the site and assist with the plan's development.

Plans are noted in a public register held by the Land and Property Management Authority, and are binding despite change of land ownership. In some respect they are similar to a covenant but operate more like a land management plan that is enforced with site-specific rules.

The main purposes for a Property Vegetation Plan are listed as being (New South Wales Office of Environment and Heritage, 2014):

- to obtain clearing approval, and to secure any offsets associated with that clearing.
- to confirm that native vegetation on a property is regrowth, providing a landholder with assurance that they will not need future clearing approval.
- to change the regrowth date of native vegetation to an earlier date, provided that landholders can demonstrate a history of rotational farming practices on the land.
- to confirm whether existing rotational farming, grazing or cultivation practices meet the definitions of these in the Act so that clearing approval will not be required.
- applying for native vegetation incentive funding.
- to protect native vegetation for future generations.

Plans are not subject to change, even if there are changes to local or state rules about threatened species or native vegetation. Variations to the plan can be sought by the landowner, as long as the plan still improves or maintains environmental outcomes.

Landowners with Property Vegetation Plans may be eligible for funding, and are also provided with high-resolution satellite imaging of their property, which assists with land use planning. Funding can contribute towards broader conservation actions, such as revegetation, salinity management strategies and controlling soil erosion.

6 Education, Training and Support

Education, training and support are key non-regulatory tools in environmental management, and biodiversity is no exception. In recent years the kinds of initiatives available has increased with local government and community groups becoming very proactive in engagement, restoration and pest control. The right kind of support can encourage people to value biodiversity, to make informed decisions about its management, to build knowledge and skills, and to actively engage in conservation management. These tools are flexible and can be tailored to meet different needs. They require relatively low institutional investment and lead-in times for their creation, and are scalable according to the needs of the user and resources of the creator. A disadvantage of education tools is that they are not normally sufficient as stand-alone measures. They work best as a complement to other incentives (e.g. regulatory or financial), to ensure that protection and change occurs in priority areas.

6.1 Education

The role of education in biodiversity management is both varied and critical. Education programmes provide access to knowledge and promote positive behaviour-change. Education is also a tool for achieving long-lasting social change (WWF, 2017). Environmental education is available to all levels of society from early childhood through to seniors, though most formal education occurs during the school years. Outside the school system, education is often undertaken to support specific social outcomes.

Enviroschools is a facilitated network of schools ranging from early childhood through to secondary education. It is supported by a national foundation, and arose from a partnership between Hamilton City Council (HCC), Waikato Regional Council, the Community Environmental Programme (CEP) and three schools looking to integrate environmental education into school life. It is now funded by MfE and other agencies, and implemented through regional councils. The programme is flexible, encompassing broad sustainability projects and study, including 'Living Landscapes' and 'Ecological Building'.

At the early childhood level, a number of initiatives such as NaturePlay and Natural Learning seek to bring children into contact with nature through play and learning materials (NaturePlay, n.d.; Natural Learning, n.d.). Designing and building 'natural playgrounds' where children can feel the 'earth beneath their feet and under their fingernails', these play spaces provide an alternative to forest and beach environments for children to connect with natural materials. The idea behind these programs is that if people are exposed to the environment as children, they are more likely to value it and protect it as adults (Chawla, 1999).

Various clubs exist for interested children to take biodiversity education beyond the classroom. In Forest & Bird's Kiwi Conservation Club, volunteer co-ordinators arrange nature activities and visits, or help with local conservation programmes. Zealandia Sanctuary provides a range of environmental education programmes and resources that give students and teachers nature-based experiences both inside and outside the classroom. The overall programme won a Green Ribbon award in 2017

and includes guidelines for incorporating curriculum objectives, and free visits to schools by their education staff.

‘Eco-fun days’ are activity days aimed at children and their families to get involved with learning about nature and wildlife through mini-projects and quizzes, for example on plant identification. Otatara Landcare and the Kiwi Conservation Club run an eco-fun day in Southland each year.

Learning Experiences Outside the Classroom (LEOTC) is a contestable funding pool administered by the Ministry of Education to provide curriculum learning outside the classroom. In the science and social science area, museums, zoos and sanctuaries around the country are contracted to provide LEOTC services.

6.1.1 Example: Matairangi Nature Trail, Wellington

This nature-based play area on Mt Victoria is inspired by the varied habitats of native fauna. Children climb through and explore a series of mini-habitats such as eel/tuna, weta, and falcon/kārearea as they progress along the trail.



6.1.2 Example: Hamilton Junior Naturalist Club

This club is for the 10-18 year old age group and fosters enthusiasm for natural history through evening talks, field trips and camps at the club’s base near Kawhia. Knowledgeable adults teach species identification; while guest speakers often come from the research, government or volunteer communities and provide an applied conservation management context. Many members go on to successful biodiversity-based careers (botanist Peter de Lange, freshwater scientist Mary de Winton, and educator Chris Eames, among others).

Formal adult education is mostly available on a paying basis through the tertiary system or high school community education classes. The Department of Conservation runs a number of training courses which are open to the public – both online and field/classroom-based. They target an audience that is already motivated to undertake conservation management, and provide the skills for them to actively engage.

An increasing range of informal learning takes place through volunteer groups, specialist NGOs such as the Ornithological and Botanical Societies, and sanctuaries.

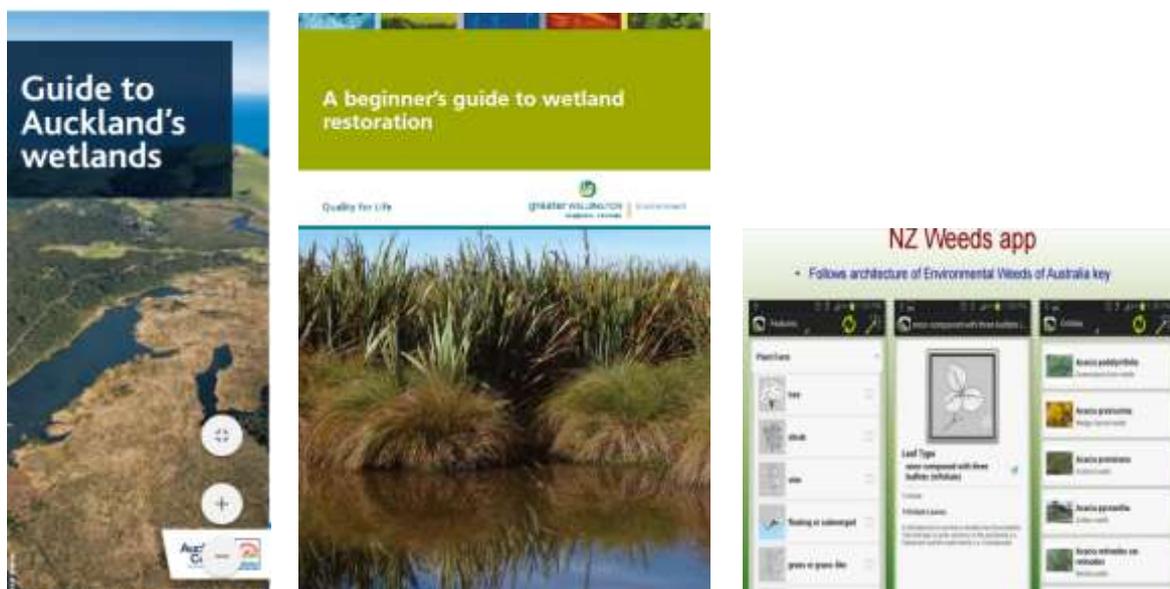
6.2 Factsheets, guides and technical tools

A wide range of information and advice is available for biodiversity management. Although the sources are somewhat fragmented, the material is increasingly sophisticated and connected nationwide. The websites of regional councils and government departments provide a good starting point.

Councils and others use a wide variety of publications to inform people about biodiversity. The material tends to fall into two categories – general information about biodiversity and sites of significance, and technical material to assist with identification or restoration. General information tends to be produced ‘in house’. Technical material may come from councils themselves, Government Departments and Crown Research Institutes, NGOs or private individuals.

6.2.1 Example: from general interest through to specialisation

The general guide to Auckland’s Wetlands on the left discusses the history and importance of wetlands, and provides information on 27 wetlands to visit around the Auckland region. This guide acts as a starting point to create awareness of the values and importance of wetlands and how they can be experienced. For those potentially interested in restoration work, the beginner’s guide in the centre provides 22- pages for landowners on planning and restoring wetland areas (many councils have similar information for other ecosystems). For identifying and controlling wetland (and other) weeds, specialized information is often available in the form of interactive websites or smartphone apps such as the LUCID keys produced by Landcare Research/Manaaki Whenua.



More specialist biodiversity guidance is available from a range of sources, and predominantly delivered in on-line format. The Landcare Trust has produced a Wetlands Monitoring and

Assessment Kit (WETMAK), a series of online modules providing a standardised approach to help community groups measure their restoration efforts. DOC has a web-based Inventory and Monitoring Toolbox, which details standardised monitoring methods for different species and ecosystems, and available for public use. Decision trees help groups choose the most appropriate methods for their study. Other electronic resources use crowd-sourcing and citizen science to be more comprehensive than would otherwise be possible. For example a smartphone app to identify native orchids has been developed by Landcare, using images provided by the public through Naturewatch and the New Zealand Native Orchid Group. Flora Finder is an electronic field guide to native plants developed by the University of Otago. It assists in identifying and locating plants by processing photos taken by the user in the field.

Naturespace is a collaborative project which supports community restoration by providing access to information and resources, and a platform for sharing best practice around the country (Naturespace, n.d.). It is supported by a number of councils, WWF, the QEII and Landcare Trusts, and DOC.

6.3 Practical training

Another way of providing biodiversity information is through hands-on workshops and 'field days'. These cover practices such as restoration, riparian planting, monitoring and pest control. They are often run as partnerships between councils, universities, NGOs and volunteer groups, and are aimed at landowners and the general public.

6.3.1 Example: 'Pest Fest'

Run by Wellington councils, DOC and nature-based organisations, this is a public event where people can learn how to control pests. Amongst other activities and stalls, the public is able to take advantage of a 'weed swap' bringing in weeds which are identified, disposed of, and exchanged for a native plant.

Riparian management workshops are also popular - one run by Auckland Council focusses on how to make up for past biodiversity losses, using the Plan-Prepare-Plant-Preserve approach along with a site visit.

It can be difficult to know whether providing information leads to changes in levels of knowledge and action. One Southland initiative in Kakanui sought to measure progress towards its goal of raising community understanding of environmental impacts. The Evaluation Report for Residents and Farmers found that levels of knowledge amongst residents on five of seven key topics increased from 2014 to 2016. This is a largely positive change but also shows that information uptake does not occur evenly (aquatic biodiversity was one area where knowledge levels dropped).

6.4 Provision of specialist advice

For landowners who are interested in protecting biodiversity but not sure what this means, the availability of accessible specialist advice is important to bridge the gap between ideas and action. This could mean simply the ability to have a casual phone discussion or a no-obligation site visit.

More formally, property management plans use the expertise and advice of ecologists and other scientists to guide landowners to long-term management and monitoring of biodiversity assets. Plans are tailor-made for each farm and incorporate the personal goals of landowners as well as the biodiversity values. Some councils provide such plans at reduced or no cost to those ratepayers who have significant biodiversity on their land. Plans can also be provided for community groups working on public land (or with landowner agreement) – for example the Whakatāne Harbour Care group’s 2013 plan. Further examples are provided in section 4.3 ‘Farm Plans’ below.

Some organisations have been established to make specialist information more accessible. Land, Air, Water Aotearoa (LAWA n.d.) is a partnership between the councils, Cawthron Institute, Ministry for the Environment and Massey University and has been supported by the Tindall Foundation. Its website contains accessible data about air and water quality, factsheets, a glossary and community news.

6.5 Recognition and Awards

Awards schemes can encourage improved performance by promoting achievements of peers and creating champions. Many organisations run awards schemes to recognise good biodiversity management, including charitable trusts set up for that purpose. The Cawthron Marlborough Environment Awards are held every two years to showcase business, community and individual environmental action. The 2017 winner was a vineyard which combined commercial aspirations with conservation planting on the property – an example of how such awards can relate to environment or business more generally but encompass biodiversity along the way. Central Government awards include the MfE/DOC ‘Green Ribbon’ scheme, and MPI’s new Biosecurity Awards. The Department of Conservation also offers summer research scholarships and creative ‘artist in residence’ opportunities and the Loder Cup for plant conservation.

Industry bodies and NGOs are also active in environmental recognition. The Worldwide Fund for Nature NZ has a crowdsourced award for innovation, where people vote for creative approaches to conservation practice.

6.5.1 Example: Ballance Farm Environment Awards

The awards are run in 11 regions throughout New Zealand and are open to any land-based farming operation. The awards recognise and celebrate good farm practices but also provide an opportunity for farmers to be advised by a panel of experienced judges, and to share their ideas with the wider community. Regional winners hold a field day on their property and compete for the prestigious national trophy. A number of sector-specific award and recognition schemes also exist. The Deer Industry NZ Environmental awards promote sustainable deer farming practices and recognise innovation. They are based on the New Zealand Deer Farmers Landcare Manual (New Zealand Deer Farmers’ Association and Deer Industry New Zealand, n.d.), which includes a chapter on biodiversity. The Manual is itself an example of specialist environmental advice prepared by an industry body.

The disadvantages of awards schemes include the risks of ‘preaching to the converted’ – that applicants are already managing biodiversity for their own reasons and the resources required to

administer such schemes might be better spent enforcing regulations. Funding constraints and different priorities mean that awards can come and go, with an uneven approach around the country or over time.

6.6 Advocacy

Environmental advocacy encompasses activities intended to influence the legal and policy systems towards positive environmental change. It is a more proactive expression of advocacy in the wider sense of public support for a particular cause or policy. Making submissions on plans and consent applications, creating campaigns, and lobbying decision-makers are some examples. Many councils, Māori groups and NGOs are strong advocates for biodiversity. The Department of Conservation also has a statutory responsibility to advocate for the conservation of natural resources. Advocacy ranges from providing information through to active participation in the environment court hearings. Timely and effective advocacy can be supported by ensuring that opportunities for public involvement are well – publicised, and by providing information on biodiversity state and trends. Most BCG members are involved in advocacy and will be well-placed to further discuss its pros and cons.

6.7 Citizen Science

Citizen science involves the public in scientific activities to supplement professional research, for example gathering field data for monitoring purposes. Citizen science is not so much a ‘measure’ in itself but a concept through which public interest and knowledge can be fostered – both as ends in themselves and to contribute to greater understanding of the natural world. It can also provide an early indication of status and trend changes and emerging issues that may warrant further investigation or more focused monitoring. Despite initial scepticism from the professional science community, studies have shown that data from properly briefed members of the public is reliable (Golan, 2013). Citizen science has become a discipline in itself – there is now a European Citizen Science association, which has produced 10 principles to guide projects involving the public.

6.7.1 Example: Garden Bird Survey

Perhaps one of New Zealand’s best-known examples of biodiversity citizen science is the long-running Garden Bird Survey by Eric Spurr of Landcare Research. By asking people to record numbers and species of birds in their gardens during one week each year, the survey has shown that the numbers of many bird species are decreasing in parks and gardens.

Intensive Bioblitz weekends, where all living things are recorded, and the Kea Count are other examples of citizen science.

7 Behavioural insights

Behavioural insights, drawing on behavioural economics and psychology, are approaches that aim to change behaviour for societal benefit. These approaches can be used across many types of intervention (both regulatory and voluntary), and aim to ensure behaviour change in the most effective, enduring or efficient way. ‘Nudges’ are interventions using behavioural insights, and these aim to offer easy and intuitive choices for beneficial behaviour change, rather than traditional incentives approaches that target reasoning or rational thinking (Thaler and Sunstein, 2008).

Behavioural insights have been used by numerous governments, with particular success in influencing people’s health and financial choices. Environmental issues that have been tackled through behavioural insights have largely focused on energy efficiency, as well as purchasing fuel efficient cars, water conservation, sustainable food consumption, and preventing waste (OECD, 2017).

Behavioural insights are used to understand and affect people’s behaviour. Various studies show that there is a gap between knowledge and awareness of an issue, and actual pro-environmental behaviour (see Kollmuss and Agyeman, 2002). DOC’s survey of New Zealanders (2016) demonstrates that in some regions, feelings that conservation is highly important does not equate to spending time on a conservation project in the last twelve months. In other regions, people spend more time on conservation projects but have a lower sense of importance about conservation. Behavioural insights go beyond providing information and awareness-raising to test and use the most effective ways to make behaviour change.

Reddy *et al.* (2017) promote the following three broad steps for a behavioural insights approach to conservation:

- Defining the behaviour change problem
- Understanding behaviour to design conservation interventions, and the variability within your targeted audience in terms of what influences their behaviour to design the interventions to those different triggers
- Evaluating and adapting behavioural interventions

The first step in involves defining the problem, objective and the outcome that is sought. A key factor is determining what behaviour the intervention is trying to change. For example, in relation to biodiversity, it could be behaviours of individuals (e.g. not leaving cats out at night), behaviours of companies (e.g. selective logging vs clear cut), and local government (encouraging planners to include certain biodiversity factors in a district plan etc.). Obviously there will be different strategies for influencing these behaviours.

Data about the different behaviours and about the environmental impacts are critical to know what behaviours currently are and their impacts. It also forms a baseline to measure how effective the chosen intervention is at a later date. The types of factors to consider in determining the undesirable behaviour are:

- Contextual factors (e.g. current settings leading to the undesirable behaviour, such as policy, legal, structural, information)
- Mental processes (e.g. automatic and/or deliberative thinking)
- Social factors (e.g. norms, social pressure, social recognition)
- Societal/cultural biases (e.g. stereotypes)

While different topics will require different interventions, there are key concepts that motivate people to change. The 'EAST' Framework from the Behavioural Insights Team in the UK (2014) states that successful 'nudges' or interventions are typically Easy, Attractive, Social, and Timely:

- Easy – through the use of defaults, simplifying choices, reducing friction and costs
- Attractive – Attracting attention, personalising rewards and incentives for maximum effect
- Social – using social norms, showing that most people already do the desired behaviour, draw on social networks, and encourage people to make a commitment to others.
- Timely – remind people at a time that they will be most receptive, note the immediate costs and benefits of the behaviour, help people plan their response to events

It is important to also consider what is being done already to encourage the desirable behaviour, and the gaps in these interventions. This could include the legal context, government interventions, NGO or citizen interventions, or sector-led programmes.

Lastly, it is critical to monitor the intervention to know what the effects are, such as changes in behaviours, side/subsequent positive effects, changes in environmental quality (e.g. ecological footprint), and changes in individuals' quality of life.

For international examples of addressing environmental issues through behavioural insights, please refer to *Tackling Environmental Problems with the Help of Behavioural Insights* (OECD, 2017). The report assesses examples relating to energy conservation and efficiency, sustainable transport choices, encouraging water conservation, incentivising sustainable food choices, waste management, and compliance with environmental regulation.

7.1.1 Example: Social influence

Social norms and influence from others have been studied with farmers (see Michel-Guillou and Moser, 2006; Siebert *et al.*, 2006; Stock, 2007). It has also been found that on-farm conservation is more likely to occur when supported by people important to the farmers, such as parents and peers (Brook, Zint and De Young, 2003). For example, one study has shown that as farmers receive more information from family, friends or neighbours about endangered species, they are more likely to protect these particular species (Brook, Zint and De Young, 2003). However, this influence of important people can be positive or negative. For example, a study in Europe found that farming neighbours can influence farmer behaviour on biodiversity protection positively (such as modelling biodiversity protection) or negatively (such as disapproving of conservation plans) (Siebert *et al.*, 2006, p. 330).

7.2 Example: Keeping cats inside at night

DOC has a social science team led by Dr. Edy McDonald, who are working to use behavioural insights for conservation benefits (e.g. preventing the spread of Kauri die-back disease). Prior to joining DOC, Edy worked with colleagues to explore encouraging cat owners to keep cats inside at night, with the objective of reducing native bird deaths. They tested 26 statements correlated to bringing cats in at night, to see which would be the most effective.

Firstly, they identified the type of behavioural beliefs that cat owners had, and found that cat safety from cars was a priority, along with the belief that keeping cats inside was good for the cat. Impacts on native wildlife were not a major factor for cat owners. Second, they identified people that would be trusted by cat owners, which highlighted the influence of veterinarians and family members. They found that SPCA, DOC, Forest and Bird and Gareth Morgan did not have a major influencing role for cat owners.

The result was that the two most effective information campaigns were pamphlets and posters that contained the following messages:

- A veterinarian advocating keeping cats inside at night for safety; the backside of the pamphlet provided statistics about the risk of cats being hit by cars at night.
- A child stating “I love it when Fluffy sleeps on my bed”, noting that “75% of cat owners agree having their cat in at night is beneficial”, that a cat’s company reduces stress, and that “2 out of 3 cat-owning families think that having their cat inside at night is the right thing to do”.

This demonstrates that it is critical to target the values of those that you are seeking the behaviour change from, rather than the values that might be driving the intervention. Identifying co-benefits of an action helps to determine how these multiple values can be fulfilled.

7.3 Example: Sustainable Living courses

The Sustainable Living programme is a national programme designed to encourage individual and household behaviour change such as reducing household waste, better transport choices, growing food and reducing power bills, for environmental, health and financial benefits. The programme can be delivered by councils or community groups in areas where the council is a member of the programme. Individuals then sign up to a local course, sometimes paying a small fee to participate. The programme is set up as a charitable trust, and currently has over 14 partner regional, city and district councils across New Zealand (Sustainable Living Trust, 2017).

The aspects of these courses that have a behavioural economics approach are (Tayler and Allen, 2009):

- Social norms – By involving some people that are predisposed to make positive behaviour changes, this shifts the ‘norm’ for everyone else’s behaviour and encourages them to change. Media was also used to influence people’s perception of the norm.
- Simplified choices – The participants’ perceptions and barriers were understood, so that the programme could provide information and options that made it easy for participants to change their behaviour.

- Rewards and encouragements – Participants were encouraged to do actions that satisfied multiple needs (e.g. health, fitness, savings on electricity and gas bills and grocery bills). Participants were also rewarded with celebrations on goals that they had achieved.

The programme has been evaluated, with long term behaviour change of the participants reported, long after they have finished their course, in actions such as reducing waste and energy efficiency actions. One of the encouraged behaviours was to reduce car use, however, this was the area with the least individual change, with the reasons perceived as strong institutional and structural barriers (Taylor and Allen, 2008).

A comparative study between the Sustainable Living programme and other campaigns has shown that this programme is much more effective than other programmes because of the group setting and social factors that encourage behaviour change (Taylor and Allen, 2009). Other sustainability programmes that simply offer information on similar content (through websites, emails, TV etc.) can raise public awareness of the issues, but have been shown to be less effective for changing behaviour.

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9 Further reading

9.1 Community-led restoration and protection

The Use and Potential of Pest-Proof Fencing for Ecosystem Restoration and Fauna Conservation in New Zealand http://pestexclusion.com/images/stories/pdf/burns-innes-day_fencing-for-conservation.pdf

Gully Restoration Programme - partnership between Hamilton City Council, friends group, WinTec and University of Waikato. <http://www.gullyguide.co.nz/>

Predator Free New Zealand. 2017. <http://predatorfreenz.org/>

The Chatham Islands Taiko Trust (private sanctuary). <http://www.taiko.org.nz/>

9.2 Mātauranga Māori in biodiversity management

Māori Environmental Monitoring in New Zealand: Progress, concepts and future direction: http://icm.landcareresearch.co.nz/knowledgebase/publications/public/2006_Maorienvmonit%20paper.pdf

An indigenous community-based monitoring system for assessing forest health in New Zealand: <https://link.springer.com/article/10.1007/s10531-016-1142-6>

The Contribution of Indigenous and Local Knowledge Systems to IPBES: Building Synergies with Science: <http://unesdoc.unesco.org/images/0022/002252/225242E.pdf>

Tūhoe Tuawhenua mātauranga of kererū (*Hemiphaga novaseelandiae novaseelandiae*) in Te Urewera: <http://newzealandecology.org/nzje/2856>

9.3 Financial and resource incentive programmes

Conservation and the delivery of ecosystem services: <http://www.doc.govt.nz/documents/science-and-technical/sfc295entire.pdf>

Discussion on Payment for ecosystem services: <http://www.doc.govt.nz/Documents/science-and-technical/sap258entire.pdf>

Incentives for biodiversity conservation: http://www.defenders.org/publications/incentives_for_biodiversity_conservation.pdf

Markets and payments for environmental services: <https://www.ied.org/markets-payments-for-environmental-services>

Payment for Ecosystem Services from Forests: <http://ftp.iza.org/dp8179.pdf>

The Use of Market Incentives to Preserve Biodiversity: <http://ec.europa.eu/environment/enveco/biodiversity/pdf/mbi.pdf>

Treasury report: Encouraging private biodiversity incentives for biodiversity conservation on private land <http://www.treasury.govt.nz/publications/research-policy/wp/2000/00-25/twp00-25.pdf>

Using economic incentives for biodiversity conservation: <https://portals.iucn.org/library/sites/library/files/documents/PDF-2000-002.pdf>

9.4 Industry-focused initiatives

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9.5 Education, Training and Support

Natural Neighbourhoods for City Children: <http://www.otago.ac.nz/geography/otago399006.pdf>

Naturewatch: <http://naturewatch.org.nz/>

An Inventory of citizen science initiatives, resources and learning opportunities in New Zealand:

<http://www.landcare.org.nz/files/file/2023/Inventory%20of%20Citizen%20Science.pdf>

The status of New Zealand agricultural sector-owned environmental management systems (EMS) - are they a realistic alternative to averting further environmental regulation?

www.massey.ac.nz/~flrc/workshops/11/Manuscripts/Paterson_2011.pdf

9.6 Behavioural insights

Changing behaviour: A public policy perspective: <http://www.apsc.gov.au/publications-and-media/archive/publications-archive/changing-behaviour>

Linking Social Norms to Efficient Conservation Investment in Payments for Ecosystem Services:

<http://www.pnas.org/content/106/28/11812.full.pdf>

Social Norms and Pro-Environmental Behavior: A Review of the Evidence:

<http://www.sciencedirect.com/science/article/pii/S0921800915301543>

Psychology for a Better World: <https://cdn.auckland.ac.nz/assets/psych/about/our-people/documents/psychology-for-a-better-world-ebook-version-Nov11.pdf>

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Tackling Environmental Problems with the Help of Behavioural Insights: <https://www.oecd.org/env/tackling-environmental-problems-with-the-help-of-behavioural-insights-9789264273887-en.htm>

The Influence of Place Attachment, and Moral and Normative Concerns on the Conservation of Native Vegetation: A Test of Two Behavioural Models:

<http://www.sciencedirect.com/science/article/pii/S0272494411000594>

Encouraging pro-Environmental Behaviour: An Integrative Review and Research Agenda:

<http://www.sciencedirect.com/science/article/pii/S0272494408000959>

Watershed Conservation and Preservation: Environmental Engagement as Helping Behaviour:

<https://www.rug.nl/staff/e.m.steg/stegvlekencouraging.pdf>