

Final report

The benefits and challenges of farmer-led, collaborative, sub-catchment policy methods and plans for consideration in the Waikato Catchment: A literature review

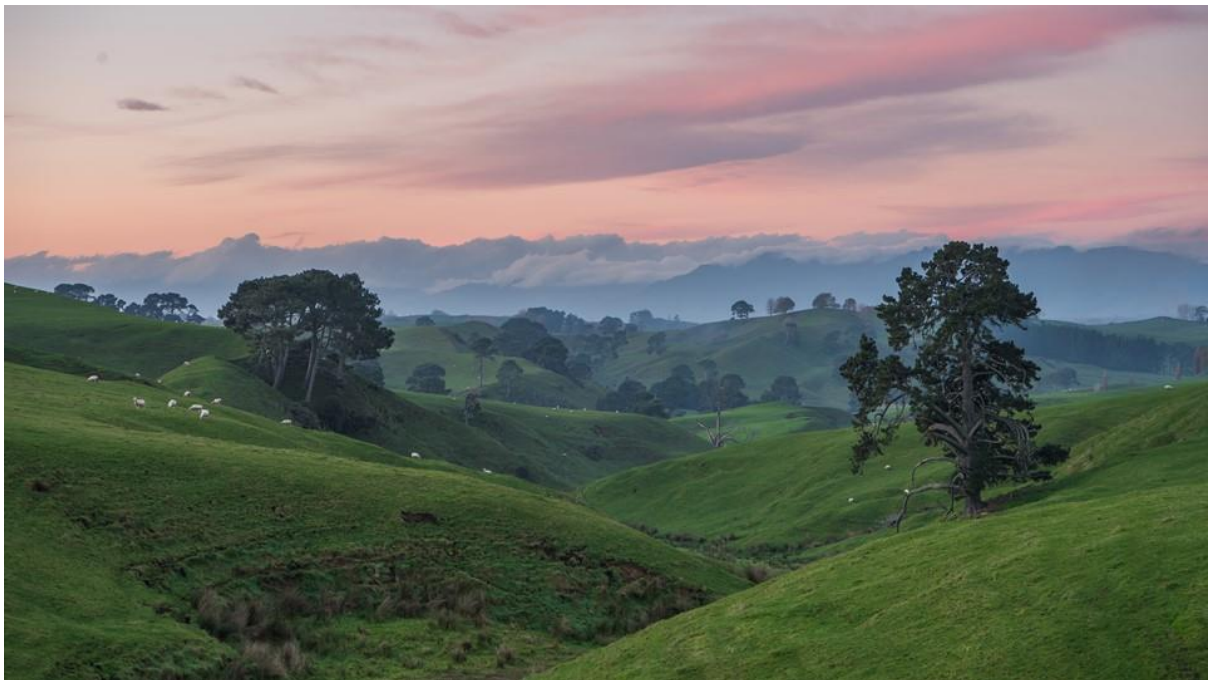


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Table of Contents

Executive summary	3
1. Introduction	9
2. Purpose of this document.....	9
3. Limitations and definitions	10
3.1. Limitations.....	10
3.2. Definitions.....	11
4. Methodology.....	13
4.1. Guiding questions	13
4.2. Locating and identifying relevant material	14
4.3. Analysis, synthesis and reporting.....	14
5. Findings – grey literature	14
5.1. Benefits to participants.....	14
5.2. Benefits generally	17
5.3. Challenges for farmers.....	20
5.4. Features of collaborative processes that make them work best for farmers	24
6. Findings – academic material.....	29
6.1. Benefits to participants.....	29
6.2. Benefits generally	31
6.3. Challenges for all collaborators	33
6.4. Features of collaborative processes that make them work best for collaborators.....	44
7. Māori and collaborative processes	51
8. Comparison between the review findings and Ostrom (1990)	58
9. Appendix 1: Summary of Ostrom’s (1990) rules for governing Common Pool Resources	61
10. References	62

Executive summary

Scholars in the social sciences have only since the 1980s begun to deal with the challenges involved in analysing complex systems. Although the principles were developed twenty-nine years ago, they are still the benchmark or provide an excellent framework for managing collaborative projects. The central problem was the large number of relevant variables and their interactions that affect how human systems operate at multiple levels. This complexity increases when social systems interact with natural systems that present similar analytical difficulties. Communities of users managing common-pool resources such as rivers, lakes, forests or fisheries are excellent examples of this complexity. Although difficult, understanding these situations is important given the increasing impact humans are having on the environment and the important role that communities often play in natural resource management in diverse settings worldwide.

This literature review supports Waikato Regional Council's understanding of the benefits and challenges of farmer-led, collaborative, sub-catchment policy methods and plans in the Waikato Catchment. It is for use in the consideration of a method to enable local farming communities to collaborate to address non-point pollution of water ways in their area. This review provides for developing an implementation plan, and investigate and document the advantages, challenges and best practice of farmer-led collective action from grey and academic literature. It chiefly focuses on the sub-catchment level but also bears the catchment level in mind. Social aspects that are applicable at the catchment level are also relevant at the sub-catchment level. It does not claim to have included all the grey literature on the topic and does not differentiate between types of communities and/or sub-communities or landowners. It builds upon other literature reviews rather than repeat them, and, because we know the situation before 2000 was uncollaborative, it does not include New Zealand material prior to 2000.

The project has two major stages: identifying relevant material, then analysing synthesising and reporting the findings. Feedback from Waikato Regional Council is incorporated in the final report.

Four guiding questions are used, the first being: What are the benefits that participants in these (collaborative) processes have found? In New Zealand, there is evidence that collaboration stimulated the development and adoption of new technologies and enabled farmers and other stakeholders to achieve their own goals. New opportunities also emerge and can be taken, for example farmers can share and compare data, show they are good stewards of the land, are willing to "to do their bit", and they can get access to resources otherwise hard to obtain. There is also the opportunity to resolve conflict. It is noted that farmer-led collaborative projects do not always achieve all the anticipated outcomes, but it is clear that they can develop a clear understanding of what farmers can do to improve water quality.

In the UK and in New Zealand participants' four capitals i.e. human, natural, financial/physical and social capital improved through collaborative processes. When farmers ask for and partake in capacity building, collaboration is more likely to be successful because they seek to fulfil their own goals while helping to fulfil wider regional goals.

The second guiding question is: What are the benefits of non-regulatory collaborative local action by farmers? There is a list of social benefits to a farming community ownership approach. These social effects often have knock-on effects, or outcomes that extend far beyond the scope of the original project(s). Examples of knock-on effects are community groups that develop and continue beyond the life of the original project, improved environmental standards being incorporated in industry-level systems, and influences on Council, and Government policies. Collaborative projects also have real-time impacts like in Australia and The Netherlands where agricultural decision-making was

influenced in real-time. In the literature there is clear evidence of win-win outcomes, for example communities who enact decision-making pathways that determine the future characteristics of their own community. New insights and shared understanding through learning are also produced during collaboration. Although consensus decision-making is important for successful collaboration, it could cause other, sometimes negative, impacts.

It can be hard for farmers to deal with stakeholders directly, but when they collaborate as a group they can be assisted with this task by others, like Councils. Further, farmers in collaborative groups can find complementary action to environmental regulations, and the wider community can take ownership of solutions and become involved and develop a sense of pride in the environment. Sustainability can also be improved on-farm, as the literature illustrates. Community resilience can improve because of collaboration and Councils' monitoring and enforcement costs can be reduced. Although collaborative projects can save organisations money, they cost participants money, for example personal costs, threats to participating organisations, and/or the costs in time and effort that it takes to get collaboration off the ground, and the costs of having to make on-farm changes.

The underlying philosophy of a project is important because it can influence its success, like building trust, and avoiding conflict and the need to regulate. The literature is clear that bottom up collaborative environmental projects are better for the environment and the experience and level of commitment of the farmers involved. Top-down and bottom-up approaches could be used in tandem.

The third guiding question is: What common challenges are encountered by farmers and other collaborators? There is common agreement in the literature that farmers' collaboration with other stakeholders is important in trying to address freshwater management in catchments. There are many examples of why farmers choose to not collaborate. Importantly, farmers need to: assume a level of personal responsibility for having contributed to creating the issue in the first place; create a mutual understanding of the need for collective action to solve a problem; and acknowledge the benefits and risks involved. The literature shows farmers world-wide generally value the maintenance of their land resource, the environment and their way of life ahead of profit maximisation. They are conflicted between using their land as a resource productively and thinking of the environment as a resource to be protected and preserved. Farmers generally are motivated by multiple influences to protect the environment. Other stakeholders generally are often motivated by the possibility that more can be achieved together, than alone. Unfortunately, as a common pool resource problem poor water quality is a social dilemma with strong incentives to defect. This could be overcome by peer sanctioning so that defectors do not prosper from defection. In sum, long-term collaboration is hard to sustain and unlikely to improve outcomes for clients and communities when stakeholders are not highly motivated to participate, or when it lacks clear value.

Closely associated with motivation to participate is farmers' perception that collaboration may not be worthwhile. New Zealand farmers may feel "the system" is against them because the country's innovation system is heavily based upon science centred innovation, and farmers' efforts undervalued. The literature review has shown that as farmers' efforts may not be attributable, participants could feel they have less agency than they believed, and processes operating at higher scales (e.g., nationally or regionally) can have a detrimental effect on local collaborative processes. Collaboration works best when it is between partners that are equally strong or equally weak, as many relationships break down if there is suspicion of one taking advantage of the other.

For farmers collaborative projects should be practical and without red-tape. There must either be a clear private benefit, or incentivisation through payments, which entices participation. While

funding and costs are issues for them, farmers are generally happy to co-fund projects up to a point. For community-led conservation projects the struggle to find adequate resources including funding for maintenance and coordination have been well documented. A lack of scientific information and leadership for developing an effective strategic, integrated water management system to support a collaborative approach can erode trust. Insufficient organisational capacity, conflict, an unintended farmer-hostile environment, insufficient communication, managing the costs of collaboration, and over-incentivising from funders and decision-makers on “working together” have also caused issues for farmers. Further, in using an Integrated Catchment Management approach issues have been identified with differences in organisational norms and procedures, loss of identity or independence, logistics, and difficulties in maintaining community accountability.

Dealing with tension and conflict is necessary but may be too hard for collaborators. Not knowing which hat to wear during collaboration is a common issue in collaborative arrangements. This is often related to authority and legitimacy issues, so having a mandate and legitimacy to speak and act on behalf of someone else are crucial.

There is general agreement in the literature that a consensus decision rule is essential for positive collaboration. From the outset it should be clear who collaborative groups report to, and what decision-making powers a group has. Stakeholder power disparities create issues, so robust engagement frameworks, participatory meeting design and a clear, appropriate decision-making process for the collaboration process are essential.

As a collaborative approach Integrated Catchment Management has been associated in the literature with imbalances of power, differential power relations, turf and territorial issues, and identifying appropriate community representation, and the tendency to discount non-scientific forms of knowledge. Weak organisational capacity can be a significant barrier to effective collaboration, whilst large long-term projects can create role confusion and overlapping responsibilities.

There is consensus in the literature that for a range of reasons collaboration can be a lengthy process. Collaborative processes take time to get going and for impact, hence time lags are common. These lags can be quite variable as some actions may have a relatively quick impact on environmental systems while the benefits of others may take several years. Quick wins are important. One of the biggest challenges is the management of cumulative effects, which can cause delays. In long-term projects staying connected is an issue, largely because of membership turnover. Setting time limits is important and, despite time related challenges, collaboration for environmental purpose can be resilient.

The fourth guiding question is: What are the features of collaborative processes that make them work best for farmers? Nine categories of some of the factors that are likely to promote successful collaborations in the New Zealand context were identified namely: existing relationships; clear, open and frequent communication; shared vision; collective identity and purpose; respect, trust, and honouring diversity; strong leadership; good governance; having the right people involved; and, a favourable climate. Further, local engagement, the right skill sets for scientists and other participants (networking, team building, openness etc.) and identifying the right participants are crucial. Local engagement is important because it provides the greatest opportunity for achieving environmental aims and are cost effective. Engagement may be hard because participants may have limited time to network and/or coordinate. Representatives of each group must be mandated by that group to represent them, and the group must respect and support their representative. Consistent representation helps collaborations.

Building trust is necessary and requires respect and recognition. Stakeholders should recognise and appreciate good work already done, and the efforts of community groups and individual farmers should be recognised. Respect is important before, during and after collaborations and has been mentioned by multiple authors. Trust is slowly built, so if there are already some existing social relationships among the parties it can speed the collaboration process up. When trust is low, but collaboration is mandatory, additional incentives to participate in good faith might be required, as well as binding guarantees prior to fully engaging. When significant power differentials exist, it is necessary to identify key local individuals who can work across different groups' boundaries. People generally do not trust those they do not know, and they must be accepted by the locals before they can expect to engage in any meaningful discussions. Pressure and coercion undermine trust and should be avoided as far as is reasonably practical. When top-down pressure is applied things can go awry, which takes time to remedy.

A holistic, integrated approach that addresses farming systems and the innovation system, is required and assists with industry programmes that often do not bear the environment in mind. Multiple accountabilities can cause confusion in holistic approaches. Credible commitment of all stakeholders is important as it brings confidence and trustworthiness, thereby improving the chances of success. There is general agreement in the literature that a distinctive kind of leadership is required for successful collaboration, although authors' descriptions vary slightly.

The literature discusses three aspects of monitoring collaborations: network performance; quality control and compliance; and, goal achievement. Monitoring should occur to track on the ground if what farmers do works, and to measure the progress and success of proposed policy to ensure targets and goals are being met. The expectations of monitoring should be kept realistic, monitoring requires funding, and monitoring the environmental outcomes of particular actions is challenging because there are often a number of external factors like weather conditions involved. From the review it is evident that working together is difficult, so farmers in volunteer roles, and other stakeholders, need support with a range of skills and resources, including monitoring. Farmers also need consistent high-quality technical advice and positive feedback, as well as support with conflict resolution. Providing support can stretch providers significantly.

Collaborative processes are deeply immersed in information. Participants base their understanding, thinking and analysing on science, local knowledge and Mātauranga Māori. Science and other forms of knowledge should be acknowledged in collaborative work, and according to the literature science-based evidence should inform change requirements. What is achievable from a science perspective must be aligned with farmers' expectations and goals.

Māori are suspicious of collaborative conservation models that offer greater involvement in protection areas, but ignores their land claims or opportunities for development. Māori typically reject biocentrism as an affront to their mana whenua because community processes cannot be disassociated from catchment-scale politics.

Customary water rights and legal considerations are crucial when it comes to Māori and freshwater management planning, the latter being a relatively new area. There is a complex set of Deeds and legal agreements that govern collaborations between Māori and the Crown generally, and in the Waikato specifically. There are three key pieces of legislation relevant to the co-management of the Waikato River Catchment. In the Waikato Region co-management arrangements in the community-based environmental sector include joint management agreements between Iwi and the Waikato Regional Council and District Councils, as well as the establishment of the Waikato River Authority.

Inclusiveness is key to successful collaborations and must include a broad cross-section of stakeholders for reasons of democratic legitimacy and practical considerations related to problem solving and policy implementation. To abide by the law and to improve the effectiveness of their collaborative approach, three “wider community audiences” including dispersed Māori communities were identified in the Healthy Rivers Wai Ora Engagement Strategy of the Waikato Regional Council. This inclusiveness is important, as there is general agreement in the literature that effective collaborative approaches hinge on appropriate institutional arrangements that consider the nature of the problem and the social, economic, and political context and consider all forms of knowledge. Although, this is difficult in practice.

Including Māori in collaborative freshwater management planning in the Waikato is also challenging for practical and logistical reasons as there are many different groups and groupings, some of which have their own arrangements like joint management plans with local authorities and /or their own Iwi Environmental Management Plans. There are also various Māori governance structures like trust boards, Iwi authorities, rūnanga and other entities, such as marae committees and Iwi collectives, who represent the Iwi and hapū for different purposes. Amidst this complex web of social and cultural structures, arrangements and obligations it is challenging to get the “right” Māori representation in collaborative projects.

Māori organisations often have a limited pool of people with sufficient mana, skill and commitment to be involved in strategic development meetings of a collaboration, so there is potential for volunteer fatigue, and that is why Iwi organisations identified capacity building as one of their multiple needs. For Māori, often involvement in community activity is based on cultural obligation and contains the implication of reciprocity. However, if this world view is not held by partners in collaboration, conflicts can occur.

From the analysis in this review it is evident that New Zealand literature and a body of international literature strongly support the eight principles of Ostrom (1990) for Common Pool Resource management, and they could be used as broad guidelines for farmer-led, collaborative, sub-catchment and catchment policy methods and plans in the Waikato Catchment.

Key points

- In New Zealand, there is evidence that collaboration stimulated the development and adoption of new technologies and enabled farmers and other stakeholders to achieve their own goals.
- Farmer-led collaborative projects do not always achieve all the anticipated outcomes but are advantageous.
- Successful collaboration is more likely when farmers ask for and partake in capacity building.
- The review shows collaboration has immediate and long-term benefits.
- The literature is clear that bottom up collaborative environmental projects are better for the environment and the experience and level of commitment of the farmers involved.
- There is common agreement in the literature that farmers’ collaboration with other stakeholders is important in addressing freshwater management in catchments.
- The literature shows farmers world-wide generally value the maintenance of their land resource, the environment and their way of life ahead of profit maximisation.
- There is general agreement in the literature that a consensus decision rule is essential for positive collaboration. From the outset it should be clear who collaborative groups report to, and what decision-making powers a group has. Stakeholder power disparities create issues, so robust engagement frameworks, participatory meeting design and a clear, appropriate decision-making process for the collaboration process are essential.

- Suspicion that one is taking advantage of the other destroys collaborative relationships.
- There is consensus in the literature that collaboration can be a lengthy process and setting time limits is important. Collaboration for environmental purposes can be resilient.
- Nine categories of factors that promote successful collaborations in the New Zealand context were identified: existing relationships; clear, open and frequent communication; shared vision; collective identity and purpose; respect, trust, and honouring diversity; strong leadership; good governance; having the right people involved; and, a favourable climate.
- Local engagement is important because it provides the greatest opportunity for achieving environmental aims and are cost effective.
- Building trust is necessary and requires respect and recognition.
- A holistic, integrated approach that addresses farming systems and the innovation system, is required.
- From the review it is evident that participants need support with a range of skills and resources because working together is difficult.
- Māori are suspicious of collaborative conservation models that ignore their land claims or opportunities for development. Customary water rights and legal considerations are crucial for freshwater management planning and Māori.
- There is a complex set of Deeds and legal agreements that govern collaborations between Māori and the Crown generally, and in the Waikato specifically. Three key pieces of legislation are relevant to the co-management of the Waikato River Catchment.
- Including Māori in collaborative freshwater management planning in the Waikato is challenging. Getting the “right” Māori representation is difficult because of a complex web of social and cultural structures, arrangements and obligations.
- For Māori, often involvement in community activity is based on cultural obligation and contains the implication of reciprocity. Conflict can occur if this is ignored.
- From the analysis in this review it is evident that New Zealand literature and international literature strongly support the eight principles of Ostrom (1990) for Common Pool Resource management, and they could be used as broad guidelines for farmer-led, collaborative, sub-catchment and catchment policy methods and plans in the Waikato Catchment.

1. Introduction

Waikato communities have consistently identified water quality as the top issue for their region. In response Healthy Rivers Wai Ora Plan Change (HRWO) put in place policies to address nitrates, sediment and bacteria (contaminants) entering the Waikato and Waipa Rivers. Developed alongside iwi and key stakeholders, the proposed plan change is one of the largest plan changes of its kind in New Zealand, applying to approximately 10,000 properties and covering a land area of 1.1 million hectares within the Waikato and Waipā river catchments.

Following notification of Proposed Plan Change 1, Pare Hauraki raised concerns with the Waikato Regional Council (WRC / Council) that they had not been consulted within the manner required by the Resource Management Act. Council withdrew part of the proposed plan change on 3 December 2016 for further consultation to take place. Since then, council worked with Pare Hauraki to discuss their concerns and interests in relation to the proposed plan change. The consultation process is now complete, and the consultation together with other considerations led to Variation 1 to Proposed Plan Change.

The Draft Plan Change is now entering a more formal statutory process that includes consideration of evidence from Waikato Regional Council staff and external stakeholders (Hearings). These Hearings will include consideration of a method to enable local farming communities to collaborate in their area to address contaminants entering the rivers and streams. This collective action may include farmer/community driven coordinated on-farm actions (such as riparian management) or off-farm ('edge of field') collective farmer and community action, such as installing wetlands, sediment ponds or bunds at the bottom of streams in their sub-catchments. This non-regulatory method would enable these farmers to complement more directive, regulatory policy methods such as Farm Plans. It is particularly relevant for dry-stock farmers because off-farm sub-catchment methods may be more cost-effective to them, compared to dairy farmers.

This document supports Waikato Regional Council's understanding of the benefits and challenges of farmer-led, collaborative, sub-catchment policy methods and plans in the Waikato Catchment by completing a literature review for use in the consideration of a method to enable local farming communities to collaborate to address non-point pollution of water ways in their area.

2. Purpose of this document

The purpose of this document is to:

1. Provide evidence-based information for the hearings and for the development of an implementation plan;
2. Investigate and document the advantages, challenges and best practice of farmer-led collective action from grey (spelled 'gray' in the USA) and academic literature.

For this literature review grey literature includes reports, magazine articles, web site contents, policy documents, newsletters, technical notes, working papers, and guides. Academic literature includes Doctoral theses/dissertations, published conference proceedings, Journal papers and books.

3. Limitations and definitions

3.1. Limitations

Scholars in the social sciences have only recently begun to deal with the challenges involved in analysing complex systems (Cox, Arnold, & Villamayor Tomás, 2010). The central problem is the large number of relevant variables and their interactions that affect how human systems operate at multiple levels. This complexity increases when social systems interact with natural systems that present similar analytical difficulties (Cox et al., 2010). Communities of users managing common-pool resources such as rivers, lakes, forests or fisheries are excellent examples of this complexity. Although difficult, understanding these situations is important given the increasing impact humans are having on the environment and the important role that communities often play in natural resource management in diverse settings worldwide (Cox et al., 2010).

Catchments are part of a scale continuum: ...plot – paddock – farm – catchment – region - country...; so sub-catchment studies address questions and aggregate effects up to the sub-catchment scale but not beyond (Dodd, Wilcock, & Parminter, 2009). This limitation applies to all scale dependant questions (Dodd et al., 2009). The scope of this report chiefly focuses on the sub-catchment level but also bears the catchment level in mind because the number of publications at the sub-catchment level is scarce. Landscape scale collaborative management is currently reported to be the exception rather than the norm and information on the extent of collaborative action among farmers remains fairly scarce (Asai et al. 2014a, in Jarrett, Morris, Wheeler, and Winter (2015, p. 14). Further, social aspects that are applicable at the catchment level are most probably just as relevant at the sub-catchment level. This report does not claim to have included all the grey literature on the topic because the focus is on New Zealand and therefore excludes material written for developing countries.

In their literature review Dodd et al. (2009) found some catchment research projects focused upon a community (see section on definitions) whereas others focused upon landowners, e.g. farmers. The only projects where the focus is upon communities, they said, seemed to be researcher-driven projects (e.g. Motueka). The projects that were not researcher-driven (e.g. Upper Waipa) seemed to focus upon landowners. This suggested an institutional barrier limiting policy agencies from involving whole communities (Dodd et al., 2009). This literature review does not differentiate between types of communities and/or sub-communities or land-owners because it focuses on farmer-led initiatives that include other community members and stakeholders. Exclusiveness leads to poor outcomes and is non-participatory.

This review does not repeat other literature reviews but makes use of and builds upon them, for example Cox et al. (2010), Jarrett et al. (2015), Allen and Clarke Policy and Regulatory Specialist Limited (2010) and Coudel, Tonneau, and Rey-Valette (2011).

New Zealand has come a long way since the early 2000's in terms of farmers' participation and involvement in policy setting. For example, Mackenzie and Harcombe (2011) discuss the "clear recognition that the adversarial nature of the Resource Management Act is not leading to good environmental outcomes. Collaboration over matters relating to the functions and duties of regional and local councils under the Resource Management Act is a concept which is beginning to gain momentum in New Zealand". Collaboration, Mackenzie and Harcombe (2011) said, "is an important tool for ensuring community involvement in decision-making leading to successful outcomes, particularly in rural New Zealand". There were advocates for collaboration decades ago, and Hobbs

(2000) reported on the adversarial situation between the Council and farmers in the Hurunui back then. Because we know the situation was uncollaborative, this report does not include New Zealand material prior to 2000.

The last 20 years have witnessed different forms of collaborative relationships that have been theorised, for example, in terms of innovation systems, innovation networks, and innovation clusters (Morrar, 2015, p. 25). This review does not use a single lens but is rather an inter-disciplinary overview covering different perspectives. It is therefore “an amalgamation of perspectives and analytics” (Carolan, 2006) using multiple disciplinary perspectives including, public administration (Eppel, 2013), learning (Coudel et al., 2011), knowledge (Šumane et al., 2017), extension (Pannell et al., 2006), culture (Burton & Paragahawewa, 2011), system innovation (Hoes, Beers, & van Mierlo, 2016), co-innovation or innovation networks (Pinxterhuis et al., 2018), systems thinking and action learning (Allen et al., 2011), and human geography (Fielke, Nelson, et al., 2017).

3.2. Definitions

Community The consensus within the literature seems to be that there is no “all-purpose” definition of community (Poland & Maré, 2005). However, “there are two main types of communities: interest communities and geographic communities. Interest communities do not usually have a spatial base but are connected through a common interest” (Poland & Maré, 2005). An example of a community of interest is a community of practice, which generally refers to groups of people who share a concern for a common practice (or management activity), and who, through building relationships, learn from each other to improve their practice (Brown & Duguid 1991, cited in Allen et al. (2011). In this sense communities of practice can be science disciplines, agency departments, or a farming community. But, farming community can also be defined as a community of place and interest (Cullen, 2010). This report does neither focus on interest, nor on geographic communities. Hence, for the purpose of this review farmers that are active in farmer-led environmental projects are not viewed from a community type perspective.

Collaboration The literature uses different terms to describe how people work together. There are seemingly “101 definitions of collaboration” (Eppel, 2013, p. 27). In this review collaboration and its related terms were strongly guided by Jarrett et al. (2015) and NZ Landcare Trust (2012b, p. 47) as well as Coombes (2007), Memon and Weber (2008), Allen et al. (2011) and Cradock-Henry, Greenhalgh, Brown, and Sinner (2017).

In the context of collaboration, scale as defined by ecology or aesthetics is less important than the appropriate scale for farmers’ collaboration, which may be determined more by economic and social factors than ecological or cultural ones (Jarrett et al., 2015, p. 6). Collaboration and cooperation have almost identical dictionary meanings and it “was used interchangeably in early scholarship” (Eppel, 2013, p. 7), but later scholars also do it, for example Jarrett et al. (2015) in their literature review. There is, however, a tendency for “collaboration” to be used in the context of studies that focus on environmental activities, whilst the term *cooperation* tends to be used in *economic contexts* and particularly *in the specific sense of formal cooperative organisations*, such as agricultural marketing cooperatives (Jarrett et al., 2015, p. 7). This review also makes this distinction.

The concept of collaboration is not new for New Zealand (NZ Landcare Trust, 2012b, p. 46). For example, at an overarching level the Treaty of Waitangi recognises this principle, while at the grassroots, groups have been taking a lead and making a difference in local issues for many years (p.46). Collaboration in its simplest definition is working together to achieve a common purpose, and it forms to enhance the quantity, quality, accessibility and cost effectiveness of services, and reduce gaps and overlaps in provision of services (Allen and Clarke Policy and Regulatory Specialist Limited,

2010, p. 8). “Collaboration means to co-labour, to co-operate to achieve common goals, working across boundaries in multisector relationships” (Eppel, 2013). Collaboration is not only applied, or seen in formal processes and agreements that exist between organisations, but includes the less formal collaborative process where a group of stakeholders will move through a series of steps including informing themselves, finding common ground, debating possible solutions and seeking a consensus resolution (NZ Landcare Trust, 2012b, p. 47)¹. This review also takes that view.

At the international level Jarrett et al. (2015, p. 8) have illustrated different views of collaboration in the context of top down and bottom-up approaches (see figure 1). Against the background of this literature review top-down would mean Council initiate, lead and control a catchment project, while bottom-up means a farmer-led collaborative approach. That is where this literature is situated. However, the review does not completely exclude other types of projects.

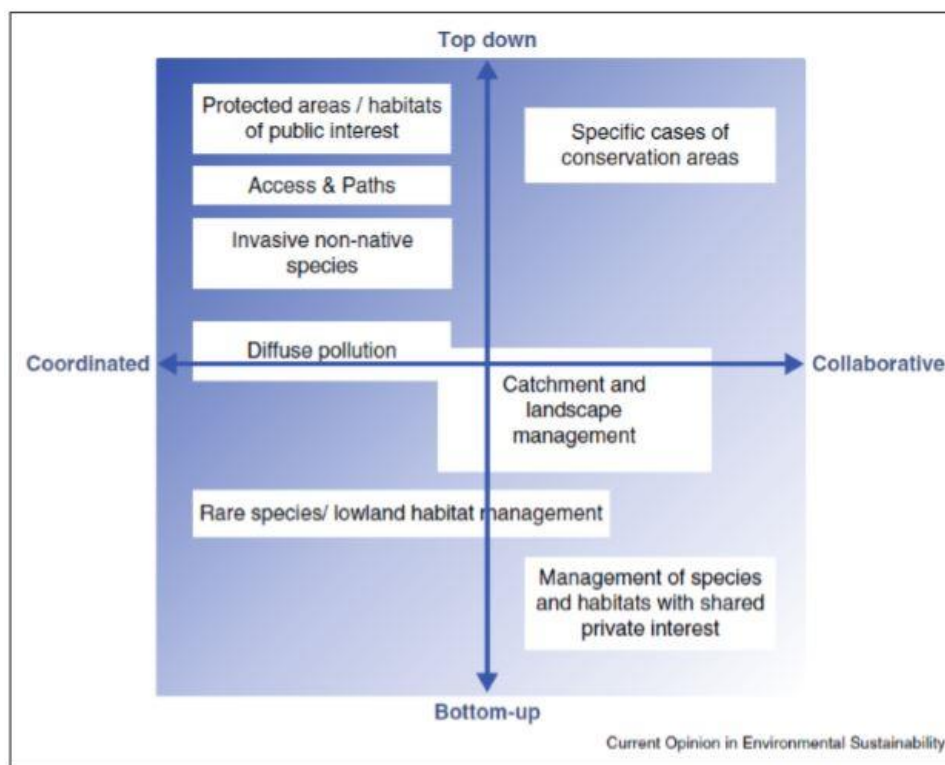


Figure 1: The coordination-collaboration spectrum, integrating a top-down – bottom-up spectrum. Note: Dark blue depicts the influence of EU policy and agri-environmental schemes; light blue depicts the influence of local and regional schemes. Source: Prager (2015, p.60), from (Jarrett et al., 2015, p. 12).

Mandate and legitimacy The terms mandate and legitimate have been loosely applied in the literature reviewed. In this review the term mandate is “the authority given to act in a certain way” and it signifies “the authority to speak for or on behalf of a group of stakeholders”. Further, in this review the term legitimate means “having a (mandated) sphere of influence”.

¹ NZ Landcare Trust (2012b, p. 47) also uses more specific terms related to collaboration which this review does not use. It says: “Collaborative management has a management objective. The group is collectively empowered to make management decisions about the catchment. Collaborative governance assumes an official mandate where the group is empowered to make policy decisions about the catchment under consideration. A collaborative forum is the entity that the collaborating groups form.”

Institutions The common usage of the term institutions pertains to an organisational entity such as a family, a firm or a government department. In a sociological sense however, it means a rule, norm, or custom simultaneously enabling and constraining human agency. Agency refers to a relationship in which a “principal” delegates authority to an “agent” to perform (Kiser, 1999). The term institution encompasses formal rules (such as statutory prescriptions) and informal norms, roles and operating practices that are so stable, structured and accepted that they can said to be “institutionalised” (Memon & Weber, 2008).

Integrated catchment management is a process that recognises the catchment as the appropriate organising unit for understanding and managing ecosystem processes in a context that includes social, economic and political considerations, and guides communities towards an agreed vision of sustainable natural resource management in their catchment (Fenemor et al., 2011, p. 314). The practice of running an Integrated Catchment Management initiative goes beyond the already significant task of enabling cross-disciplinary collaboration, to managing an array of social processes, such as public participation and engagement, multi-stakeholder inquiry, and conflict management (Kilvington, Allen, & Fenemor, 2011, p. 542).

Social innovations are changes of attitudes, behaviour or perceptions of a group of people joined in a network of aligned interests that, in relation to the group’s horizon of experiences, lead to new and improved ways of collaborative action within the group and beyond (Neumeier, 2016).

Innovation, co-innovation and innovation networks Innovation is a process of negotiation between stakeholders (Fielke, Kaye-Blake, Smith, & Vibart, 2017). Co-innovation involves the negotiation of concerns among stakeholders leading to collaboratively-agreed transition pathways toward future resource organisation (Fielke, Kaye-Blake, et al., 2017). Co-innovation goes beyond participatory and transdisciplinary research in the form of doing joint experiments but is aimed at supporting broader changes in farming systems, sectors, territories and value chains (N. Botha, Turner, Fielke, & Klerkx, 2017). The practical application of a co-innovation approach includes active cooperation and coordination by all participants (Pinxterhuis et al., 2018, p. 24).

From a range of published papers, Rijswijk and Brazendale (2017, p. 247) summarised innovation networks’ characteristics and functions as follows: “An innovation network usually involves a diverse group of actors, relevant to a particular problem. Innovation networks are particularly useful in agriculture, as the problems tend to be complex. They involve different biophysical, socioeconomic and political factors, and concern various formal and informal institutions. Innovation networks can take place at different levels, for example, local, regional or national, or within a certain sector. The actors voluntarily contribute tangible, human, structural, or relational resources to jointly develop or improve a social or economic process or product. The network itself often has a non-hierarchical structure, a collaboration-based culture, consensus-based coordination (because members are free to leave the network at any time), usually no legal personality (especially in their early stages), and often relatively fuzzy objectives (such as improving the management of natural resources)”.

4. Methodology

4.1. Guiding questions

The literature review focused on four questions:

1. What are the benefits that participants in these processes have found? This may include a description of the benefits to non-farming participants in these processes.
2. What are the benefits of non-regulatory collaborative local action by farmers?

3. What common challenges are encountered by farmers?

4. What are the features of these collaborative processes that make them work best for farmers?

4.2. Locating and identifying relevant material

The review and summary of research and other published material related to non-regulatory collaborative local action by farmers had two major stages.

First, all the material that could be identified through internet searches, contacting researchers and practitioners interested in the topic, and searching ResearchGate's database as well as the author's endnote database containing over 2,000 entries, was screened and categorised into grey and academic material. Bibliographic references in each document was also searched and obtained where relevant. The scope of the search chiefly included the agricultural, social science, policy and public affairs domains. All the material was screened and 110 titles that met the research criteria remained.

4.3. Analysis, synthesis and reporting

The second stage consisted of analysing and synthesising the material and reporting. This followed a two-stage process. First, the grey material was analysed, and findings and insights reported in a draft report to Waikato Regional Council on 21 March 2019. The draft report was discussed with Waikato Regional Council to inform stage 2, the analysis, synthesis and writing a draft report on the academic material. Then, the findings of the grey and academic material were blended together into a combined report. In conclusion, the internationally accepted rules for the successful governance of Common Pool Resources of Ostrom (1990) (as summarised by Mills et al. 2012, p.17, and quoted by Jarrett et al. (2015, p. 12) in appendix 1, were used to compare and contrast the findings of this literature review against.

Feedback from Waikato Regional Council on the two draft reports was incorporated in the final report.

5. Findings – grey literature

Answers to the four guiding questions are generally discussed under a particular heading but could be mentioned under one or more headings. For example, a benefit may be described as a benefit, or as a feature that makes it worthwhile for farmers, but which falls under another heading. Moreover, when the benefit is absent it could also be viewed as a challenge and described under that heading.

5.1. Benefits to participants

This section answers the first guiding question: What are the benefits that participants in these processes have found?

Social capital strengthening In their literature review of UK and European literature, Jarrett et al. (2015, p. 18) indicated social benefits can arise from working together and these benefits are “principally related to the enhancement of social capital through strengthening social ties and networks and facilitating mutual learning between farmers”. There are New Zealand examples of this. The Sustainable Farming Fund for example, is built upon the notion of collaboration and bottom-up action and has enabled the building of relationships and networks between the farming community, science and industry (Oakden, King, & Allen, 2014, pp. 35, 46). Through collaboration, farming communities have become aware of feasible approaches to farming practice that harnessed resources for optimal production whilst protecting the environment (Oakden et al., 2014, p. 30).

Farmers' social capital was enhanced as they "...learned to accommodate the needs of other stakeholders and regulators, and to safeguard their industries for the longer term" (p.30). Oakden et al. (2014) also found evidence of farmers "developing transferable skills in project management, proposal development, project administration, and operational and financial management" (p.30).

Development and adoption of new technologies Oakden et al. (2014, p. 31) reported increased development and adoption of new technology due to Sustainable Farming Fund project collaboration. When farmers have the opportunity to develop solutions alongside scientists and industry, they can, "through trial and reflection embed improved practice in their communities", and "...resulting change may appear to be slow, (but) these on-the-ground projects do actually achieve voluntary change" (p.31). Oakden et al. (2014, pp. 32, 33) describe how "...technology transfer occurs at a number of different levels in the Top of the South case study: Setting an example for sustainable water quality." Collaborating with scientists and other stakeholders provide farmers with an opportunity to achieve their own goals.

Goal achievement Farmers get support in achieving their own production and environmental goals when they collaborate in projects (Red Meat Profit Partnership, 2018) (Bay of Plenty Regional Council, 2019). For example, since 2001 farmers at Lake Rerewhakaaitu have invited AgResearch and the fertiliser companies to work with both them and Bay of Plenty Regional Council to provide ways in which they could take corrective action to protect the lake (Parminter, Barrett-Ohia, & Wilson, 2007). In the Waikato, for example, farmers collaborated with DairyNZ, AgResearch, Ballance Agrinutrients and the Waikato Regional Council, to put together a research proposal to the Sustainable Farming Fund (Rural Delivery & DairyNZ, 2018). This farmer-led project involved a number of farms on consolidated peat that had been developed for over 40 years and helped farmers to achieve their goals of farming more sustainably. For example, practical guidelines for assessing the risk status of peat paddocks have been developed, allowing farmers to categorise their farms' soils and identify safer sites for irrigation of effluent (Rural Delivery & DairyNZ, 2018). The project is a good example of how, with a bit of outside technical help and facilitation, farmers can collaborate to solve local problems (Rural Delivery & DairyNZ, 2018).

Opportunities emerge and can be taken Not only farmers benefit from collaboration, but councils and other stakeholders benefit as well. For example, in the Healthy Rivers Wai Ora project in the Waikato, many new opportunities were realised by Waikato Regional Council (Wendy Boyce Consulting, 2015, p. 27). Examples are catchment staff who proactively supported the dissemination of information through their sub-committees, and extension staff began leading some community engagement events.

When farmers collaborate with councils they get the opportunity to take the lead in protecting the environment like lakes, rivers and streams (Bay of Plenty Regional Council, 2019). For example, the Waitangi River catchment project was conceived in 2009 when several local farmers gathered to discuss growing concerns around water quality in the Bay of Islands. These farmers realised that the farming community needed to be more proactive in land and water management and they resolved to make a start in the Waitangi River catchment (NZ Landcare Trust, 2014, p. 8). Another example is the Aorere Catchment project - in 2010 farmers were asked whether they thought the Aorere Catchment Project had been useful and why and they all reported that the project had been useful because it helped farmers to be proactive, the local regional council had been easier to deal with because of this open group, and farmers were more willing to share information" (NZ Landcare Trust, 2012a, p. 9).

Environmental problems at the catchment and sub-catchment levels are complex, and through collaboration participants (can) together develop creative solutions for these complex problems (Newman, 2016).

In catchment or sub-catchment projects that involve farmer-led research, farmers get the opportunity to collect data for their own farms while collaborating with scientists and other farmers (Fioret, Johnson, Lam, Thompson, & Hargreaves, 2018). In the USA, farmer-led research often led to action and innovation, the approach built local capacity, and supported livelihoods including productivity, nutrition, and household income (Fioret et al., 2018). In New Zealand Newman (2016) has reported the development of personal capacity development (knowledge and skills) that can be applied elsewhere.

In New Zealand it was reported that collaboration provides farmers with the opportunity to share their data collectively for the greater good (Taylor, 2017) (Deavoll, 2017) and they also have the opportunity to compare themselves with other farmers in the same or farther away locations (Bay of Plenty Regional Council, 2019).

Not only do farmers get the opportunity to commit to something “bigger than themselves” when they collaborate (Bay of Plenty Regional Council, 2019), but, with reference to the Hurunui, Deavoll (2017) indicates farmers also take the opportunity to show they are good stewards of the land. By belonging to the group in the Hurunui, and abiding by its requirements farmers also showed their “willingness to do their bit to protect and enhance their water quality and environment” (Taylor, 2017). It is not to say that all farmers who collaborate agree that they contribute to the greater good. For example, in their analysis of the Sustainable Land Use Initiative and Dairy Environmental (Nutrient) Plans as implemented by Horizons Regional Council, as part of the One Plan, Brown et al. (2016) reported some farmers did not explicitly agree that their land management decisions contributed to and were partly responsible for the public good (Horizons Regional Council, 2016, p. 36).

As a group, farmers get opportunities to access resources (Bay of Plenty Regional Council, 2019). For example, an evaluation of the Rai project conducted in 2012 showed it was successful over time in engaging farmers in actions to improve water quality, and it also showed large local support for the project. Moreover, a successful funding bid to the Sustainable Farming Fund was obtained for the Rai to continue working with landowners in the Rai-Pelorus, Linkwater and Kaituna Communities (NZ Landcare Trust, 2012a, p. 12). The opportunity and ability to attract other sources of funding has also been reported by Newman (2016).

At a broader level the Sustainable Farming Fund contributed to encouraging farmer, grower, forester and aqua-culturalist-led projects to partner innovative approaches to environmental challenges (Oakden et al., 2014, p. 22). Collaboration also provided farmers with the opportunity to get a united voice (Deavoll, 2017) which may facilitate access to resources.

Collaboration gives farmers the chance to offer alternative solutions, for example through the zone committee process in Canterbury (Taylor, 2017).

Collaboration provides the opportunity to avoid conflict. For example, in 2010 farmers were asked whether they thought the Aorere Catchment Project had been useful and why. All respondents reported that the project had been useful and among others the following reason was mentioned: “if the project had not happened, the mussel industry would have taken farmers to court; so we avoided legal action and increased environmental performance” (NZ Landcare Trust, 2012a, p. 9). It

is the opportunity to dialogue where perspectives differ (Tikkisetty & McLay, 2011, p. 1) that can help to avoid or resolve conflict.

Conflict is a real issue when farmers are not invited to or choose not to collaborate in catchment or sub-catchment environmental projects. For example, the Banks Peninsula landscape case is a classic example where a plan was developed which imposed strict rules on landowners and established detailed maps without the consultation of landowners. A ten-year long argument developed which was undertaken in an adversarial Environment Court setting. In the Hurunui district there was a strong emphasis on consultant driven policy development throughout the development of the planning provisions with very little local landowner input. Landowners felt they needed to fight for their private property rights when the council announced its Significant Natural Area and landscape provisions” (Mackenzie & Harcombe, 2011).

Conflict, however, is associated with collaboration and one of the challenges farmers have to deal with. This is discussed in section 5.3.

Farmer-led collaborative projects do not always achieve all the anticipated outcomes. For example, although the Sustainable Farming Fund made an important contribution to improving environmental practice in the Aorere Catchment, a catchment dairy farm survey has shown that it is still not enough to completely solve environmental challenges such as stopping faecal spikes occurring. The reason is that it is challenging to achieve the required changes and impacts on the environment (Oakden et al., 2014, p. 38). It is clear however that farmer-led collaborative projects can develop a clear understanding of what farmers can do to improve water quality (NZ Landcare Trust, 2012a, p. 8).

SYNOPSIS of the benefits that participants in collaborative processes have found. In the UK and in New Zealand participants’ social capital was strengthened (Jarrett et al., 2015) (Oakden et al., 2014) and in New Zealand there is evidence that new technologies were developed and adopted (Oakden et al., 2014). Collaboration has also helped New Zealand farmers and other stakeholders to achieve their own goals (Red Meat Profit Partnership, 2018) (Bay of Plenty Regional Council, 2019) (Parminter et al., 2007) (Rural Delivery & DairyNZ, 2018). New opportunities also emerge and can be taken, for example in the Waikato for the Waikato Regional Council (Wendy Boyce Consulting, 2015) and Bay of Islands for farmers (NZ Landcare Trust, 2012a). There are several opportunities for stakeholders that emerge when they collaborate, for example farmers can share and compare data (Deavoll, 2017), show they are good stewards of the land (Bay of Plenty Regional Council, 2019), are willing to “to do their bit” (Taylor, 2017), and they can get access to resources otherwise hard to obtain (Newman, 2016). There is also the opportunity to resolve conflict (Tikkisetty & McLay, 2011). It is noted that farmer-led collaborative projects do not always achieve all the anticipated outcomes (Oakden et al., 2014), but it is clear that they can develop a clear understanding of what farmers can do to improve water quality (NZ Landcare Trust, 2012a).

5.2. Benefits generally

This section answers the second guiding question of this literature review: What are the benefits of non-regulatory collaborative local action by farmers?

NZ Landcare Trust (2012b, p. 14) listed the added benefits of a community ownership approach (Box 1).

Added benefits of a community ownership approach (from NZ Landcare Trust (2012b, p. 14)

- Ability for peers to get together and share ideas. (‘Farmers are innovative experts.’)

- Diversifying skills and achieving synergistic benefits through bringing in other stakeholders
- Supporting each other long-term through a long journey
- Gaining widespread sustained change
- Building social capital and a sense of community (Sense of community is a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together (Gillespie, 2016, p. 14))
- Chance to attract external funding to bring in independent experts for project support or technical advice. Working alone makes funding harder.
- Opportunity to collectively establish a vision and 'buy in' for the environmental goal.
- Creating a coordinated point of call for communications with the farming community.

The following discussion acknowledges this list and adds to it from other sources. In this section general benefits of community-led projects are viewed as the knock-on effects of collaboration, i.e. benefits additional to what collaborative efforts set out to achieve.

Social benefits that farmers get from collaborating have knock-on effects (Jarrett et al., 2015, p. 19) in themselves. In New Zealand, for example it was shown that Sustainable Farming Fund projects contributed to the "development of a number of community groups that have continued beyond the life of the projects" (Oakden et al., 2014, p. 30). Additionally, these projects also contributed to better environmental standards being incorporated in industry-level systems, and influenced Council as well as Government policies (Oakden et al., 2014, p. 36).

When farmers contribute information, councils can use that information for marketing and to engage positively with urban communities, government, regulatory organisations and NGOs (Deavoll, 2017).

In the Waikato, Waikato Regional Council Care groups have taken a cooperative approach to encouraging better environmental practices for over two decades, which helped to build a stronger sense of community, and also improved communication between agencies and communities. This created the potential for new issues to be introduced and discussed, with reference to local conditions (Tikkisetty & McLay, 2011, p. 1).

When farmers have to deal with government and scientists directly they find it difficult (Taylor, 2017) but, when they work as part of a group, councils can help them with this task (Newman, 2016). For example, in the Motueka Integrated Catchment Management project council has helped identify the major resource management issues, and was the link between scientists and people in the community (Fenemor & Bowden, 2001). Very soon after it started, because it linked with Council's own environmental investigations programmes, the Motueka Integrated Catchment Management programme provided all stakeholders with a better idea of the causes and solutions for some of the environmental issues arising in this catchment (Fenemor & Bowden, 2001). In the Waikato, Waikato Regional Council Care Groups appreciate the material assistance, facilitation and technical advice they receive from the council and other agencies, and also the relationship that is built up over time. They gain a lot from the networking opportunities provided for Care Groups to interact (Tikkisetty & McLay, 2011, p. 2). Community-led conservation projects can hugely benefit from in-kind support like advice because of capability issues (Hungerford, 2017).

Through collaboration farmers can find compromises to environmental regulations that meet the needs of all parties – and the environment (Taylor, 2017).

Another knock-on effect is when the wider community takes ownership of solutions (Newman, 2016), become involved and develop a sense of pride in the environment (Loney, 2018a).

When farmers lead research, public research funding is spent on real on-farm problems, brings accountability, and boosts innovation (MacMillan, 2018)

Collaboration can improve the environment and sustainability (Brown et al., 2016). With respect to the Sustainable Land Use Initiative, farmer participants and non-participants in the catchment had a strong perception that it had a major impact on environmental and economic sustainability. Moreover, farmers said the Sustainable Land Use Initiative made an important contribution to resilience, both on-farm and in the community (Horizons Regional Council, 2016, p. 36).

Bottom-up initiatives that are self-regulating and motivating can reduce monitoring and enforcement costs (Jarrett et al., 2015, p. 15).

The underlying community-led philosophy of the Aorere Catchment Project has been vital in its success in resolving waterway issues (Robertson, 2011, p. 84). An evaluation of the Aorere/Rai projects, has shown that information exchange between landowners and councils was a success, alongside the raising of awareness within the dairy community about the seriousness of the issue (NZ Landcare Trust, 2012a, p. 17). Other knock-on effects of the Aorere/Rai projects, were their impact on stakeholder organisations as it allowed the stakeholders to assist farmers in a mutually trusting way, rather than just being able to criticise and regulate. Moreover, the improved land management techniques benefited the relationships between landowners and shellfish farmers, as well as recreational users of the river and regulatory bodies such as local and central government (NZ Landcare Trust, 2012a, p. 17). Many stakeholders noted that the project was especially beneficial to their organisation as it allowed the stakeholders to assist farmers in a mutually trusting way, rather than just being able to criticise and regulate. General comments about the project by the stakeholders applauded the collaborative approach to responsible land management”.

In conclusion to this section the following comment by Jarrett et al. (2015, p. 3) is pertinent. “The literature is clear that bottom up approaches to collaborative environmental action have been shown to work best in most situations (better for the environment and better for the experience and level of commitment of the farmers involved). However, some situations are better suited to a coordinated (i.e. relatively more top down) as distinct from a collaborative (i.e. relatively more bottom up) approach, particularly in instances where the public benefit of actions clearly outweighs the private benefits. In a UK context, where farmers are accustomed to a top-down approach to on-farm environmental action, there may be challenges involved in fostering a more cooperative ethos or spirit with respect to delivering environmental benefits, even if the majority of farmers are accustomed to cooperating with respect to other aspects of their business”. In a community development context Isidiho and Sabran (2016, p. 268) argue for a top-down approach for “more scientific and innovative technological developments” because it has proved to be more “successful and goal-realizable” when local communities “have not been exposed to such innovations and technologies”. However, they point out, the bottom up “approach is not a complete turnaround on the top-down approach, but a way of making amends and increasing the gains of people’s active participation in the affairs of their life and well-being”. They further argue for a “mixed approach” which allows for side-by-side uses of the two approaches as “in community development top-down and bottom-up approaches are interwoven as there is no one that is perfect and encompasses

developmental projects” (Isidiho & Sabran, 2016, pp. 271-272). In the context of this literature review it means where a single science answer is required a top-down approach is useful so that scientists can do their experiments independently and bring a solution, and where people’s lives and well-being are concerned, like in common pool resource management, the bottom-up approach is useful and scientists can collaborate as stakeholders.

SYNOPSIS of the benefits of non-regulatory collaborative local action by farmers. There is a list of social benefits to a farmer community ownership approach (NZ Landcare Trust, 2012b). These social effects have knock-on effects (Jarrett et al., 2015) for example community groups that develop and continue beyond the life of the original project, improved environmental standards being incorporated in industry-level systems, and influences on Council as well as Government policies (Oakden et al., 2014). It can be hard for farmers to deal with other stakeholders directly (Taylor, 2017) but as a group they can be assisted with this task by Councils (Newman, 2016), like in the Motueka Integrated Catchment Management project (Fenemor & Bowden, 2001) and the Waikato in Waikato Regional Council Care Groups (Tikkisetty & McLay, 2011). Farmers can find compromises to environmental regulations (Taylor, 2017) and the wider community takes ownership of solutions (Newman, 2016), become involved and develop a sense of pride in the environment (Loney, 2018a). Sustainability can be improved (Brown et al., 2016), on-farm and community resilience can improve (Horizons Regional Council, 2016, p. 36) and monitoring and enforcement costs can be reduced (Jarrett et al., 2015). The underlying philosophy of a project can influence its success (Robertson, 2011) like building trust, and avoiding conflict and regulating (NZ Landcare Trust, 2012a). The literature is clear that “bottom up approaches to collaborative environmental action have been shown to work best in most situations (better for the environment and better for the experience and level of commitment of the farmers involved)” (Jarrett et al., 2015, p. 3).

5.3. Challenges for farmers

This section answers the third guiding question of this literature review: What common challenges are encountered by farmers?

Motivation (why me?) Community conservation initiatives commonly stem from personal connections to, and visions for, local areas and wildlife values (Predator Free Hauraki Coromandel Community Trust, 2018). Community conservation groups are driven by passionate people who provide an array of skills and inputs to enhance native biodiversity and social values in and around the places they live (Predator Free Hauraki Coromandel Community Trust, 2018). From their literature review of UK and European literature Jarrett et al. (2015, p. 15) concluded that, collectively, there had to be a strong social network that would reward farmers who took personal responsibility for the effects of farming on their local environment and recognised their efforts when they made positive changes. In New Zealand, Parminter et al. (2007, p. 31) and C. A. J. Botha, Parminter, and Bewsell (2008, p. 29) reported farmers not feeling personally responsible for protecting a lake as a potential issue. This was described by Nelson et al. (2003): “The farmers around Lake Rerewhakaaitu were open to potential solutions for a water quality problem once they had assumed a level of personal responsibility for having contributed to creating the issue in the first place. Not everyone will be motivated. In Sustainable Land Use Initiative, for example, there remained a lack of agreement among many farmers that environmental initiatives (and Whole Farm Plans) are integral to their long-term profitability and well-being (Brown et al., 2016) (Horizons Regional Council, 2016, p. 36). Building a sense of personal involvement in an issue should be the first step in any strategy for voluntary change in environmental practices (Nelson et al., 2003).

Practical without red-tape (It is too cumbersome) Bureaucratic processes can be an issue to participants (Jarrett et al., 2015, p. 32). Perkins (2016) and Waikato Regional Council (2016, p. 26) mentioned the need for practical initiatives that avoid “red-tape” and balance solutions with farming systems, all of which challenge farmers. An example is the duplication in paperwork required for compliance (Waugh, 2011). Participants not understanding regulations, which might appear as “chaos” to them can be an issue as well (Deavoll, 2017). Simple administrative procedures are much sought after (Connolly, 2018, pp. 50, 51).

Funding and costs (I can't afford it) Participation in community conservation is rising but community-led conservation projects are generally underfunded (M. A. Brown, 2018). In the Waikato, co-funding biodiversity projects worked well (Waikato Regional Council, 2016, p. 41) although compliance costs is an issue for participants (Waikato Regional Council, 2016, p. 25). Farmers are (usually) happy to co-fund projects, but up to a point (Stowell, 2019). In Rerewhakaaitu, farmers described the benefits from nutrient budgeting at both an individual and community level. For individuals, there had to be clear financial advantages from using a nutrient budget (Parminter et al., 2007, p. 30). The costs to catchment communities of encouraging land use change can be considerable, but are seldom fully assessed (e.g. school closures as populations move away) (Dodd et al., 2009). Given this financial imperative, collaboration for environmental purposes is likely to require either a clear private benefit, or incentivisation through payments. The costs involved in participating in collaborative schemes for public benefit (e.g. application costs, transaction costs for meetings and negotiation) may also need to be recompensed (Jarrett et al., 2015, p. 48). Financial incentives can bolster support, and collaboration. For example, the financial incentives attached to the Sustainable Land Use Initiative and the funding of Dairy Nutrient Plans were accepted by farmers as powerful inducements or even as necessary conditions for their support (Horizons Regional Council, 2016, p. 36). Funding support entices participation. For example, the Sustainable Farming Fund is a popular fund that is significantly over-subscribed each year, and is seen as a fund that originates from the grass roots and motivates farmers to get things done (Oakden et al., 2014, p. 45). Individual farmers struggle to attract financial support, should they be inclined to ask. But in groups it is easier, for example in the Waikato, Waikato Regional Council Collaborative Stakeholder Groups have mobilised a wide range of funding and support. Mostly, they have been able to access the project funding they require and cover their out-of-pocket administration expenses (Tikkisetty & McLay, 2011, p. 2). But not all costs have been covered and participants need support for project maintenance and time spent in coordination and administration (Tikkisetty & McLay, 2011, p. 2). In community-led conservation projects the struggle to find adequate resources including funding for maintenance and coordination has been well documented (Hungerford, 2017) (M. A. Brown, 2018) (Predator Free Hauraki Coromandel Community Trust, 2018) (Peters, 2018).

Drawn out time frames (It takes too long) *Time to get going and have an impact:* The establishment of a successful collaboration group takes time, because building trust and group cohesion can be a slow process (Jarrett et al., 2015, p. 56). It may take 10 years for a group to reach a maturity level where real benefits are delivered, hence, where possible, the use of existing groups and networks to implement collaborative environmental management activities may, therefore, be beneficial (Mills et al., 2011).

Collaborative processes can often take a long time to achieve successful outcomes (Mackenzie & Harcombe, 2011) (Jarrett et al., 2015, p. 56) (Steel, 2018) (Newman, 2016). What farmers do today may and probably will take a long time to “work” (Loney, 2018a) (Loney, 2018b). Time lags may also be problematic in sustaining the long-term engagement of farmers in collaborative schemes, as the literature has shown that clear, tangible benefits of environmental actions are an important

motivational factor for farmer participation” (Jarrett et al., 2015, p. 2). Dealing with emergent properties in the farming system can be an issue, that is, dealing with a priority area (e.g. sediment) while a secondary issue (e.g. nutrients) emerges. Moreover, only dealing with the most pressing issues first and then moving on to secondary and tertiary issues could later be viewed as “moving the goalposts” and unconvincing (Connolly, 2018, p. 37). It is important to get quick wins² when time frames are drawn out, for example addressing stock crossings which followed by other environmental practices.

Times lags are variable A major understanding that has arisen from catchment-scale research is the appreciation of variable time lags in the responses of environmental indicators to management changes. This appreciation must also be set alongside the realisation that the on-ground application of systems and practices targeted at improving sustainable land management also incorporates time lags (Dodd et al., 2009, p. 18). Although some actions may have a relatively quick impact on environmental systems, the benefits of others may take several years which creates challenges for monitoring and assessing land management measures (Jarrett et al., 2015, p. 2) (Dodd et al., 2009, p. 18).

Setting time limits is important Collaborative processes take time, but it is important that there are time constraints. Issues must be resolved before the process exhausts patience or the scope and dimension of the issues change. Effective collaboration therefore follows good strategic practice, sets clear objectives, and builds in agreed targets for reaching milestones (NZ Landcare Trust, 2012b, p. 52).

There are many time related challenges, but *environmental collaboration can be resilient*. A further temporal dimension in the literature is the resilience of non-UK based forms of environmental collaboration, suggesting that collaborative environmental initiatives can be sustained over long periods (Jarrett et al., 2015, p. 2).

Dealing with conflict (It's too hard) Despite the benefits of participation, collaborative approaches can raise a number of issues, particularly with regard to self-regulation by farmer groups (Jarrett et al., 2015, p. 34). For example, managing ‘difficult’ behaviour when collaborating can be an issue (Ministry for the Environment, 2015, p. 12). Another example is farmers dealing with other farmers who breach rules but are part of their voluntary group, which makes dealing with conflict over time important (Connolly, 2018, p. 62).

Cultural clashes (It's too different) Collaborating with stakeholders is inevitable and it is at the stakeholder interfaces (when stakeholders meet) where different cultural, i.e., “how we work” issues become apparent. The tension that the differences in “how we work” are not only true for farmers but also for Council staff, who may not understand these interfaces (Wendy Boyce Consulting, 2015, p. 27). Another example is non-researcher participants who often are unaware of the environment in which science operates and need to appreciate aspects of this environment to ensure their expectations are realistic. Conversely researcher participants need to appreciate that there are other ways of gaining, and sources of, knowledge (Dodd et al., 2009, p. 6).

Role confusion (Who am I representing?) Not knowing which hat to wear during collaboration is a common issue in collaborative arrangements (Ministry for the Environment, 2015, p. 9). What happens when roles are unclear have been described as multiple meetings, each involving different

² A quick win is an improvement that is visible, has immediate benefit, and can be delivered quickly after the project begins. The quick win does not have to be profound or have a long-term impact, but needs to be something that many stakeholders agree is a good thing (Parker, 2013).

roles, that result in divergent directions (Wendy Boyce Consulting, 2015, p. 26). That is why good meeting culture and role clarity is essential in collaborative processes to keep on track and reduce iterations (Wendy Boyce Consulting, 2015, p. 26). Roles should be clear because role confusion slows collaborative processes, to the expense of farmers, and other stakeholders, that dedicate considerable time and other resources to participation (Newman, 2016).

Agenda setting and decision-making (Whose knowledge and issues count and who decides?)

When cooperating for environmental benefits, a mutual understanding of the need for collective action to solve a problem, and of the benefits and risks involved, is also important, yet often lacking (Jarrett et al., 2015, p. 50). A local example is the “...challenge...of allowing the Catchment Stakeholder Group to shape its own agenda, while keeping enough structure and coherence in the process and allowing for prior preparation of inputs from technical, policy and other workstreams” (Wendy Boyce Consulting, 2015, p. 23).

Knowing and understanding their own decision-making powers as a group is crucial (Newman, 2016). That is because how to make decisions in the collaborative group to reach an outcome could create issues (Ministry for the Environment, 2015, p. 14). It should be clear who collaborative groups report to, and what decision-making powers – formal or informal – a group has from the outset (Ministry for the Environment, 2015, p. 7).

There are differences in the power of participating stakeholders (Ministry for the Environment, 2015, p. 11) and these power differences create issues. For example, “the inclusion of community representatives alongside sector representatives creates a challenge in terms of where to pitch the content of sessions and how to maintain a balance of participation. Sectors are usually represented by seasoned veterans of collaborative and more traditional Resource Management Act processes, and some have been central to national processes such as the Land and Water Forum, National Policy Statement and National Objectives Framework. Community representatives bring other types of knowledge and experience but do not necessarily feel as comfortable to express their opinions in a larger group. It is also a challenge to provide the space for local knowledge and mātauranga to be shared alongside the mainstream technical and policy considerations” (Wendy Boyce Consulting, 2015, p. 22).

“For collaboration to be effective...each group needs to have approximately equal power over decision-making. In other words, each group has the power to stop a solution” (NZ Landcare Trust, 2012b, p. 51). The value of robust engagement frameworks, participatory meeting design and a clear and appropriate decision-making process for the collaboration process were emphasised by Wendy Boyce Consulting (2015, pp. 23, 24).

SYNOPSIS of common challenges farmers encountered. Overseas (Jarrett et al., 2015) and New Zealand farmers may just not be motivated to participate in collaborative projects (Parminter et al., 2007) and they need to assume a level of personal responsibility for having contributed to creating the issue in the first place (Nelson et al., 2003). Projects should be practical and without red-tape (Jarrett et al., 2015) (Perkins, 2016) (Waikato Regional Council, 2016) (Waugh, 2011) (Deavoll, 2017) (Connolly, 2018, pp. 50, 51). Funding and costs are issues for farmers who are happy to co-fund projects up to a point (Stowell, 2019) and there must either be a clear private benefit, or incentivisation through payments (Jarrett et al., 2015) (Horizons Regional Council, 2016). Funding support entices participation (Oakden et al., 2014). In community-led conservation projects the struggle to find adequate resources including funding for maintenance and coordination has been well documented (Hungerford, 2017) (M. A. Brown, 2018) (Predator Free Hauraki Coromandel Community Trust, 2018) (Peters, 2018). Collaborative processes take time to get going (Jarrett et al.,

2015) and to have an impact (Mackenzie & Harcombe, 2011) (Steel, 2018) (Newman, 2016), while time lags are also variable because some actions may have a relatively quick impact on environmental systems while the benefits of others may take several years (Dodd et al., 2009). However, setting time limits is important because effective collaboration follows good strategic practice, sets clear objectives, and builds in agreed targets for reaching milestones (NZ Landcare Trust, 2012b). Despite many time related challenges environmental collaboration can be resilient (Jarrett et al., 2015). Dealing with conflict may just be too hard for collaborators (Jarrett et al., 2015) (Ministry for the Environment, 2015) (Connolly, 2018) and “how we work” issues create tension that can be challenging to deal with (Wendy Boyce Consulting, 2015) (Dodd et al., 2009). Not knowing which hat to wear during collaboration is a common issue in collaborative arrangements (Ministry for the Environment, 2015). A mutual understanding of the need for collective action to solve a problem, and of the benefits and risks involved is important, yet often lacking (Jarrett et al., 2015). It should be clear who collaborative groups report to, and what decision-making powers – formal or informal – a group has from the outset (Ministry for the Environment, 2015). There are differences in the power of participating stakeholders (Ministry for the Environment, 2015) which create issues on the ground, so robust engagement frameworks, participatory meeting design and a clear and appropriate decision-making process for the collaboration process are essential (Wendy Boyce Consulting, 2015) .

5.4. Features of collaborative processes that make them work best for farmers

This section answers the fourth guiding question: What are the features of these processes that make them work best for farmers?

Local engagement offers the best opportunities for achieving a range of landscape scale objectives. Many authors strongly argue that farmer-led, bottom-up approaches where farmers are involved in all aspects of scheme design, implementation, monitoring and enforcement, not only provided the greatest opportunity for achieving their environmental aims, but were also the most cost effective (Mills et al., 2011). Empowering farmers is important (Waugh, 2011). In community-led conservation projects there is a need for greater collaboration and coordination (Hungerford, 2015). It may be challenging to engage with community groups because many of these groups are run by volunteers who may not have the time to network/coordinate and the trustees of these groups often have weak administration and governance skills (Hungerford, 2015).

Mandate Representatives of each group must be mandated by that group to represent them. The group must respect and support their representative and the representative must in turn report back what is happening so the processes are open, engaging and informed. It is helpful if representation is consistent to avoid significant catch-up time for a new representative (NZ Landcare Trust, 2012b, p. 51). The volunteer group should ideally have a mandate from a public decision-making body (a government minister or a regional council for example) to address an issue or resolve a problem. This is important to ensure individuals don't feel they are wasting their time in pointless discussion, that there is a critical end-point to the talking (NZ Landcare Trust, 2012b, p. 51).

Avoid pressure and coercion Top-down pressure can lead to resistance to collaboration if farmers feel coerced into agreements (Jarrett et al., 2015, p. 34) and heavy-handed enforcement should be avoided (Perkins, 2016) (Stowell, 2019) (Mackenzie & Harcombe, 2011). Things could go seriously wrong when top-down pressure is applied for example in the Hurunui, where trust and communication were lacking (Hobbs, 2000).

Trust and good relationships are crucial. Trust is multifaceted and influenced by several factors. For example, time efficient projects build trust (Perkins, 2016) (Waikato Regional Council, 2016). However, there has to be a commitment of time by all parties to be engaged in the process and there also has to be a commitment to develop a level of trust with other parties (Mackenzie & Harcombe, 2011). Providing consistent advice builds trust (Waikato Regional Council, 2016, p. 26). This can be tricky, for example in the Toenepi project where “there has been a mix of collaborative approaches over the life of the project, including group meetings, one-on-one meetings and use of other professionals working in the catchment. The consistency of the message spread by those involved in the catchment, as well as the belief amongst farmers that they had to do a nutrient budget, are the most likely reasons for adoption of this technology (nutrient budgets). The challenge is to ensure that there is a consistent message from different approaches and stakeholders” (C. A. J. Botha et al., 2008, p. 29).

People generally don't trust those they do not know and consider them “outsiders”. These outsiders must have a “local mandate” i.e. they must be accepted by the locals before they can expect to engage in any meaningful discussions (C. A. J. Botha et al., 2008, p. 28). For example, Field Officers (in the Sustainable Land Use Initiative project) have vital and influential roles in introducing and helping implement Whole Farm Plans. The engagement between Field Officers and farmers is fundamental and based on trust and mutual respect. The good relationships brokered between Field Officers and farmers were recognised by farmers as a necessary and valued conduit to the wide range of skills and services Councils provided (Horizons Regional Council, 2016, p. 37). In the Sustainable Farming Fund, projects assisted farmers to develop close working relationships with stakeholders, e.g., scientists, Council staff and representatives of industry-good organisations (Oakden et al., 2014, p. 35). Good relationships are important, but it requires time and therefore reliable resourcing (i.e. funding) (Dodd et al., 2009).

When collaborating, Councils should be doing all that it could if it asks farmers to do all they can, otherwise farmers get frustrated and lose trust (Connolly, 2018, p. 41).

Building trust requires **respect and recognition**. Acknowledging farmers' voluntary, ongoing and completed voluntary work helps with trust building and is therefore important (Perkins, 2016) (Loney, 2018a) (Waikato Regional Council, 2016, p. 26) (J. Brown, 2018, pp. 2, 37). Many farmers have already done something to protect the environment, and often it is quite a lot (Connolly, 2018, p. 45). Therefore, stakeholders should recognise and appreciate the good work that has already been done (Horizons Regional Council, 2016, p. 36). In the Sustainable Land Use Initiative project, it was shown that many farmers, who have not even chosen to be part of the Sustainable Land Use Initiative or who were non-plan dairy farmers, carried out independent environmental work. Farmers' objections (often strongly expressed) were the apparent lack of acknowledgement by scientists and regional authorities of any environmental works they had done “off their own bat” prior to any official plan (Brown et al., 2016) (Horizons Regional Council, 2016, p. 37). More needs to be done to recognise the efforts of community groups and volunteers (Predator Free Hauraki Coromandel Community Trust, 2018). In community-led conservation projects attribution for work done can be an issue. Organisations often take credit for work that had been primarily achieved because of community efforts and non-government funding, agency staff say their contribution is often not appreciated, especially where the input was in kind, and some organisations complain that other organisations claim credit for outcomes they'd been involved with to a limited extent or not at all (M. A. Brown, 2018). At a local level the importance of clear attribution of effort from success is unquestionable and when outcomes depend on multiple efforts, all should be acknowledged (M. A. Brown, 2018).

A holistic, integrated approach but without confusion A holistic approach that addresses the whole farming system is important (Waikato Regional Council, 2016, p. 38) (Stowell, 2019). Not only is the production and business systems of most primary sector operations very sophisticated, a whole of system approach is required (Ministry for Primary Industries, 2012) that includes the innovation system, i.e. other stakeholders. Having a defined structured process for engaging a range of stakeholders (incl. governance, research, education) is a critical part of an integrated approach (Dodd et al., 2009, p. 4). For example, Whole Farm Plans work as a framework for strategic land management, often in conjunction with shifts in land use, increased diversification and shifts in livestock policies (Horizons Regional Council, 2016, p. 36). In Rerewhakaaitu the benefits to such a nutrient budget have been apparent to farmers at both an individual and collective level but they have generally still not obtained all the advantages that might have been available if a more whole farm systems approach was provided in their advice (Parminter et al., 2007). If done well farm planning processes can achieve multiple objectives (Perkins, 2016).

A holistic approach is also required because industry programmes (often) do not bear the environment in mind (Connolly, 2018, p. 49). When using a holistic approach multiple accountabilities can occur but should be avoided to reduce confusion as far as is reasonably practicable (Connolly, 2018, p. 35). For example, “many people talked about already doing some of the various components of a farm plan, such a nutrient budget, which they would still do even if they were part of a Catchment Collective. A Catchment Collective is a self-organising group through which collective environmental action can be taken, and the action agreed by the group is the means by which the members of the group are held accountable to council (Connolly, 2018, p. 1). Others spoke of how they expected that members of a Catchment Collective would each need to have an individual farm plan as a way of both developing the individual commitments that they would make to a Catchment Collective (e.g. nutrient allocations), or to deliver on the promises each made individually to a Catchment Collective. Similarly, Industry Programmes were seen as something that many people may have alongside an Individual Farm Plan or a Catchment Collective, either because they may already be in one, or because that may be required as a pre-requisite for access to a certain product market” (Connolly, 2018, p. 35). An Integrated Catchment Management approach can work (Fenemor & Bowden, 2001).

Knowledge, science and expectations A defining aspect of collaborative processes is that they are deeply immersed in information. Participants base their understanding, thinking and analysing on extensive knowledge and science, including local knowledge and Mātauranga Māori. Large amounts of information are discussed in a non-adversarial setting. Through this, participants come to a deep understanding of the true nature of the problem they are addressing as well as the most effective solution (NZ Landcare Trust, 2012b, p. 52). With science and knowledge as the basis of collaborative work, participants work through a process of jointly identifying the problem they need to solve, considering the options they have for resolution of the problem and seeking consensus on those options (NZ Landcare Trust, 2012b, p. 52). Science-based evidence must underpin change requirements/expectations (Waikato Regional Council, 2016, p. 42) (Steel, 2018) (Loney, 2018a).

Other forms of knowledge must also be acknowledged, for example, the use of farmers’ knowledge and building upon their lessons and experiences (Waikato Regional Council, 2016, p. 36). There are two reasons 1) localised solutions are important (C. A. J. Botha et al., 2008, p. 28) and, 2) the cost-effectiveness of all Best Management Practice varies greatly with the context in which they are applied – i.e. soil types, existing management systems, sensitivity of the receiving environment, financial drivers and the rigour with which they are applied (Dodd et al., 2009).

What is achievable from a science perspective must be aligned with farmers' expectations and goals (Red Meat Profit Partnership, 2018) (MacMillan, 2018). Expectations must be appropriate so it is important to ensure everyone is on the same page to begin with (Connolly, 2018, p. 37). For example, where Whole Farm Plans (in the Sustainable Land Use Initiative programme) were viewed as aligned with farmers' own priorities for their farms, it was found that change happened, and plans were more welcome (Horizons Regional Council, 2016, p. 36).

Monitoring for evidence Monitoring should occur for two reasons: to track on the ground if what farmers do works (Steel, 2018) (Loney, 2018a) (Waugh, 2011), and to measure the progress and success of proposed policy to ensure the targets and goals are being met (Horizons Regional Council, 2016). For example, in the Sustainable Land Use Initiative project there was a strong need for more information and demonstration that environmental works (whether in the hills or on the flats) have positive results. This was difficult to achieve. The inherent challenge of the plans as a product of a one-off event or of a particular context is how to apply them as part of a process of change which must be re-enforced by on-going relationships, reviews and re-contextualisation. But more visible evidence can, does, and could have a powerful impact (Horizons Regional Council, 2016).

Jarrett et al. (2015, p. 52) suggest that farmers need to be confident that their actions will result in demonstrable benefits for the environment. Thus, a requirement for effective monitoring and feedback regarding the impact of schemes, which may require specific funding or training, is reiterated throughout the literature. Demonstrating positive environmental benefits may help farmers to internalise these as a primary purpose of the collaboration, thereby fostering a sense of shared responsibility and ownership and shifting the key motivational driver from an economic to an environmental one (Jarrett et al., 2015, p. 52).

Connolly (2018, pp. 38, 40) indicates the expectations of monitoring should be kept realistic and to avoid distance from monitoring. Make sure there is no "disconnect between the producers and the data that does exist, regardless of whether it is sufficient or not. This is seen as a barrier to the potential evolution and alignment of producers' personal views on the nature of the problem and therefore their support for any action that may be required, and the mechanisms that will be used to deliver it."

However, there are two challenges to monitoring. Funding is required to cover the costs of monitoring, and monitoring the environmental outcomes of particular actions is challenging because there are often a number of external factors (e.g. weather conditions) involved (Jarrett et al., 2015, p. 55).

Support farmers in volunteer roles Farmers at Lake Rerewhakaaitu have been able to organise their own meetings, workshops, and community activities. However, they also needed institutional support to provide them with a community problem solving process, give them confidence throughout the process of change that they were involved in, and reward their successes. They also needed a consistent technical resource to draw upon, challenge them constructively and provide positive feedback (Parminter et al., 2007, p. 29).

Farmers must be provided with tools and resources that support them when they work in or as a group, and an outside group facilitator can help a lot (Red Meat Profit Partnership, 2018). The support and advice they get must be high quality (Connolly, 2018, pp. 57, 60). There is a danger of conflict within groups, hence support with resolving internal conflict is very helpful (Dodd et al., 2009).

External support including effective local facilitators to coordinate collective action has been reiterated throughout the literature (Jarrett et al., 2015, p. 51). Moreover, landscape-scale projects are only likely to take place where third party facilitation is used. Access to high quality advice and support has also been found to be important, particularly within schemes designed to enhance environmental benefits (Jarrett et al., 2015, p. 33).

Farmers must be helped to access the right support, particularly if council promised support (Connolly, 2018, p. 46). But providing support can stretch providers significantly, for example in Sustainable Farming Fund projects MPI Advisers and Project Managers believed the support they were providing was “stretched” (Oakden et al., 2014, p. 49).

Show solidarity Tikkisetty and McLay (2011, p. 3) suggested that regulation and enforcement on key issues be strengthened (e.g. livestock exclusion, drainage around wetlands and nutrient management in nutrient-sensitive catchments), to reinforce the work of voluntary groups. It will show solidarity with these groups in this way.

SYNOPSIS of the features of collaborative processes that make them work best for farmers. Local engagement is important because it provides the greatest opportunity for achieving environmental aims and cost effectiveness (Mills et al., 2011), but it may be hard to engage with community groups because many of them are run by volunteers who may not have the time to network and/or coordinate and the trustees of these groups often have weak administration and governance skills (Hungerford, 2015). Representatives of each group must be mandated by that group to represent them. The group must respect and support their representative and the representative must in turn report back what is happening so the processes are open, engaging and informed. It is helpful if representation is consistent (NZ Landcare Trust, 2012b). Pressure and coercion should be avoided (Perkins, 2016) (Stowell, 2019) (Mackenzie & Harcombe, 2011) because things can go seriously wrong when top-down pressure is applied (Hobbs, 2000). Trust and good relationships are crucial. Trust is multifaceted and influenced by several factors. A commitment of time by all parties to be engaged in the process and to develop a level of trust with other parties (Mackenzie & Harcombe, 2011) helps, as well as providing consistent advice (Waikato Regional Council, 2016). The challenge is to ensure that there is a consistent message from different approaches and stakeholders (C. A. J. Botha et al., 2008). People generally don't trust those they do not know and these “outsiders” must have a “local mandate” i.e., they must be accepted by the locals before they can expect to engage in any meaningful discussions (C. A. J. Botha et al., 2008, p. 28). Good relationships are important, but it requires time and therefore reliable resourcing (Dodd et al., 2009). Building trust requires respect and recognition. Acknowledging farmers' voluntary, ongoing and completed voluntary work helps with trust building (Perkins, 2016) (Loney, 2018a) (Waikato Regional Council, 2016) (J. Brown, 2018). Stakeholders should recognise and appreciate the good work that has already been done (Connolly, 2018) (Horizons Regional Council, 2016), and more needs to be done to recognise the efforts of community groups and volunteers (Predator Free Hauraki Coromandel Community Trust, 2018) although attribution for work done can be an issue (M. A. Brown, 2018). A holistic approach that addresses the whole farming system (Waikato Regional Council, 2016) (Stowell, 2019) and innovation system is required (Ministry for Primary Industries, 2012). A holistic approach is also required because industry programmes (often) do not bear the environment in mind, and multiple accountabilities can occur, but should be avoided to reduce confusion as far as is reasonably practicable (Connolly, 2018). Collaborative processes are deeply immersed in information. Participants base their understanding, thinking and analysing on extensive knowledge and science, including local knowledge and Mātauranga Māori. Science and other forms of knowledge is the basis of collaborative work (NZ Landcare Trust, 2012b), and science-based evidence must underpin change

requirements/expectations (Waikato Regional Council, 2016) (Steel, 2018) (Loney, 2018a). What is achievable from a science perspective must be aligned with farmers' expectations and goals (Red Meat Profit Partnership, 2018) (MacMillan, 2018). Monitoring should occur for two reasons: to track on the ground if what farmers do works (Steel, 2018) (Loney, 2018a) (Waugh, 2011), and to measure the progress and success of proposed policy to ensure the targets and goals are being met (Horizons Regional Council, 2016). The expectations of monitoring should be kept realistic (Connolly, 2018), monitoring requires funding, and monitoring the environmental outcomes of particular actions is challenging because there are often a number of external factors (e.g. weather conditions) involved (Jarrett et al., 2015). Farmers in volunteer roles need support with facilitation (Jarrett et al., 2015; Red Meat Profit Partnership, 2018), consistent high quality technical advice and positive feedback (Parminter et al., 2007), as well as conflict resolution (Dodd et al., 2009). But providing support can stretch providers significantly (Oakden et al., 2014).

6. Findings – academic material

6.1. Benefits to participants

This section answers the first guiding question - what are the benefits that participants in these processes have found?

Building the so-called “four capitals” There are human, social, natural and financial/physical aspects of those things that affect our wellbeing – the so-called “four capitals” (The Treasury, 2018). The four capital has to do with sustainable development and the “four-capital method” measures it (Ekins, Dresner, & Dahlström, 2008).

Writing in the context of public-private innovation processes Morrar (2015, p. 30) explains that public and private actors communicate and interact between each other and “complex knowledge and technologies are exchanged between them in a collaborative environment. These interactions are supported by social capital, to produce better technological innovation output. Network actors either reinforce each other to produce and diffuse new technological resources or, conversely, hamper each other”. Social capital is identified as a key indicator and requisite for innovation networks (Pinxterhuis et al., 2018, p. 24), and a prerequisite to effective interaction. But, at the same time, the interactions that occur in networks also create social capital. For example, in a co-innovation case study in New Zealand Fielke and Srinivasan (2017) identified the creation of social capital, and other forms of capital. Social capital improvement was evident in the form of “the creation of a network interested in irrigation efficiency” (Fielke & Srinivasan, 2017). Increased productivity on-farm via reduced pumping costs and input loss evidenced economic capital improvement, and human capital was improved through the feedback of community members' thoughts and ideas to the researcher/s and vice versa which led to new skills (Fielke & Srinivasan, 2017). Ultimately, more efficient use of the freshwater resource, i.e. improved environmental capital, was also identified (Fielke & Srinivasan, 2017).

Memon and Weber (2008, p. 4) have indicated the “enhancement of long-term community capacity for problem-solving”, i.e. increases in human, or social capital, as a consequence of collaboration. Similarly, when farmers collaborate with researchers it can have “profound, self-reinforcing and long-lasting impacts, especially on capacity to innovate” (Waters-Bayer et al., 2015, p. 6), which is a social capital. Moreover, Waters-Bayer et al. (2015, p. 6) showed that, in developing countries, farmer-led research led to greater food and nutrition security through more and higher yields (natural capital) than those achieved through previous practices.

In New Zealand, Sustainable Farming Fund funded projects that were farmer-initiated and included active farmer experimentation and engagement were generally found to be the most “collaborative” or “collegiate” (McEntee, 2010). Interestingly, while farmer participation in a project does not appear to determine technology uptake, higher levels of engagement by farmers do appear to result in deeper learning - a social capital - which is sustained long after the project has ended (McEntee, 2010).

Integrated Catchment Management can create a culture change (a form of social capital) in which catchment stakeholders see their actions and the consequences within a whole catchment perspective and take responsibility to mitigate those consequences (Fenemor et al., 2011, p. 324).

In a Sustainable Farming Fund project, called Wheat Calculator, McEntee (2010) has shown that social capital improved when environmental knowledge highlighted through the technology and discussed with farmers through interactive “extension” activities, became enculturated in wheat farming practices.

In linking with the analysis of the grey material on collaboration, the development of ideas and adoption of new technologies are discussed under a separate heading even though they are related to social and human capital.

Development of ideas and adoption of new technologies McEntee (2010) analysed six Sustainable Farming Fund funded projects and found technology uptake and social learning occurred in five of them. Klerkx and Nettle (2013) analysed dairy sector innovation projects in The Netherlands and Australia. These projects supported initiatives that addressed common challenges like environmental issues. They found the generation of new, quite different ideas as a significant achievement. This is not to say that innovation does not take place outside the confines of collaborative projects. By itself regulation like the Resource Management Act can both encourage and discourage innovation (Valentine, 2015, p. 146). But, farmers can be innovative despite regulations, as was shown by farmers who were able to provide examples of how they autonomously innovated on their farms (Valentine, 2015, p. 146).

Goal achievement The goals of landholder families or individuals are heterogeneous and can include material wealth and financial security, environmental protection and enhancement beyond that related to personal financial gain, social approval and acceptance, personal integrity and high ethical standards, and balance of work and lifestyle (Pannell et al., 2006).

When farmers ask for and collaborate in capacity building, it is more likely to be successful because participants seek to fulfil their own goals while helping to fulfil wider regional goals (Bewsell et al., 2017, p. 65).

According to Pannell et al. (2006) landholders are unlikely to change their management unless proposed changes are consistent with their goals. It seems that the Landcare movement in Australia has increased the emphasis given to conservation goals by landholders, but the extent of increase has been modest for most landholders (Pannell et al., 2006). The strength of Australian Landcare is that community groups and networks, with government and corporate support, conceive their own visions and set goals for local and regional environmental action. Working from the ground up to achieve these goals creates freedom and flexibility, giving communities a great sense of purpose (Youl, Marriott, & Nabben, 2006).

SYNOPSIS of the benefits that participants in collaborative processes have found. The so-called “four capitals” are human, social, natural and financial/physical aspects of those things that affect our

wellbeing (The Treasury, 2018). Albeit not in the same project, all four these capitals have been improved through collaborative processes, for example Fielke and Srinivasan (2017) identified improvements in social capital, human and natural (environmental) capital, and Waters-Bayer et al. (2015, p. 6) showed that, in developing countries, farmer-led research led to greater social and natural capital. While farmer participation in a project does not appear to determine technology uptake, higher levels of engagement by farmers do appear to result in deeper learning – a social capital - which is sustained long after the project has ended (McEntee, 2010). Development of ideas and adoption of new technologies have occurred in collaborative projects (Klerkx & Nettle, 2013). When farmers ask for and collaborate in capacity building, it is more likely to be successful because participants seek to fulfil their own goals while helping to fulfil wider regional goals (Bewsell et al., 2017).

6.2. Benefits generally

This section answers the second guiding question – what are the benefits of non-regulatory collaborative local action generally?

Collaboration provides the opportunity for building social capital and trust, and, if successful, can have outcomes that extend far beyond the scope of the original collaboration (Cradock-Henry et al., 2017).

Community resilience The influence of the Sustainable Farming Fund funded projects that McEntee (2010) analysed also impacted the wider communities who were engaged through interactive workshops, farmer experimentation, fieldtrips and farmer-initiated conferences. She did not explain these wider impacts. However, in a recent New Zealand case study Fielke and Srinivasan (2017) have shown when there are community champions, such as the key project figures who emerged to shape decision-making possibilities, there can be “positive alterations in community resilience” (Fielke & Srinivasan, 2017). Community resilience, as a component of social resilience, involves the “ability of groups of communities to cope with external stresses and disturbances as a result of social, political, and environmental change” (Adger 2000, p. 347; Wilson 2012, p. 1, cited in Fielke and Srinivasan (2017)). In practice community resilience becomes visible at individual/ household level through direct actions and through communities, regions, nations, and global levels, actions become more indirect. In their case study community resilience improved in spite of a decline in economic capital because of low commodity prices (Fielke & Srinivasan, 2017). “Community” means “the totality of social system interactions (i.e. an affective unit of belonging and identity and a network of relations) usually (but not exclusively) within a defined geographical space” (Wilson, 2012, p. 1219). Community resilience is part of social resilience, which is “about the necessity of human systems to learn to manage by change” (Wilson, 2012, p. 1221). Worthwhile mentioning here is that “social resilience research is often based on a ‘bottom-up’ approach predicated on understanding human drivers and indicators of resilience at community level, of which human-environment interactions are only one of many components” (Wilson, 2012, p. 1221).

Influencing real-time decision-making While collaborating there are opportunities to effect change. For example, the inclusion of multiple stakeholders in research projects in Australia and The Netherlands, influenced agricultural decision-making in real-time (Klerkx & Nettle, 2013). Importantly, local stakeholder inclusion means that the community can enact decision-making pathways that determine how they themselves want their community to look in the future (Fielke & Srinivasan, 2017). For example, the co-innovation approach that was used in a case study was led by a project team, which enabled alteration in on-farm practice to address both economic and environmental drivers (Fielke & Srinivasan, 2017). For some environmental issues, however, the real

challenge is to find or develop innovations that are not only good for the environment, but also economically superior to the practices they are supposed to replace (Pannell et al., 2006).

Potential for win-win outcomes Memon and Weber (2008, p. 4) point out “collaboration can increase the potential for positive sum, or win-win outcomes in which all stakeholders are better off than before the collaboration”. Further, if the “effort adopts a comprehensive, integrated approach, collaboration can increase the likelihood that the needs of multiple policy areas, for example, ‘environment, economy and community,’ will be met on a more consistent basis” (Memon & Weber, 2008, p. 4). Councils can benefit from collaborating with farmers and other organisations. For example, over the past decade the Tasman District Council has become more familiar with a range of facilitated social processes, and now targets the use of group and facilitated multi-stakeholder processes more deliberately (Allen et al., 2011). The council research team has developed a range of skills that are necessary for integrated and collaborative endeavours, including skills in active listening and meeting participation, in addition to making full use of skilled facilitation and engagement processes (Allen et al., 2011). A number of the research team have also gained the skills, confidence and connections to work collaboratively with iwi (Allen et al., 2011)

New insights and shared understanding through learning are produced through collaboration. That is because dialogue provides the conversations, connections and combinations that bring new insights to virtually every kind of collective endeavour. When dialogue enables social learning, individuals, groups and organisations grow in their understanding of different perspectives, areas of agreement and disagreement, and their own values and those of others (Schusler, Decker, & Pfeffer, 2003). These all contribute to a shared understanding as a precursor to the development of innovative solutions that can support more enduring catchment management (Allen et al., 2011). The importance of social learning was also emphasised by Memon and Weber (2008, p. 4) who said “collaboration can promote social and cognitive learning and improve the quality of technical information, as well as the political and social information essential to successful problem solving and negotiations among diverse interests. Also, it can tap into the problem-solving benefits that comes from the incorporation of diverse ‘ways of knowing,’ particularly in the areas of experiential (practice based) and local knowledges (e.g., the culture and practices of indigenous people)”.

As stakeholders in complex programs work together to build a more unified and in-depth understanding of the wider system, they also learn to communicate more effectively, providing a more reflective approach that supports learning and adaptive management (Allen, Cruz, & Warburton, 2017). Complex programs require highly skilled facilitation particularly for natural resource management given the high likelihood of debate and conflict (Allen et al., 2011, p. 18).

Unintended consequences (also see 6.3 Murphy’s law) Consensus decision-making is important for successful collaboration but could cause other, sometimes negative, impacts. For example, in agri-environmental schemes in Wales, councils selected group members and processes were more successful in terms of “achieving consensus and meeting internal evaluation criteria, but less successful in reducing conflict (also see 5.3 Opportunities emerge and can be taken) away from the negotiating table” (Mills et al., 2011, p. 163). The same experience was reported in New Zealand (Sinner, Newton, & Duncan, 2015).

SYNOPSIS of the benefits of non-regulatory collaborative local action for farmers and other stakeholders generally. Successful collaboration can have outcomes that extend far beyond the scope of the original project(s) (McEntee, 2010) (Cradock-Henry et al., 2017). Community resilience improved and a community could enact decision-making pathways that determine how they themselves want their community to look in the future (Fielke & Srinivasan, 2017). In Australia and

The Netherlands, agricultural decision-making was influenced in real-time (Klerkx & Nettle, 2013). There is the potential for (Memon & Weber, 2008) and practical examples of win-win outcomes when collaborating (Allen et al., 2011). New insights and shared understanding through learning are also produced through collaboration (Allen et al., 2011) (Allen et al., 2017). Consensus decision-making is important for successful collaboration but could cause other, sometimes negative, impacts (Mills et al., 2011) (Sinner et al., 2015).

6.3. Challenges for all collaborators

This section answers the third guiding question – what common challenges are encountered by farmers and other collaborators?

Memon and Weber (2008, p. 2) critically appraised the potential for successful collaborative governance of water resources in New Zealand and found several primary obstacles to collaboration in Canterbury. They said some stakeholders had little or no incentive to cooperate, particularly to cooperate for the sake of sustainability because of the 2008 global economic climate for farm commodities, the institutional inertia within New Zealand (in 2008) that allowed a slide toward unsustainable water use, and many, if not most people did not acknowledge widespread water resource scarcity as a problem. Memon and Weber (2008, p. 2) also identified a lack of scientific information that was necessary to develop an effective strategic, integrated water management system to support the collaborative sustainability approach. Moreover, trust levels were low and social capital was weak. Leadership required for collaborative effort was also lacking. Finally, there were complexities and uncertainties associated with the incorporation of Māori customary water rights under the Treaty of Waitangi (Memon & Weber, 2008, p. 2).

A New Zealand literature review (Allen and Clarke Policy and Regulatory Specialist Limited, 2010) identified several general matters that can prevent or restrict collaboration. These included: organisational capacity; conflicts; hostile environment; insufficient communication or knowledge; managing the costs of collaboration; and over-incentivising (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 18). The author explained how an “over-emphasis from funders and decision-makers on ‘working together’ might force community organisations to work within a highly complex web of collaboration, comprehensive or integrated service delivery and multi-community coalition” (Allen and Clarke Policy and Regulatory Specialist Limited, 2010).

In New Zealand, “farmers often view government policy and regulations in a negative light”, because “it limits their flexibility and adds costs” (Crofoot, 2016, p. 31). Valentine (2015, p. 60) reported the results of a Federated Farmers farm confidence survey dated July 2012, saying regulation and compliance costs ranked second in farmers’ concerns. The time and expense of complying with the Resource Management Act was of particular concern to farmers at that time. Moreover, top and middle management executives who dealt with international business situations reported that environmental laws and compliance costs hindered the competitiveness of their businesses, which placed Zealand last out of 60 countries (Valentine, 2015, p. 60).

From this point onwards the discussion uses similar headings as for the review of the grey material to make it easier to compare and contrast the findings from the two literature types.

It is important that farmers collaborate with other stakeholders In linking with the previous discussion it is noteworthy that Crofoot (2016, p. 31) also said “it is important for farmers to be involved with the development of policy and regulation. This can happen through collaborative processes”. There is common agreement in the literature that farmers’ collaboration with other stakeholders is important in trying to solve environmental issues like water quality. Although water

quality, from an economic perspective, is not a traditional common pool resource problem, “in the presence of some form of external threat or regulation associated with degradation, the diffuse loss of nitrate to waterways is transformed into a common pool resource problem” (Parsons, 2016). This is a social dilemma, characterised by strong incentives to defect, for example withdrawing participation and challenging levels of complexity (Parsons, 2016). Parsons used economic experiments³ to show that “strong incentives for defection in common pool resource management, including collective management of water quality, can be overcome by sufficiently strong sanctions”. The findings of Parsons (2016)’s experiments “suggest that sanctions administered by peers can be effective in improving environmental outcomes and stabilising the level of resource use over time”. This stabilisation can prevent “the decline in cooperation that is evident where individuals are able to profit from defection”. So, Parsons (2016) concludes “if institutions can be designed in such a way as to ensure that cheaters do not prosper from defection, the prospects for collective management of water quality are positive”.

However, collaboration is hard to sustain and unlikely to improve outcomes for clients and communities when stakeholders “are not highly motivated to participate”, or when it lacks “clear value for the organisation” (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 22).

What motivate farmers? Involving 12 in-depth case studies, a study prepared for the Parliamentary Commissioner for the Environment covering the period from 1990 to 2010 concluded “research suggests that New Zealand farmers’ decision-making is largely dominated by financial factors. This work found that, for all case study farms, investment in new infrastructure and technology is dominated by the need to intensify and lift profitability” (Parliamentary Commissioner for the Environment, 2004, p. 4). This is an interesting finding, as elsewhere, in their study of farmer decision-making in Scotland, McGregor et al. (1996 cited in (Valentine, 2015, p. 48) found that farmers valued the maintenance of their land resource, the environment and their way of life ahead of profit maximisation. It was originally thought that farmers’ decisions were based solely on maximising profit, but later on literature suggested that farmers’ decision-making behaviours are also influenced by socio-economic and psychological variables (Willock et al., 1999). Valentine (2015, p. 51) concluded farmers are influenced in their decisions when balancing economic and environmental factors, by their values and attitudes towards the environment and their understanding of biodiversity. There are many influencing factors including financial, the farmer’s characteristics, the household’s characteristics, the farm structure, the innovation to be adopted, and the wider social milieu (Valentine, 2015, p. 59).

In Australia, Pannell et al. (2006) have warned against the risk of making incorrect or over-simplified assumptions about what landholders’ goals really are. The authors indicated farmers were motivated by multiple influences. Case study research by Greiner and Gregg (2011) in three regions within the tropical savannas of northern Australia found that graziers had a very high level of conservation and lifestyle motivation and were motivated to lesser extents by financial/economic and social considerations. Further afield in Wales, farmers’ motivations for joining agri-environmental groups were varied, and, while economic motives were important there were also social, cultural and psychological factors motivating them to join agri-environmental schemes. For Welsh farmers, Mills et al. (2011, p. 157) explained the motivational aspects of “access funding, marketing advantage, opportunities for knowledge information exchange, sharing and mobilising resources, development of diversification activities, and lobbying power”. On the basis of the

³ Experimental economics uses controlled, scientific experiments to test what choices people actually make in specific circumstances (University of Massachusetts, undated).

empirical evidence presented by Greiner and Gregg (2011) in Australia, the authors said “governments would be well advised to harness the diverse set of aspirations and motivations of farmers when designing conservation programs”.

Additionally, in this review much evidence was found in the grey literature that farmers’ care for the environment is not solely or entirely economic driven. Farmers are conflicted between using their land as a resource productively and thinking of the environment as a resource to be protected and preserved (Valentine, 2015, p. 56).

What motivate stakeholders generally? The Pasture Improvement Leadership Group was formed to improve the quality and consistency of advice provided to dairy farmers in New Zealand (Rijswijk & Brazendale, 2017). The largest challenge of setting up this group was mainly around the level of collaboration and interaction required versus the incentives of the involved actors. This was particularly apparent between the public sector actors on the one hand and the private sector actors (including farmers) on the other hand (Rijswijk & Brazendale, 2017, p. 259). This conclusion was similar to earlier findings by Klerkx and Proctor 2013, and Phillipson et al. 2016, cited in Rijswijk & Brazendale, 2017, p. 259).

Stakeholders generally are also motivated by the possibility that more can be achieved together, than alone, as long as stakeholders appreciate and honour the diversity between the groups involved. It is that diversity which brings the most benefit to collaboration - that together groups can achieve more (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 25). But working together is not easily achieved as there are several commonly found demotivational factors like poorly equipped leaders (Memon & Weber, 2008, p. 22), lack of information and poor communication (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 21) and issues of proximity⁴ (Heringa, Horlings, van der Zouwen, van den Besselaar, & van Vierssen, 2014, p. 690) that usually hinder collaborative efforts.

Closely associated with motivation is the perception that collaboration may not be worthwhile anyway. This is discussed next.

The system is against us A main blocking mechanism of New Zealand’s innovation system is science centred innovation (Turner, Klerkx, Rijswijk, & Barnard, 2016). This means innovation is expected to come from science and this expectation could easily lead to some farmers asking, “why bother” collaborating, while others may want to collaborate to listen to “the experts”, i.e., scientists.

Murphy’s law⁵ Policy can often have unintended consequences. It is important that farmers engage in policy and regulation development as they can help avoid these unintended consequences (Crofoot, 2016). If farmers do not engage, they are “ceding control of important aspects of their business to others” (p31). An example of policy causing an unintended consequence is the Land Development Encouragement Loans that were introduced in 1978. They were not intended to create erosion problems, but they “subsidised the conversion of steep erosion prone hill country, under scrub and forest cover to pastoral farming despite the known erosion problems of this land” (Crofoot, 2016, pp. 29, 31). Farmers are good at pointing out unintended consequences of new

⁴ Proximity, including geographical, cognitive, organisational, institutional, social and personal proximity, between stakeholders is necessary for forming and maintaining collaborations (Ooms, Werker, & Caniëls, 2018). Proximity means being close by.

⁵ Murphy's law is an adage that typically states “things will go wrong in any given situation, if you give them a chance,” or more commonly, “whatever can go wrong, will go wrong.”

policy or regulations, not only due to their experience on the ground with the issues trying to be addressed, but they can also say how they will react, according to Crofoot (2016).

It won't make a difference In a New Zealand study Rijswijk and Brazendale (2017) focused on the dynamics between the public and private sectors in innovation networks to identify the challenges of forming and maintaining networks to coordinate advisory services. They used the Pasture Improvement Leadership Group as a case study and found that “the relational resources in terms of power, influence, and reputation of the group were limited”. The reason was the communication of group members back into their respective organisations were, and stayed, limited, and that the impact of their efforts could not be attributed to them (Rijswijk & Brazendale, 2017, p. 258).

It is bigger than us There may be other factors that also demotivate collaboration. External factors and conditions unrelated to the collaboration may affect how participants interact in a process (Cradock-Henry et al., 2017). For example, in comparative case-studies the TANK (Tūtaekurī, Ahuriri, Ngaruroro, and Karamū) process in Hawke's Bay, these external factors were related to processes to approve water storage in a nearby catchment and water bottling at the end of the catchment (Cradock-Henry et al., 2017). These external factors signalled to participants that they may ultimately have less agency than they believed. The extent to which these events may have had a bearing on participants' perceptions of the collaborative process has yet to be fully explored (Cradock-Henry et al., 2017). Evidence from elsewhere has shown that processes operating at higher scales (e.g., nationally or regionally) can have a detrimental effect on local processes (Patterson, 2016).

“They” will just use us A formal partnership can be difficult when there are significant differentials in power or resources. Arguably, collaboration works best when it is between partners that are equally strong or equally weak, as many relationships break down if there is suspicion of one taking advantage of the other (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 22)

Practical without red-tape (It is too cumbersome) Only two papers that referred to farmers' dislike for bureaucracy were found. Valentine (2015, p. 1) reported that New Zealand Federated Farmers maintain that “if there is one thing that raises the ire of farmers it is bureaucracy and compliance.” More indirectly, but still related to bureaucracy and bureaucratic processes, Crofoot (2016, p. 30) discussed how different regions handle the required process of creating policy and setting limits. For example, Otago Regional Council has put in place effects-based policies, where they leave it to the farmer as to how to best achieve the desired outcome with the resulting effect. In contrast, the Hawke's Bay Regional Council have taken a prescriptive approach and regulated the activity rather than the effect, to protect against the potential damaging aspects of cattle access (Crofoot, 2016).

Funding and costs Costs are important to all stakeholders. Working with others can save money. For example, councils and other organisations collaboration can reduce transaction costs relative to hierarchical top-down approaches, especially for heterogenous, dispersed problems. The savings mean, for example, that more resources are available for attacking more public problems, or that fewer resources can be used to achieve the same amount of policy gain (Memon & Weber, 2008, p. 4).

But collaborating also costs money and there are a number of costs that need to be weighed against the benefits in deciding whether to collaborate. Eppel (2013, p. 28) states, “networks have their collaborative costs, as well as their benefit”. These costs include financial, personal, threat to participating organisations, and/or the costs in time and effort that it takes to find, link with, establish a relationship with and then move forward with organisations that share a vision, but may

have different motivations for and ways of achieving that vision (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 25). For example, “tangible resources” in the form of time and money, were problematic in the Pasture Improvement Leadership Group (Rijswijk & Brazendale, 2017, p. 258). Another example is where there was also the need to have sufficient resources available for development of supporting material and to bring in new people with appropriate skills, thus avoiding requiring an unreasonable amount of time and/or effort from collaborators (Pinxterhuis et al., 2018, p. 29). In the second example, many of the people did not consider the time they committed to be sufficiently worthwhile to forgo income from consultancy and they preferred to simply have updates on the project work (Pinxterhuis et al., 2018, p. 31).

There are also the costs of having to make on-farm changes, which influence whether farmers will consider collaborating or not. Not all farmers are the same and the importance of profit as one of the drivers for most farmers has strong implications for conservation practices (Pannell et al., 2006). From an agricultural extension perspective, among those farmers with a focus on profit, the farm-level economics of a proposed conservation practice will be important. Those conservation practices that are not profitable at the farm level will tend to be acceptable only to “farmers with stronger conservation goals”. Unprofitable conservation practices are likely to be more widely adopted if they are able to generate conservation benefits when adopted at a small scale. Environmental benefits can often be most readily achieved by developing conservation practices that provide a commercial advantage to farmers (Pannell et al., 2006).

Drawn out time frames (It takes too long) There is consensus in the literature that collaboration can be a lengthy process for a range of reasons such as:

- too many objectors, paper work and processing times (Valentine, 2015, p. 71);
- the time it takes to communicate delays in decision-making (Valentine, 2015, p. 147);
- by nature the process is difficult (Memon & Weber, 2008, p. 22);
- collaboration takes time to set up (Eppel, 2013, p. 4);
- time to build relationships, trust and commitment (Allen et al., 2011, p. 17) (McEntee, 2010);
- time to get to the point where they are productive and sustainable (Eppel, 2013, p. 12);
- addressing power imbalances and previous bad experiences takes time and may require significant facilitation (McEntee, 2010);
- things keep on changing i.e. the nature of the problem, and how it might be addressed continue to change in nonlinear and unpredictable ways (Eppel, 2013) (Fenemor et al., 2011, p. 320);
- practical considerations such as the need to communicate, negotiate, organise meetings, follow-up and other logistical issues around engagement (Vereijssen et al., 2017) (N. Botha et al., 2017, p. 89);
- the need to build the capacity of participants, both in the community and in organisations (Allen et al., 2011).

Trust is at the core of successful collaboration and elaborated elsewhere (see 5.4 Trust and good relationships).

According to Memon and Weber (2008, p. 22) “collaboration is grounded in an iterative, ongoing process of deliberation, negotiation, and problem solving as opposed to ‘single shot,’ one-time dispute resolution exercises designed to resolve a particular dispute. In addition, participants’ involvement with the problem needs to be long-term and iterative. Thus, it matters whether participants are ongoing entities and are embedded in the relevant policy network such that they interact regularly with other stakeholders”.

Due to long time frames staying connected is an issue, and authors articulated this in slightly different ways. Klerkx and Nettle (2013) showed while long-term commitment is important, keeping momentum becomes a key challenge, particularly for high ambition targets. The results from the TANK (Tūtaekurī, Ahuriri, Ngaruroro, and Karamū) process showed that allowing sufficient time for collaboration is essential (Cradock-Henry et al., 2017). Collaboration is a lengthy process, and to ensure participants do not become disenchanted, the time expectation should be clearly communicated from the outset. Unrealistic expectations regarding the time needed to undertake a collaborative process influence the dedication to the process for stakeholders (Cradock-Henry et al., 2017). Deliberately managing the pace of collaboration in co-innovation projects is challenging, but it is important to retain stakeholder engagement (N. Botha et al., 2017, p. 90).

Good relationships, well-structured governance and well-planned collaborations take time. If collaborations are rushed, they may fail in achieving outcomes. Short funding cycles work against successful collaboration because they are insufficient to allow for trust and relationships to form (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 22). Often, as some of the examples in the Motueka Integrated Catchment Management project illustrated, time is needed to build suitable relationships to have meaningful discussions in the first place (Allen et al., 2011, p. 18).

By their very nature, integrative projects need appropriate time to allow for different disciplines and knowledge cultures to come together and reach agreement on the goals of the work, and how it is going to be tackled (Allen et al., 2011, p. 17).

When problems are multifaceted and resistant to definition, collaborative governance⁶ is an approach which can allow multiple perspectives, including denial of a problem, to be brought to bear to generate solutions. There is unlikely to be one best solution and yet, previously unattainable and beneficial progress can be made. There are real limits to what can be known because of the reflexive dynamism⁷ which exists in all social systems. This dynamism causes the nature of the problem, and how it might be addressed, to continue to change in nonlinear and unpredictable ways (Eppel, 2013). But it is not only the ways in which problems are perceived that change, cumulative effects can change the actual problem as well.

One of the biggest challenges in Integrated Catchment Management is management of cumulative effects. For example, the impacts of land and water use, and associated management practices, accumulate spatially and through time. While scientists have made good progress in providing tools and technologies to predict where to possibly reduce specific effects, uptake of those solutions and implementation of multiple solutions to achieve cumulative improvements is often poor (Fenemor et al., 2011, p. 320). Moreover, sometimes solving one issue may create new ones; for example, regulating land use to improve water quality may have negative social and economic consequences because landowners are no longer able to intensify land use. At the root of catchment issues is often a clash of worldviews, a contest of the relative importance of different value sets, which, when seen as interlinked, may also open up options for resolution (Fenemor et al., 2011, p. 320).

Ambivalence Valentine (2015, p. 103) assessed the impacts of environmental legislation on farmers in New Zealand. Their involvement was mainly in submitting on district plan reviews both on a personal level and on behalf of other organisations such as Federated Farmers. These farmers had mixed opinions as to whether it was positive or negative.

⁶ Collective governance involves working across organisational boundaries both within government and with the wider community through some sort of horizontal collaborative arrangement (Eppel, 2013).

⁷ Reflexivity refers to circular relationships between cause and effect.

Issues arise during collaboration All sorts of issues can arise during collaboration including: imbalances of power; turf and territorial issues; differences in organisational norms and procedures; lack of or mis-communication; loss of identity or independence; differential power relations; logistical issues; difficulties in maintaining community accountability, and identifying appropriate community representation (Takahashi et al, 2002; Sheridan et al, 2000 cited in Allen and Clarke Policy and Regulatory Specialist Limited (2010, p. 19).

Causes of tension Failure to find a way of dealing with value and power tensions and conflicts is an issue for collaboration (Eppel, 2013, p. 24). The co-innovation approach has a deliberate cyclic nature, which is an ongoing plan-do-reflect cycle that requires new ways of working for participants, which leads to tension (Schut et al., 2016) (N. Botha et al., 2017, p. 19). For community organisations funders and decision-makers may over-emphasise “working together”, which may force community organisations to work within a highly complex web of collaboration, comprehensive or integrated service delivery, and multi community coalitions (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 21). This can create issues and tension. Community organisations are often heavily dependent on volunteers who have multiple responsibilities and competing requests for time, leading to volunteer fatigue (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 21). Further, high staff turnover (Eppel, 2013, p. 24) has been noted as a barrier to collaboration, and each staff member who moves on represents a loss of institutional knowledge. There can be instability and uncertainty among small community-based organisations regarding shifting priorities and competition for funds which reduces their ability to commit to long-term collaboration (Allen and Clarke Policy and Regulatory Specialist Limited, 2010).

Dealing with tension and conflict Despite the cooperative spirit and aura of accommodation in collaborative efforts, networks are not without conflicts and power issues (Eppel, 2013, p. 28). Given the high likelihood of debate and conflict, highly skilled facilitation is important for natural resource management (Allen et al., 2011, p. 18).

For Councils or other agencies considering collaboration as a means of resolving disputes, greater attention might need to be paid to network recruitment to ensure the stakeholders involved are willing to set aside personal differences and work together. There is a downside because organisations exercising greater control over membership may have adverse effects on accountability to stakeholder groups (Cradock-Henry et al., 2017).

Hoes et al. (2016) analysed the ways in which influential stakeholders in the dairy sector continually had to address and deal with tensions in their daily conversations. They used three strategies to address and deal with tensions such as concerns about the initiative’s impact: voicing concerns, questioning as starting point and questioning as response. Tensions among them were avoided in the formal meetings, but were addressed in frequent bilateral contacts (Hoes et al., 2016).

Falling back to default position Small community organisations, because of their relative flexibility and adaptive capacities, may be well suited to cope with rapidly changing contexts. But collaboration creates larger, more complex arrangements. Further, in forming collaborations, community organisations may risk losing their community-based focus and ongoing participation from their traditional support base, becoming effectively controlled by stakeholders outside the community (Takahashi et al, 2001 cited in Allen and Clarke Policy and Regulatory Specialist Limited (2010, p. 20).

Organisational capacity can be a significant barrier to effective collaboration. Effective collaboration also depends on the key participants having a wide range of skills to enable them to work well together (how to cooperate, conflict resolution, understanding diversity), and skills/knowledge to

build and manage the collaboration (organisational development processes, member roles and responsibilities) (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 19)

For pragmatic reasons the co-innovation approach is not able to include all individual end-users or intermediaries, and achieving learning and practice change with a larger group of end-users tends to fall back on traditional linear approaches to extension (Pinxterhuis et al., 2018, p. 31). The same fall back to a default position probably applies to collaboration.

Membership fluctuation and role confusion Collaborative processes are often large-scale, long-term projects that evolve through different cycles of goal setting and key political relationships (Cradock-Henry et al., 2017). These large long-term projects can create role confusion and overlapping responsibilities. For example, Klerkx and Nettle (2013) found the main challenges in large scale dairy innovation projects in The Netherlands and Australia included the potential for duplication as stakeholders became enrolled in different initiatives sponsored by different organisations in an increasingly devolved institutional setting.

The people around the collaborative table have a significant influence on the success of a process (Cradock-Henry et al., 2017) but unfortunately having the same people at the table is not always achievable. For example, in a co-innovation project human resources were difficult to manage, because private sector actors regularly changed as people moved to different organisations, or different functions within their organisation, and a replacement for the collaborative network (Pasture Improvement Leadership Group) was not always found (Rijswijk & Brazendale, 2017, p. 258). The commitment of members and membership turn-over in innovation networks need to be managed particularly if there is an imbalance in the decision-making power of stakeholders (Rijswijk & Brazendale, 2017, p. 260). In the same innovation network two critical success factors were a broad representation of the involved or affected stakeholders and terms of reference about roles and responsibilities (Rijswijk & Brazendale, 2017, pp. 259-260). Membership fluctuation is common in innovation networks and can also be based on the changing nature of the problem (Ekboir, 2012).

Membership is very important, but who decides who are members and who not? If councils select group members, processes may be more successful in terms of achieving consensus and meeting internal evaluation criteria, but less successful in reducing conflict away from the negotiating table (Sinner et al. 2015). Selection is important as interest groups and the wider community might question whether the outcomes of the collaborative efforts reflect a consensus of all interested groups and parties, or just a consensus of people selected by the council (Cradock-Henry et al., 2017). That is why resourcing collaborations and catchment groups can foster legitimacy and increase the likelihood of a truly representative process when the time comes (Cradock-Henry et al., 2017).

Agenda setting, decision-making and forms of knowledge The collaboration process can fail due to factors related to authority and legitimacy (Eppel, 2013, p. 24) so having a mandate and legitimacy to speak and act on behalf of someone else is crucial for collaboration. In Canterbury, it was said the watershed collaborative must be perceived as representative (inclusive) of the stakeholders for it to be legitimate (Memon & Weber, 2008, p. 21). Whatever the chosen level or style of engagement, any project needs a clear mandate and leadership to support the social and organisational processes required (Allen et al., 2011).

Collective processes and their aftermath need to be governed, and a key design principle of collaboration involves a set of formal binding collective choice (or decision-making) rules (Memon & Weber, 2008). These are binding rules that restrict the ability of public leaders and other

stakeholders to pursue self-interested behaviour at the expense of long-term cooperation, thereby reducing uncertainty and inducing a higher level of trust and cooperation than would otherwise be the case. The “rules” are grounded in four basic concepts: shared decision-making power; explicit consideration of participants’ interests in how they speak of the project and the decision-making rules; a written “protective” contract that identifies and arranges consequences for defections from the collaborative process, or other violations of the collective choice rules; and active monitoring of agreements to ensure compliance (Memon & Weber, 2008).

Shared decision authority grants participants a direct role in crafting and implementing programs, which gives them “the confidence to invest” in, and develop ownership of the outcomes produced by, the collaborative effort (Memon & Weber, 2008). The explicit consideration of interests often includes mandated monitoring (also see 5.4 Monitoring for evidence) and data reporting systems so that progress and accountability for results are readily tracked, agreement on a standard decision-making procedure that forces decisions to consider a broad cross-section of interests and values before being accepted, and a broad, cross-cutting, balanced mission statement (e.g., protecting and preserving the health of the environment, economy and community) (Ostrom, 1990, p. 93).

With respect to protective contracts, Weber (1998), cited in Memon and Weber (2008), notes the importance of written agreements not to litigate, or otherwise intervene to stop the implementation of jointly agreed decisions. People are fallible and will make mistakes and that is why Ostrom (1990, pp. 93, 94) iterates the need for binding, yet graduated sanctions.

There is general agreement in the literature that a consensus decision rule is critical. The logic behind the consensus decision rule is that granting all participants a veto power over decisions leads to broad agreement, thereby increasing legitimacy, lowering implementation resistance, engendering self-enforcement, and respecting minority rights (Memon & Weber, 2008). Finally, there is general agreement that a clear mission statement is important because it constantly reminds participants of the ultimate goals of the collaborative. Likewise a common vision based upon the definition of targets and measures can also motivate participants (Neumeier, 2016).

To understand how social relations of trust and knowledge are contested and shaped within and between agricultural social networks and organisational configurations Carolan (2006) studied Iowa farmers and agriculture professionals against the backdrop of sustainable agriculture. In this study “whose” knowledge counts greatly influenced individuals’ and groups’ abilities to create an effective challenge to dominant social relations. Farmers, unsurprisingly, most trusted the knowledge and social relations of scientists. By drawing on the public’s trust of science, it appears that sustainable agriculture was able to attain a degree of truth-worthiness that previously had been lacking (Carolan, 2006).

Knowledge in New Zealand is not integrated (Turner et al., 2016, p. 6). Primary industry stakeholders hold perceptions of Government as a regulator of, and barrier to, innovation. This view of Government is exacerbated by the perception within industry and research organisations that many individuals within Government agencies lack an understanding of the sectors they are working with. Further, a lack of time and resources to support interactions in knowledge development hampers joint development of knowledge across industry, Government and research organisations (Turner et al., 2016, p. 6). From this finding it appears farmers are not part of the New Zealand research and knowledge development agenda-setting. Moreover, Memon and Weber (2008, p. 15) said the problem for Canterbury is similar to many communities around the world: it “suffers from strong social capital within stake-holding groups and weak social capital (low to no trust) between the diverse stakeholders that matter, including between government officials and key water user groups

and other interested parties". They conclude "even in a best-case scenario the disaggregated character of the region's broader social capital network requires extensive bridging/liaison work" (Memon & Weber, 2008, p. 15). Yet, in a co-innovation project in New Zealand, farmers and field extension staff have been shown to be accepting of the concept of starting with farmers to develop information because they have a shared understanding of adaptation of principles in practice and the difference between a research environment and commercial farming (Pinxterhuis et al., 2018, p. 31). Internationally it is widely accepted that farmers themselves also develop and hold knowledge and should be included.

The tendency to discount non-scientific forms of knowledge is a barrier to collaborative approaches (Allen et al., 2011). There is value in working together because, if farmers have a good understanding of what the issues are then they may be able to suggest alternative solutions, such as places where good management practice may be sufficient and more flexible to provide a solution (Crofoot, 2016, p. 31).

Šumane et al. (2017) have examined the multiplicity of knowledge sources and learning structures in agriculture, the integrative links between informal knowledge and formal knowledge institutions and demonstrated that farmers' informal knowledge makes a considerable contribution to promoting sustainable and resilient agriculture. Local knowledge encompasses dynamic and complex bodies of know-how, practices and skills, developed and sustained over time on the basis of local people's experiences in their environmental and socio-economic realities (Beckford & Barker, 2007). Farmers' knowledge is a sub-set of local knowledge that enables them to farm in specific local conditions. It is based in their practical experience and often linked to practical skills. As agriculture is highly dependent on the local environment, local farmers' knowledge is of particular importance as it contains an intimate understanding of the particular set of local cultural and natural resources. Local knowledge has relevance for agricultural sustainability and resilience as it tends to be holistic, dynamic and adaptive in character (Šumane et al., 2017, p. 2).

There is much value in connecting the worlds of farmers' informal knowledge and the formal agricultural knowledge and innovation system and institutions (Šumane et al., 2017, p. 4). "The integration of various knowledge sources and learning forms comes to the forefront as a key aspect in surviving, adapting, developing and prospering in modern agriculture" (Šumane et al., 2017, p. 8).

In Wales, case studies (Mills et al., 2011, p. 160) highlighted the value that farmers placed in being involved in the process of problem framing and resolution. Allowing farmers to find their own solutions resulted in stronger group ownership. There is a challenge for nurturing a more inclusive approach to research and management, i.e. to facilitate processes by which a wider range of stakeholders can engage with complex problems on equal terms (Allen et al., 2011). This is difficult. For example, in the Pasture Improvement Leadership Group, there was an imbalance in stakeholders' decision-making power, which was caused by the different types of resources provided by each of the stakeholders (Rijswijk & Brazendale, 2017, p. 260).

Participatory knowledge processes also demand social type of knowledge and skills (networking, team building, openness etc.) (Šumane et al., 2017, p. 8).

SYNOPSIS of common challenges encountered by farmers and other collaborators. There is a long list of challenges for farmers and other stakeholders in terms of collaborating with others to address environmental and water related issues. Examples are not having an incentive to cooperate, a lack of scientific information that is necessary to develop an effective strategic, integrated water management system to support the collaborative sustainability approach, low trust levels and weak

social capital, as well as a lack of leadership for collaborative effort (Memon & Weber, 2008). Other examples are organisational capacity, conflicts, a hostile environment, insufficient communication or knowledge, managing the costs of collaboration, and over-incentivising from funders and decision-makers on “working together” (Allen and Clarke Policy and Regulatory Specialist Limited, 2010). There is common agreement in the literature that it is important for farmers and other stakeholders to collaborate in trying to solve environmental issues like deteriorating water quality.

Deteriorating water quality is a Common Pool Resource problem which is a social dilemma with strong incentives to defect, but this could be overcome by peer sanctioning so that cheaters do not prosper from defection (Parsons, 2016). Collaboration is hard to sustain and unlikely to improve outcomes for clients and communities when stakeholders are not highly motivated to participate, or when it lacks clear value for the organisation (Allen and Clarke Policy and Regulatory Specialist Limited, 2010).

Farmers world-wide value the maintenance of their land resource, the environment and their way of life ahead of profit maximisation and are conflicted between using their land as a resource productively and thinking of the environment as a resource to be protected and preserved (Valentine, 2015). Generally farmers are motivated by multiple influences to protect the environment (Pannell et al., 2006) (Greiner & Gregg, 2011) (Mills et al., 2011). Generally, stakeholders are motivated by the possibility that more can be achieved together, than alone (Allen and Clarke Policy and Regulatory Specialist Limited, 2010).

Closely associated with motivation is the perception that collaboration may not be worthwhile. Farmers may feel the system is against them because New Zealand’s innovation system is based upon science centred innovation (Turner et al., 2016), their efforts may not be worthwhile and not attributable (Rijswijk & Brazendale, 2017), participants may feel they have less agency than they believed (Cradock-Henry et al., 2017), and processes operating at higher scales (e.g., nationally or regionally) can have a detrimental effect on local processes (Patterson, 2016). Collaboration works best when it is between partners that are equally strong or equally weak, as many relationships break down if there is suspicion of one taking advantage of the other (Allen and Clarke Policy and Regulatory Specialist Limited, 2010).

Only two papers referred to farmers’ dislike for bureaucracy (Valentine, 2015) (Crofoot, 2016) but there was much commentary on costs and funding. Costs are important to all stakeholders and can save money (Memon & Weber, 2008) but it also costs money (Eppel, 2013) for things like personal expenditures, threat to participating organisations, and/or the costs in time and effort that it takes to get collaboration off the ground (Allen and Clarke Policy and Regulatory Specialist Limited, 2010), and the costs of having to make on-farm changes (Pannell et al., 2006).

There is consensus in the literature that collaboration can be a lengthy process for a range of reasons (Valentine, 2015); (Eppel, 2013); (Fenemor et al., 2011); (Vereijssen et al., 2017) (Allen et al., 2011) and staying connected is an issue (Klerkx & Nettle, 2013) (Cradock-Henry et al., 2017). One of the biggest challenges in Integrated Catchment Management is the management of cumulative effects, which can cause delays (Fenemor et al., 2011, p. 320). All kinds of issues can arise during collaboration including: imbalances of power; turf and territorial issues; differences in organisational norms and procedures; lack of or mis-communication; loss of identity or independence; differential power relations; logistical issues; difficulties in maintaining community accountability, and identifying appropriate community representation (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 19).

Dealing with tension and conflict is hard but necessary (Eppel, 2013) (Allen et al., 2011, p. 18). (Cradock-Henry et al., 2017). Organisational capacity can be a significant barrier to effective collaboration, while large long-term projects can create role confusion and overlapping responsibilities and membership turn-over is an issue (Rijswijk & Brazendale, 2017) (Ekboir, 2012). The collaboration process can fail due to factors related to authority and legitimacy (Eppel, 2013, p. 24) so having a mandate and legitimacy to speak and act on behalf of someone else are crucial.

There is general agreement in the literature that a consensus decision rule is critical (Memon & Weber, 2008). The tendency to discount non-scientific forms of knowledge is a barrier to collaborative approaches (Allen et al., 2011) (Šumane et al., 2017).

6.4. Features of collaborative processes that make them work best for collaborators

This section answers the fourth guiding question - what are the features of collaborative processes that make them work best for farmers and other collaborators?

Drawing on the New Zealand and international published literature, as well as several case studies, nine categories of some of the factors that are likely to promote successful collaborations in the New Zealand context were identified (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 15):

- existing relationships,
- clear, open and frequent communication,
- shared vision,
- collective identity and purpose,
- respect, trust, and honouring diversity,
- strong leadership,
- good governance,
- having the right people involved, and
- a favourable climate.

Local engagement In a research-extension-farmer collaboration context, working with landholders forces researchers and advisors or extension workers to recognise that their own goals may be different to landholders' goals, and such interaction also increases landholders' knowledge of the research and their ownership of, and faith in, the results (Pannell et al., 2006). Social type of knowledge and skills (networking, team building, openness etc.) for working with landowners are required by researchers, but so far have often been neglected or underrepresented in scientific analysis (Šumane et al., 2017, p. 8). Identifying the right participants, ensuring (as far as possible) that there is support for collaboration from the outset, and having a well-designed process will likely result in improved outcomes (Cradock-Henry et al., 2017).

Avoid pressure as far as is reasonably practical Participatory approaches in New Zealand could allow "a move away from the 'big stick' which centres on regulation and fines to promote change, an approach intensely disliked by farmers" (McEntee, 2010, p. 6), because resorting to coercive regulatory or judicial tools may destroy the collaborative process (Memon & Weber, 2008, p. 21). However, if collaborative processes are used by stakeholders to delay or avoid environmental improvements, then the traditional regulatory tools should be considered. Without consistent and adequate enforcement of current regulatory provisions for water management of water allocation and water quality provisions by Environment Canterbury, there was (in 2008) limited incentive for many parties to collaborate (Memon & Weber, 2008, p. 21).

Trust and good relationships Trust is at the core of successful collaboration. Why? Like all people, farmers often find truth in those social relations they trust. Through this process, they can begin to assess how the knowledge claim fits with their personal sense of trustworthiness and, thus, begin to assess the claim's truth-worthiness. Trust depends upon relationships, both past and present, that are borne out of previous relational experiences (Carolan, 2006). This is important because, "upon being presented with a knowledge claim, assuming we are indeed interested in establishing its validity, we quickly seek to link it to a particular social network. 'Who told you that?' or 'Where did you hear that from?' are some of the questions we might ask in order to determine truthfulness" (Carolan, 2006).

Hurlbert and Gupta (2015, p. 103) discuss trust as "trust that people have in those that they know, and 'social trust' or trust that people have in those that they do not know, but there is trust in the social structure within which people interact. Social trust indicates whether people are willing to defer to judgements of other stakeholders in the policy process". Even if people disagree, "social trust can be high if people are willing to cooperate and work towards a common solution. There is a clear link between trust and the levels of citizen involvement and quality of information flows. To build trust increasing information flows and iterative process of involvement are required" (Hurlbert & Gupta, 2015).

If there are already some existing social relationships among the parties the getting-to-know and learning-to-trust processes may be assisted and perhaps shortened, but still takes time. In New Zealand past experience of working with scientists and perceptions of having been exploited or having benefited from the experience coloured the development of new relationships and trust between farmers and extension workers (McEntee, 2010). The results of another analysis did show that in one catchment, previously established social capital and trust from other community initiatives helped to prime the process for success (Cradock-Henry et al., 2017). Studies in the UK (Mills et al., 2011) have highlighted the advantages of working with groups who had either worked together previously or knew each other informally prior to the process of developing collective action. Through previous activities, these groups or networks have developed factors of trust, familiarity, and respect that can only develop through time. They also had the opportunity to learn about how the other members worked, as well as their technical capability and values (Mills et al., 2011, p. 158). Whilst a participatory approach is beneficial it is recognised that in the UK context the complex funding and accountancy structures of co-financed projects means that the ultimate decision-making power must rest with the government, hence, over there, participatory approaches can only supplement, not replace government administrative decision-making processes. Nevertheless, for this approach to work there must be a certain level of trust between the farmer and Government agencies (Mills et al., 2011, p. 162).

In New Zealand, additional time demands, particularly in the early days of a project when stakeholders, like research managers, demand to see progress in the project, are not easily accounted for in project budgets and objective plans, and often accumulate to create pressures on participants (Allen et al., 2011, p. 18).

Collaboration requires high levels of interpersonal, as well as, inter-organisation trust (Eppel, 2013). Trust, or the lack of, is one of the most frequently cited barriers to inter-organisational working (Eppel, 2013, p. 24). Trust is also an issue in integrative research projects and communication must take place in an atmosphere of trust and respect (Phillips, Allen, Fenemor, Bowden, & Young, 2010).

In communities of practice learning is facilitated by interactions between people that build trust, binding its members together into a social entity that shares a repertoire of communal resources

(Allen et al., 2011). The trust embodied in communities of practice provides a safe environment in which people can learn by interacting. Thus, they are useful for sharing tacit and cultural knowledge about practice. It is this characteristic of communities of practice that makes them good tools for building capacity across and between organizations (Allen et al., 2011).

Formal approaches to aspects of collaborative environmental problem-solving (read workshops and meetings) are supported by related informal engagement activities (e.g. those smaller conversations in cabs on the way to airports, etc.) that support long-term relationship and trust building (Allen et al., 2011).

When trust is low, and collaboration must go on none-the-less, like in Canterbury (during 2008), “some stakeholders will likely require additional incentives to participate in good faith, especially in cases where compliance cost burdens are likely to be considerable, are distributed inequitably, and/or involve the diminishment of a stakeholder’s water usage right for the sake of the common good. Others will require binding guarantees prior to fully engaging in a collaborative effort” (Memon & Weber, 2008, p. 22). Resourcing small-scale collaborations and catchment groups “can foster legitimacy and increase the likelihood of a truly representative process when the time comes, and they should be considered” (Cradock-Henry et al., 2017).

In catchments where low trust and weak social capital exist, the collaborative approach to watershed management should be designed to foster trust and a culture of cooperation among relevant stakeholders, including scientists. This is because to the extent that low trust exists, this must be resolved first before one can resolve the information deficit problem (Memon & Weber, 2008, p. 21). Otherwise, opponents will throw up enough “doubt” with their own scientific results that a decision-maker won’t be able to know the best science when they see it anyway (because they are not scientists) (Melnick 1983, cited in Memon and Weber (2008, p. 21). According to Pannell et al. (2006) lack of information has been an issue for farmers for a long time. Phillips (1985), cited in Pannell et al. (2006) have shown “a typical dairy farmer may embark on anything up to 30 learning projects in one year. A landholder (or landholding family) has limited learning time, and each project must compete with the others for that limited time. A minor decision will receive minimal information time, sufficient to achieve an acceptable solution, which is not necessarily the best possible solution. For more important decisions, the dairy farmers in Phillips’ (1985) study sought information from up to 40 people”.

Working together is more likely to be embraced and to be successful when there are incentives to choose a collaborative alternative and the social-political context possesses the capacity to support the kinds of trust- and respect-based, good faith negotiations and relationships required for successful collaborative problem-solving efforts (Memon & Weber, 2008, p. 5).

The design of creative yet purposeful engagement processes based on principles such as trust, respect and open communication are also important in an Integrated Catchment Management context (Fenemor et al., 2011, p. 323) .

Respect and recognition Recognition is a sign of respect⁸ and both are linked to trust. Respect is important before, during and after collaborations and has been mentioned by several authors, in slightly different ways and contexts:

⁸ Respect is a positive feeling or action shown towards someone or something considered important or held in high esteem or regard; it conveys a sense of admiration for good or valuable qualities; and it is also the process of honouring someone by exhibiting care, concern, or consideration for their needs or feelings.
<https://en.wikipedia.org/wiki/Respect>

- A history of respectful relationships between landholders and advocates for the innovation, including scientists, extension agents, other landholders, and private companies will affect farmers' behaviours (Pinxterhuis et al., 2018, p. 24);
- Farmers' "informal knowledge" needs to be recognised, and supports the goals of an inclusive knowledge-based society, which builds on the respect of knowledge diversity broad access to knowledge and everyone being able to share his or her knowledge (Šumane et al., 2017, p. 8);
- Participant norms include civility and respect for others (and their positions) and respect for the past (Memon & Weber, 2008, p. 10);
- A climate of acceptance/cooperation means the acceptance of the concept and processes to be followed by the stakeholders, as well as the willingness to cooperate fairly and constructively (Neumeier, 2016);
- Integrated Catchment Management requires scientists and policy-makers to find ways to walk alongside the people who themselves live and work in the catchment...there is mutual learning based on mutual respect (Fenemor et al., 2011, p. 325);
- In its implementation the Resource Management Act should take positive impacts into account, i.e. the legislation does not allow for positive externalities to be offset against adverse effects; positive externalities may not be taken into account or not recognised – it ignores good stewardship (Valentine, 2015, p. 72);
- Dairy sector innovation policies should address institutional constraints (e.g. provision of leadership – more about it later - and rewards for involvement in co-production processes) (Klerkx & Nettle, 2013).

A holistic, integrated approach Engaging stakeholders in Integrated Catchment Management provides for a holistic approach to managing natural resources by actively involving the different stakeholders with an interest in the resource (Allen et al., 2011).

Researchers should better integrate local social, ecological and economic contexts, or focus on proposing agro-ecological principles rather than generalised ready "recipes". Such principles demand a holistic, systemic approach to farming, which is closer to farmers' own approaches (Šumane et al., 2017, p. 8).

Collaborations also require a particular style of mutual learning which bears different perspectives in mind. Collaborators must learn about the problem and its solutions from each other. They must also learn the way forward through experimentation and learning by doing (Eppel, 2013, p. 11).

Monitoring Authors have mentioned three aspects of monitoring when collaborating: network performance; quality control and compliance; and, goal achievement.

Network performance Regarding the diagnosis of the effectiveness of the Pasture Improvement Leadership Group as a governance mechanism for innovation in, and provisioning of, advisory services, the innovation network concept has helped to identify the critical success factor of regular reflection on the effectiveness of the innovation network, and roles and responsibilities (Rijswijk & Brazendale, 2017, pp. 259-260).

Quality control and compliance Within all the Welsh case studies there was an element of self-monitoring. For example: certain members of one group were appointed inspectors to check the quality of the work, which was evidently an effective way of monitoring, as reputation effects ensured compliance and a high standard of work; another group had a self-regulation and self-monitoring approach to compliance (Mills et al., 2011, p. 160). As mentioned before, a written

“protective” contract that identifies and arranges consequences for defections from the collaborative process is required, as well as active monitoring of agreements to ensure compliance (Memon & Weber, 2008). Monitoring is principle number four of Ostrom’s design principles for managing common-pool resources. It makes those resource users who do not comply with rules visible to the community, which facilitates the effectiveness of rule enforcement mechanisms and informs strategic and contingent behaviour of those who do comply with rules (Ostrom, 1990).

Goal achievement Collaborative institutions should develop milestones, and measure, and monitor progress at regular intervals with respect to the primary social, economic and environmental goals (Memon & Weber, 2008, p. 21). Indicators and targets are required to assess the effectiveness of policy under the Resource Management Act and/or the achievement of local or catchment targets. These indicators can be environmental, social, economic or cultural. Recognising that Integrated Catchment Management has clear social dimensions, indicators may well for example measure trends in community cohesion or levels of conflict (Fenemor et al., 2011, pp. 322-323).

Support stakeholders From the discussion so far, it is evident that collaborating is not easy and farmers in volunteer roles, and other stakeholders need support. There may not be enough skilful leaders around. Training in “soft” skills such as networking, collaboration and joint learning for farmers and other stakeholders could help to strengthen networks, by avoiding over-reliance on a few skilful leaders, and improving the learning outcomes (Šumane et al., 2017, p. 8). Other forms of support are also required, like simple, limited, financial support for organisational expenditures (e.g. printing materials, postal delivery, and travel costs) for learning networking combined with simple and transparent guidelines on how to apply for them would be helpful. Such support would reduce the financial and time constraints faced by dedicated and trusted farmers who are actively engaged in the voluntary work of sharing their knowledge and who often become overburdened (Šumane et al., 2017, p. 8). Another study has demonstrated a need for facilitation skills, particularly to manage the overall direction of collaborative efforts (Allen et al., 2011).

In Wales, all three case studies had external facilitators who were important in supporting farmers to gain access to information and knowledge. For all three groups these facilitators, to varying degrees in each situation, also played an important role in assisting with group development which often required substantial amounts of time and resources. Rather than prescribing changes these facilitators assisted in developing skills required for working together, such as communication, conflict resolution and group decision-making. Importantly, the facilitators avoided “spoon-feeding” the groups, allowing them to gain in strength by resolving their own issues (Mills et al., 2011, p. 160). The case studies also suggested that not all organisations’ staff will make appropriate facilitators, even if they have received appropriate training. The best facilitators, in the opinion of group members, were those people who were local, respected by farmers and able to enter into dialogue with them (Mills et al., 2011, p. 160).

In the dairy sectors of New Zealand and Australia, individual actors were less able to operate effectively in innovation co-production roles without strong institutional support for innovation co-production processes (Klerkx & Nettle, 2013). Institutional constraints included rewards for involvement in co-production processes and support for coordination to avoid duplication of effort (Klerkx & Nettle, 2013).

Credible Commitment The commitment of all stakeholders is important, and it can derive from different motives, but it is especially the intensity and continuity of the actors involved that is important for success (Neumeier, 2016). The commitment of members and membership turn-over

needs to be managed particularly when there is an imbalance in decision-making power (Rijswijk & Brazendale, 2017, p. 260).

In their analysis of international literature on institutional arrangements for the collaborative governance of natural resources Memon and Weber (2008) identified common themes, of which commitment was prominent. They coined the term Credible Commitment, explaining that it entails consistency in words and actions which, together, shows that a participant, along with their “home” organization, is supportive of the collaborative decision process and collective problem resolution (Memon & Weber, 2008, p. 10).

Credible commitment to the collaborative organisation means that participants willingly direct their power and resources to cooperate in good faith toward mutually agreeable decisions and then to promote, protect, and enforce such deals. As cooperation is in good faith, credible commitment requires and evidences respect. This means participants will refrain from renegeing on deals once agreed and will not use private information gained through cooperation for their own advantage (Memon & Weber, 2008, p. 10).

“To the extent that credible commitment exists, the more participants are able to exhibit a high degree of confidence, or trustworthiness in a participant’s behaviour, and the greater the chances for collaborative success as participants become more willing to share private information, receive and accept others’ ideas, and engage in constructive deliberations” (Memon & Weber, 2008, p. 10).

There appears to be five elements that contribute to constructive deliberations (summarised from Memon and Weber (2008, p. 10):

- A high level of credible commitment becomes manifest when stakeholders demonstrate clear and consistent support for collaboration throughout their hierarchy or group.
- All representatives need enough discretion and authority (a mandate) to make agreements and implement decisions, or, at a minimum, need a clear chain of command that is generally supportive of the collaborative effort and has the capacity to act in a timely manner.
- Representation is durable and consistent over time, signalling commitment and increasing the prospects for collaborative success because miscommunication is minimised, and transaction costs reduced. New people can join, but all stakeholders are best served by committing their representatives for long-terms as opposed to a regular rotation system.
- Community of place is important hence participants evoke a clear, strong commitment to the “place” where the collaboration is occurring, its people, and its livelihoods. This requires respect for the past (no matter the mistakes by various actors), an appreciation for the present mix of businesses, livelihoods, and land tenure patterns, and a genuine concern for the goal of ensuring a sustainable future for the people, livelihoods, and place in question.
- Required commitment to a participants’ “home” organisation is not forsaken, but a clear, strong commitment to one’s own organisation or group mission is required because without it there will be little respect for the participant. The inability to make such a commitment weakens the capacity to influence proceedings, raises suspicions about where loyalties lay (i.e., what is their agenda?), and increases the chance they will be replaced by their organisation, along with the probability that deals will be short-lived once the home organisation learns of the breach of trust.

Strong, effective leadership Whatever the chosen level or style of engagement, a collaborative project needs a clear mandate and leadership to support the social and organisational processes required (Allen et al., 2011). Good leadership, accompanied by good governance and effective

communication are vital for ensuring that organisations value and honour the diversity between the groups involved (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 25).

There is general agreement that a distinctive kind of leadership is required for successful collaboration (Memon & Weber, 2008), but authors describe what is required differently. All leadership approaches are not the same, and successful collaboration requires specific leadership roles that facilitate collaboration. Eppel (2013, p. 12) describes three types of leadership roles: Stewards who help to convene collaboration and maintain its integrity; Mediators who manage conflict and arbitrating exchange between stakeholders, and; Catalysts who help to identify and realise value-creating opportunities. Although collaborative leaders are called upon to play multiple roles, the salience of these roles may vary with the circumstances and goals of collaboration (Eppel, 2013, p. 12).

Memon and Weber (2008, p. 9) emphasise the leadership requirement of building collaborative capacity, which “requires leadership traits and skills including such basics as the possession of good communication and listening skills, respect for and ability to work with all sides of an issue, and strong people skills, meaning that the leader is comfortable with, and skilled at, interaction and outreach involving a diversity of different organizations and individuals”.

Moreover, the collaborative leader also is “not afraid to share power because s/he realises this is necessary in order to get to positive sum, or win-win outcomes. In addition, successful collaborative leaders are those with a reputation for high capacity and honest, trustworthy leadership” (Memon & Weber, 2008, p. 9).

Where there are low levels of trust or significant power differentials it is necessary to identify key local individuals who can work across the boundaries between science and the community (McEntee, 2010). People who work well across organisations and disciplinary boundaries have been given the name “boundary spanners”. Boundary spanning revolves around people and organisations working together to manage and tackle common issues, to promote better co-ordination and integration of public services, to reduce duplication, to make the best use of scarce resources and to meet gaps in service provision and to satisfy unmet needs (Williams, 2011, p. 27, cited in Eppel (2013). According to Eppel (2013, p. 10), Williams (2011) noted four boundary spanner roles: managing and working with a network of people; making things happen and getting results; awareness and appreciative of multiple interests while building collective action; organising, planning, co-ordinating and servicing the collaborative “machinery”.

For all three case studies in Wales, success was in part due to competent and imaginative leadership (Mills et al., 2011, p. 159). There were leaders who were willing, and able, to stimulate action in their local areas. If such leadership is not present in these situations, collective action may not occur even though every individual would actually like to co-operate with the others (Mills et al., 2011).

Leaders can also be provided for at the policy level, for example, dairy sector innovation policies should address institutional constraints like the provision of leadership (Klerkx & Nettle, 2013).

SYNOPSIS of the features of collaborative processes that make them work best for farmers. Nine categories of some of the factors that are likely to promote successful collaborations in the New Zealand context were identified (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 15) namely: existing relationships; clear, open and frequent communication; shared vision; collective identity and purpose; respect, trust, and honouring diversity; strong leadership; good governance; having the right people involved; and, a favourable climate. Further, local engagement (Pannell et al., 2006), the right skill sets for scientists (networking, team building,

openness etc.) (Šumane et al., 2017, p. 8) and identifying the right participants are crucial (Cradock-Henry et al., 2017). Pressure on farmers should be avoided as far as is reasonably practical (McEntee, 2010, p. 6) (Memon & Weber, 2008).

Trust is at the core of successful collaboration and slowly built (Carolan, 2006) so if there are already some existing social relationships among the parties it can speed the process up (Cradock-Henry et al., 2017) (Mills et al., 2011). Trust, or the lack of, is one of the most frequently cited barriers to inter-organisational working (Eppel, 2013) and is also an issue in integrative research projects (Phillips et al., 2010). When trust is low, and collaboration must go on none-the-less additional incentives to participate in good faith might be required, as well as binding guarantees prior to fully engaging a collaborative effort (Memon & Weber, 2008). Recognition is a sign of respect and both are linked to trust. Respect is important before, during and after collaborations and has been mentioned by many authors (Pinxterhuis et al., 2018); (Šumane et al., 2017); (Memon & Weber, 2008); (Neumeier, 2016); (Fenemor et al., 2011); (Valentine, 2015); (Klerkx & Nettle, 2013).

A holistic, integrated approach is required (Allen et al., 2011) (Šumane et al., 2017) (Eppel, 2013). Three aspects of monitoring when collaborating have been discussed by authors: network performance (Rijswijk & Brazendale, 2017); quality control and compliance (Memon & Weber, 2008) (Mills et al., 2011); and, goal achievement (Memon & Weber, 2008) (Fenemor et al., 2011).

From the review it is evident that collaborating is not easy and farmers in volunteer roles, and other stakeholders need support with a range of skills and resources (Šumane et al., 2017). (Mills et al., 2011, p. 160) (Klerkx & Nettle, 2013) (Allen et al., 2011). The commitment of all stakeholders is important (Neumeier, 2016) (Rijswijk & Brazendale, 2017) and it must be credible (Memon & Weber, 2008). To the extent that credible commitment exists, the more participants are able to exhibit a high degree of confidence, or trustworthiness in a participant's behaviour, and the greater the chances for collaborative success as participants become more willing to share private information, receive and accept others' ideas, and engage in constructive deliberations (Memon & Weber, 2008, p. 10). Strong, effective leadership is required (Allen et al., 2011). There is general agreement that a distinctive kind of leadership is required for successful collaboration (Memon & Weber, 2008), but authors described what is required differently. Where there are low levels of trust or significant power differentials it is necessary to identify key local individuals who can work across the boundaries between science and the community (McEntee, 2010). People who work well across organisations and disciplinary boundaries have been given the name "boundary spanners", who have four roles (Williams 2011, cited by Eppel (2013): managing and working with a network of people; making things happen and getting results; awareness and appreciative of multiple interests while building collective action; organising, planning, co-ordinating and servicing the collaborative "machinery".

7. Māori and collaborative processes

This section of the review answers the question – what does the review find in terms of Māori and collaboration for improved environmental outcomes in the Waikato?

Six key papers from the grey and academic literatures provided evidence for this review on Māori and voluntary collaboration. The discussion broadly follows the order in which these documents are listed below.

- Coombes (2007) analysed and critiqued Māori restoration of Lake Whakaki from a community-based natural resource management perspective.

- Memon and Weber (2008) emphasised inclusiveness during collaboration and drew upon the increasingly voluminous international literature on collaborative approaches to watershed, natural resource, and ecosystem management to critically appraise the potential for successful collaborative governance of water resources in New Zealand, with specific reference to the Canterbury region.
- Wendy Boyce Consulting (2015) analysed collaboration in freshwater management in the Waikato catchment by describing the establishment phases of the Healthy Rivers Wai Ora project from a council practitioner's perspective.
- Hungerford (2015) provided an overview of the community-based environmental sector in the Waikato Region showing the complexity thereof.
- Hungerford (2017) provided an overview of the perceptions of the community-based environmental sector in the Waikato Region, and the challenges and opportunities they face.
- The literature review of Allen and Clarke Policy and Regulatory Specialist Limited (2010) focused on what works for encouraging collaboration between community organisations.

Legitimacy and power devolution The basic assumptions by community-based natural resource management proponents that conservation will achieve sufficient legitimacy with rural populations only where it is subject to decentralised governance, community consensus and economic development were critiqued by (Coombes, 2007) in New Zealand in a case study of Māori restoration of Lake Whakaki. Coombes (2007, p. 60) labelled these assumptions “narrow and biocentric⁹, failing to enlist popular support” but, “outwardly, the rationale for community-based natural resource management is convincing”. Community-based natural resource management endorses spatial devolution of authority for private and public resources but also sanctions greater use of rural commons which would otherwise be destined for expansion of public conservation areas (Coombes, 2007, p. 70).

Coombes (2007, p. 61) further argued the notion of concurrent use and conservation of community-based natural resource management “may be particularly appealing to Māori, who typically reject biocentrism as an affront to their mana whenua (authority over the land)”. Further, “Māori are suspicious of collaborative conservation models that offer greater involvement in the protection areas, but which do not address their land claims or bestow opportunities for development” (p.61).

In practice, the devolution of power has been nominal and lacked empowering of communities to manage ecological processes, and capturing the benefits of the benefits of community-based natural resource management was also nominal, like in the restoration of Lake Whakaki (Coombes, 2007, p. 61). That is because “community processes cannot be disassociated from catchment-scale politics” (Coombes, 2007, p. 61). In the case of Lake Whakaki the restoration by Māori was an expression of sovereignty, and looking ahead this might cause difficulties for policy makers who have to work out how to incorporate different expressions of sovereignty in conservation policy to secure indigenous support (Coombes, 2007, p. 70).

Customary water rights and legalities However, collaboration in freshwater management planning is relatively new (Wendy Boyce Consulting, 2015, p. 3). In addition, lack of clarity pertaining to Māori customary water rights guaranteed in the Treaty of Waitangi is an unresolved issue that has constrained the willingness of people in many parts of New Zealand to collaborate with Māori when it comes to water resources (Memon & Weber, 2008, pp. 18-19). Moreover, “the incorporation of Māori cultural values, practices, and rights pertaining to water creates tremendous challenges for

⁹ Biocentrism is the view or belief that the rights and needs of humans are not more important than those of other living things.

water resources planning, allocation and management given the stark differences between existing water resource institutions, rights and practices and the communal emphasis in Māori society, their holistic perspective of water as a taonga (a treasure), the belief that no separation can be made between water in a river, the riverbed and surrounding land, their stance against the mixing of water from different catchments, and Māori customary water ownership and management rights as recognised in the Treaty of Waitangi¹⁰ (Memon & Weber, 2008, pp. 18-19).

There is a complex set of Deeds and legal agreements that govern collaborations between Māori and the Crown generally, and in the Waikato specifically. In 2008 Waikato-Tainui and the government of New Zealand signed a Deed of Settlement to settle the tribe's claim to the Waikato River. A further version was signed in 2009. The premise of the settlement was the Raupatu by which Waikato-Tainui had both the lands and the river taken (Hungerford, 2015, p. 8). Then, further legislation in 2010 resulted in a new era of Crown-Iwi co-management of the Waikato River catchment. Co-management provides iwi with mechanisms to manage the river in partnership with central and local government. There are three key pieces of legislation relevant to the co-management of the Waikato River Catchment (from Hungerford (2015, p. 8):

- Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 which covers Waikato-Tainui and its involvement in co-managing the Waikato River from the Karāpiro Dam to Te Puaha o Waikato (Port Waikato).
- Ngāti Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Act 2010, covering Ngāti Tūwharetoa, Raukawa and Te Arawa river iwi (specifically the hapū Ngāti Tahu - Ngāti Whaoa, Ngāti Kearoa - Ngāti Tuarā and Tuhourangi - Ngāti Wahiao), which covers the Waikato River from Te Toka a Tia near Taupō through to Karāpiro.
- Ngā Wai o Maniapoto (Waipa River) Act 2012, covering Ngāti Maniapoto and enabling them to enter into co-management arrangements with local government authorities for the Waipa River.

For the Waikato Region Hungerford (2015, p. 8) explains, , “co-management arrangements in the community-based environmental sector include joint management agreements between iwi and the Waikato Regional Council, and iwi and District Councils, on the way they will work together to improve water quality in the catchment, as well as the establishment of the Waikato River Authority”. The latter is an important feature of the environmental sector in the Waikato Region. It is an independent Crown-Iwi organisation charged with administering more than \$250million, over 25 years, to help achieve a healthier Waikato River (Hungerford, 2015).

Inclusiveness is key to successful collaborations and therefore must include a broad cross-section of stakeholders across interests, governmental jurisdictions, and agencies with responsibilities to address the wicked conservation problem¹¹ in question (Memon & Weber, 2008). The inclusivity factor is important for reasons of democratic legitimacy and practical considerations related to

¹⁰ The Treaty of Waitangi is the founding document of New Zealand. It is an agreement entered into by representatives of the Crown and of Māori iwi (tribes) and hapū (sub-tribes). It is named after the place in the Bay of Islands where the Treaty was first signed, on 6 February 1840. The Treaty was not drafted as a constitution or a statute. It was a broad statement of principles upon which the British officials and Māori chiefs made a political compact or covenant to found a nation state and build a government in New Zealand to deal with pressing new circumstances. <https://nzhistory.govt.nz/politics/treaty/treaty-faqs>

¹¹ A wicked problem is a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognise. https://en.wikipedia.org/wiki/Wicked_problem

problem solving and policy implementation (Memon & Weber, 2008). Failure to practice inclusion thus lessens the probability that implementation and the establishment of the kinds of durable, effective policy programs able to deliver long-term problem-solving benefits will occur” (Memon & Weber, 2008, pp. 18-19).

To abide by the law and to improve the effectiveness of their collaborative approach, three “wider community audiences” including dispersed Māori communities were identified in the Healthy Rivers Wai Ora Engagement Strategy of the Waikato Regional Council (Wendy Boyce Consulting, 2015, p. 10). The wider community focuses on those people who are not impacted by the policy change as directly as a member of the farming community but may wish to know what’s happening and may engage from time to time in the project. They are likely to be impacted more directly by the policy when funding options are being explored and in later phases of the project (Wendy Boyce Consulting, 2015, p. 10). The three wider audiences were: the community and general public, e.g. ratepayers’ and residents’ associations and broader cultural, economic and social interests; farming and local communities, especially individual farmers and catchment; “Māori communities, who can be reached through channels such as regional management committees, marae committees and land trusts, as well as through special-purpose meetings on matters such as iwi environmental plans and strategy development” (Wendy Boyce Consulting, 2015, p. 10).

This inclusiveness is important, as there is general agreement that “the effectiveness of a collaborative approach is contingent on having in place appropriate institutional arrangements that take into account the nature of the problem as well as the social, economic, and political context” (Memon & Weber, 2008, p. 2). Moreover, as has been shown before, all forms of knowledge should be acknowledged. Interestingly, Stephenson & Moller (2009, cited in Fenemor et al. (2011, p. 323) characterised western science as “knowledge seeking” while traditional knowledge, such as Māori ecological knowledge, was described as “knowledge holding”. Further, “because catchments and their communities are shaped as much by cultural and social interactions as water and nutrient dynamics local, indigenous and anecdotal knowledge needs to be considered alongside science, so that all types of knowledge can inform debate and enable subsequent actions” (Fenemor et al., 2011, p. 323). But this is difficult on the ground. For example, in the Waikato it was “a challenge to provide the space for local knowledge and mātauranga to be shared alongside the mainstream technical and policy considerations” (Wendy Boyce Consulting, 2015, p. 23).

On the ground complexities and practicalities Including Māori in collaborative freshwater management planning in the Waikato is also challenging for practical and logistical reasons: there are many different groups and groupings, some of which have their own arrangements like joint management plans¹² with local authorities and /or their own Iwi Environmental Management Plans¹³ that are taken into account by the Waikato Regional Council. There are specific legislative requirements which place a duty on council staff to take these plans into account. In 2015 there were 12 current Iwi Environmental Management Plans¹⁴ in the Waikato Regional Council Region

¹² A joint management plan is a plan for how the iwi and the local authority will work together in regard to the co-management of the Waikato River (Hungerford, 2015, p. 7).

¹³ An Iwi Environment Management Plan is a document developed and approved by iwi to address matters of resource management activity of significance within their respective rohe (Hungerford, 2015).

¹⁴ Hauraki - Whaia te Mahere Taiao a Hauraki; Ka Ru a Poutama - Te Whakauakitanga o Poutama (Iwi Management Plan 2010); Maniapoto - He Mahere Taiao; Motakotako Marae Hapu Management Plan; Ngāti Hikairo Iwi Management Plan - Freshwater; Ngāti Hikairo Heritage Management Plan; Raukawa Fisheries Plan; Te Rautaki Taiao A Raukawa - Raukawa Environmental Management Plan 2015; Rising above the mist - Te aranga ake i te taimahatanga : Ngāti Tahu - Ngāti Whaoa Iwi Environmental Management Plan; Tahinga

(Hungerford, 2015). Hungerford (2015, pp. 5-6) listed the six principal iwi¹⁵ who have tribal areas within the Waikato Region Council. In addition, there are three principal iwi who have tribal areas within the Ruapehu District¹⁶. Within these iwi, there are numerous hapū, and the rohe of the iwi and hapū extend beyond, and across regional and local council boundaries (Hungerford, 2015). Hungerford (2015, p. 7) estimated a total of 285 Marae across the Waikato Region¹⁷.

There are also various Māori governance structures like trust boards, iwi authorities, rūnanga and other entities, such as marae committees and iwi collectives, who represent the iwi and hapū for different purposes (e.g. on matters relevant to the Resource Management Act) (Hungerford, 2015).

Amidst this complex web of social and cultural structures, arrangements and obligations it is challenging to get the “right” Māori representation in collaborative projects. Moreover, there is no one right answer about “how to do it” because each collaboration project is unique (Wendy Boyce Consulting, 2015, p. 3).

Representation Issues with representation that cropped up in the Waikato were because “some stakeholders believed that the collaborative stakeholder group should comprise only those stakeholders who would be submitters and/or appellants to the regional plan. They did not agree with community representation, on the basis that these individuals were not accountable to a constituency. Others believed that community seat holders would bring new skills and perspectives, demographic balance, independence and local connections” (Wendy Boyce Consulting, 2015, pp. 16-17). The key challenges with the appointment process related to the final composition of the collaborative stakeholder group and the way in which these decisions were made. Moreover, there was a “tension for iwi partners to the project about ensuring sufficient Māori representation on the collaborative stakeholder group, without being seen to be ‘railroading’ a particular perspective”. When “asked beforehand if they wanted to set aside an allocation of seats for Māori representation, they decided not to take up that option. So, just one of their proposed 16 sector seats was allocated to ‘Māori interests’”. “This left decision makers in a difficult position in order to ensure Māori voices were part of the collaborative group as well as the governance structures. If not, they ran a dual risk that tangata whenua voices and values might be absent from the process and also that the collaborative stakeholder group might come up with recommendations that were not acceptable to iwi decision-making partners” (Wendy Boyce Consulting, 2015)

“Some community representatives and Māori interest representatives were replaced on the collaborative stakeholder group after they withdrew early on. The group also made a call that it would be too hard for new people to come into the process after the sixth workshop” (Wendy Boyce Consulting, 2015, p. 22).

Environmental Management Plan; Te Arawa River Iwi Trust - Fisheries Plan; Te Arawa River Iwi Trust - Environmental Management Plan; Tūwharetoa - Ngāti Tūwharetoa Iwi Environmental Management Plan; and Waikato-Tainui Environmental Plan, Tai Tumu, Tai Pari, Tai Ao.

¹⁵ Waikato-Tainui, Ngāti Maniapoto, Ngāti Raukawa, Hauraki, Ngāti Tūwharetoa, and Te Arawa (Ngāti Tahu - Ngāti Whaoa; Ngāti Kearoa - Ngāti Tuarā; Tūhourangi - Ngāti Wāhiao).

¹⁶ Ngāti Tūwharetoa, Ngāti Maniapoto, and some Hauāuru iwi (including Te Atihaunui a Papārangī, Ngāti Rangī, Ngāti Maru).

¹⁷ The Marae across the various rohe were: Waikato-Tainui: 68 Marae; Ngāti Raukawa: 31 Marae; Ngāti Maniapoto: 54 Marae; Hauraki: 30 Marae; Ngāti Tūwharetoa: 44 Marae; Te Arawa (Ngāti Tahu - Ngāti Whaoa; Ngāti Kearoa - Ngāti Tuarā; Tūhourangi - Ngāti Wāhiao): 26 Marae; and Hauāuru (Te Atihaunui a Papārangī, Ngāti Rangī, Ngāti Maru): 32 Marae (Hungerford, 2015, p. 7).

Complex processes Collaboration and coordination involve and create complex processes. For example, collaborative processes created new coordination challenges for the Waikato Regional Council plan-making process such as how to coordinate and blend the interface(s) between: technical specialists (council, CRI, other) and the collaborative stakeholder group; iwi and council (as decision-making bodies) and the collaborative stakeholder group; planners as statutory policy designers and the collaborative stakeholder group; and broader council staff and the collaborative stakeholder group (Wendy Boyce Consulting, 2015, p. 27).

From a different perspective Hungerford (2017, p. iii) identified several ways in which collaborating, coordinating and networking occurred within the Waikato region for iwi-based environmental sector organisations: regional networking; ‘umbrella’ co-ordination or support organisations; local collaborative groups or organisations; NGO and government relationships; and local level collaborations and networks including cross-sector, working with iwi and general networking. It is therefore unsurprising that iwi-based environmental sector organisations’ relationships with Waikato Regional Council were varied (Hungerford, 2017, p. 45). Their experiences varied from “frustration” to “good working relationship and support from staff and Māori councillors”.

How iwi-based environmental sector organisations worked with iwi occurred at a number of different levels including: “governance levels, with local authorities and central government; ‘community’ levels with locally- based groups as supporters, committee members and partners; and ‘iwi’ levels with varying levels and types of support, such as in-kind, funding and/or resource from iwi trusts” (Hungerford, 2017, pp. 45-46).

Iwi groups and organisations “often had a wider vision than ‘just environment, related to iwi development, succession and kaitiakitanga and as well, many faced significant and specific challenges, such as being under-resourced for kaitiaki and consent tasks, requiring support to access ‘expertise’ across a range of kaupapa and to create pathways and opportunities to enhance skills to mobilise and sustain the workforce” (Hungerford, 2017, p. 51).

Limited capacities Māori organisations often have a limited pool of people with sufficient mana, skill and commitment to be involved in strategic development meetings of a collaboration, so there is potential for volunteer fatigue. In the New Zealand context, there is evidence that this particularly affects Kaumatua and Kuia, who have a sense of obligation to be involved in most projects in their community. However, this can result in fatigue, as these often elderly Kaumatua and Kuia may be obliged to be at multiple meetings across a week (Knox, 2004, cited in Allen and Clarke Policy and Regulatory Specialist Limited (2010).

Iwi organisations identified capacity building needs for their organisation and/or iwi in relation to community-based environmental work (Hungerford, 2017, p. 50). These were: up skilling and/or support in operations and project management; opportunities to increase knowledge in specialist areas; access to professional expertise; support for iwi to become engaged in the mahi; support and resourcing for consultation activities; support to ensure the ‘human resource’ has the incentive to engage; and support with local needs and aspirations. Meeting the above needs could include both resourcing of the groups themselves and resourcing, strengthening and widening the scope of existing umbrella organisations to provide support and access to expertise (Hungerford, 2017, p. 50).

Conflict Factors that cause conflict during collaboration can arise from the differing protocols, structures, systems, cultures and values of individual agencies (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, pp. 19-20). Conflicts can also arise from differing world views. For Māori, often involvement in community activity is based on cultural obligation and contains the

implication of reciprocity. However, if this world view is not held by partners in collaboration, conflicts can occur (Allen and Clarke Policy and Regulatory Specialist Limited, 2010, p. 19).

SYNOPSIS of the findings of the review find in terms of Maori and collaboration for improved environmental outcomes in the Waikato Region. The basic assumptions by community-based natural resource management proponents failed to enlist popular support even though they are outwardly convincing (Coombes, 2007), for example in the restoration of Lake Whakaki (Coombes, 2007, p. 61). Māori are suspicious of collaborative conservation models that offer greater involvement in the protection areas, but ignore their land claims or ignore opportunities for development (Coombes, 2007). Māori typically reject biocentrism as an affront to their mana whenua (Coombes, 2007).

Customary water rights and legal considerations are crucial when it comes to Maori and freshwater management planning, the latter being a relatively new area (Wendy Boyce Consulting, 2015).

There is a complex set of Deeds and legal agreements that govern collaborations between Māori and the Crown generally, and in the Waikato specifically, with three key pieces of legislation relevant to the co-management of the Waikato River Catchment (Hungerford, 2015); Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010; Ngāti Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Act 2010; and Ngā Wai o Maniapoto (Waipa River) Act 2012. In the Waikato Region co-management arrangements in the community-based environmental sector include joint management agreements between Iwi and the Waikato Regional Council and District Councils, as well as the establishment of the Waikato River Authority (Hungerford, 2015).

Inclusiveness is key to successful collaborations and must include a broad cross-section of stakeholders for reasons of democratic legitimacy and practical considerations related to problem solving and policy implementation (Memon & Weber, 2008). To abide by the law and to improve the effectiveness of their collaborative approach, three “wider community audiences” including dispersed Māori communities were identified in the Healthy Rivers Wai Ora Engagement Strategy of the Waikato Regional Council (Wendy Boyce Consulting, 2015). This inclusiveness is important, as there is general agreement in the literature that effective collaborative approaches hinge on appropriate institutional arrangements that consider the nature of the problem and the social, economic, and political context (Memon & Weber, 2008) and consider all forms of knowledge (Fenemor et al., 2011). Although, this is difficult in practice (Wendy Boyce Consulting, 2015).

Including Māori in collaborative freshwater management planning in the Waikato is also challenging for practical and logistical reasons: there are many different groups and groupings, some of which have their own arrangements like joint management plans with local authorities and /or their own Iwi Environmental Management Plans that are taken into account by the Waikato Regional Council (Hungerford, 2015). There are also various Māori governance structures like trust boards, Iwi authorities, rūnanga and other entities, such as marae committees and Iwi collectives, who represent the Iwi and hapū for different purposes (e.g. on matters relevant to the Resource Management Act) (Hungerford, 2015). Amidst this complex web of social and cultural structures, arrangements and obligations it is challenging to get the “right” Māori representation in collaborative projects, and unsurprisingly, issues with representation that cropped up in the Waikato (Wendy Boyce Consulting, 2015).

Collaboration and coordination involve and create complex processes and provided challenges for the Waikato Regional Council plan-making process (Wendy Boyce Consulting, 2015). There are several ways in which collaborating, coordinating and networking occurred within the Waikato

region for Iwi-based environmental sector organisations, and how they worked with Iwi occurred at a number of different levels (Hungerford, 2017).

Māori organisations often have a limited pool of people with sufficient mana, skill and commitment to be involved in strategic development meetings of a collaboration, so there is potential for volunteer fatigue (Allen and Clarke Policy and Regulatory Specialist Limited, 2010). That is why Iwi organisations identified capacity building as one of their multiple needs (Hungerford, 2017). For Māori, often involvement in community activity is based on cultural obligation and contains the implication of reciprocity. However, if this world view is not held by partners in collaboration, conflicts can occur (Allen and Clarke Policy and Regulatory Specialist Limited, 2010).

8. Comparison between the review findings and Ostrom (1990)

Although water quality is not a traditional common pool resource problem, in the presence of some form of external threat or regulation associated with degradation, the diffuse loss of nitrate to waterways is transformed into a common pool resource problem (Parsons, 2016). The seminal work of Ostrom (1990) is therefore of relevance for comparing the findings of this review against. The purpose of the comparison is assessing how the findings of this review stack up against the eight design principles of Ostrom's model for governing common pool resource problems.

In her critique of the Land and Water Forum from a collaborative environmental governance perspective Brower (2016, p. 392) described the underlying logic of Ostrom's approach as follows:

“The idea of common-pool ownership of a resource and its problems is to empower those affected by it to take ownership of the problem, manage its causes, and mitigate its effects. The underlying logic is that those affected by the problem have the most knowledge of it and are most motivated to manage and mitigate it for the benefit of all in the long-term (Ostrom 1990). Parties affected include those who benefit from a resource held in common, like water users, and those harmed by its diminution. In other words, common pool ownership of a resource extends ownership rights to the beneficiaries”.

Cox et al. (2010) describe Ostrom's principles as follows:

- Principle 1: Well-defined boundaries: the presence of well-defined boundaries around a community of users and boundaries around the resource system this community uses
- Principle 2: Congruence between appropriation and provision rules and local conditions: The first condition is that both appropriation and provision rules conform in some way to local conditions; Ostrom emphasises local conditions of the Common Pool Resources, such as its spatial and temporal heterogeneity. The second condition is that congruence exists between appropriation and provision rules.
- Principle 3: Collective-choice arrangements: “most individuals affected by the operational rules can participate in modifying the operational rules.” This principle is in the spirit of a large amount of literature on the importance of local knowledge in natural resource management (e.g., Berkes et al. 2000), in which local users have first-hand and low-cost access to information about their situation and thus a comparative advantage in devising effective rules and strategies for that location, particularly when local conditions change.
- Principle 4: Monitoring: we treated principle 4 as two subcomponents. Principle 4A stipulates the presence of monitors, whereas 4B stipulates the condition that these monitors are members of the community or otherwise accountable to those members. Monitoring makes those who do not comply with rules visible to the community, which facilitates the

effectiveness of rule enforcement mechanisms and informs strategic and contingent behaviour of those who do comply with rules.

- Principle 5: Graduated sanctions: Sanctioning deters participants from excessive violations of community rules. Graduated sanctions progress incrementally based on either the severity or the repetition of violations. Graduated sanctions help to maintain community cohesion while genuinely punishing severe cases; they also maintain proportionality between the severity of violations and sanctions, similar to the proportionality between appropriation and provision rules from principle 2.
- Principle 6: Conflict-resolution mechanisms: systems with low-cost conflict resolution mechanisms are more likely to survive. Conflict over an exhaustible resource is inevitable in Common Pool Resource management, necessitating the presence of established mechanisms for conflict resolution to maintain collective action.
- Principle 7: Minimum recognition of rights: external government agencies do not challenge the right of local users to create their own institutions.
- Principle 8: Nested enterprises: in successful systems, “governance activities are organized in multiple layers of nested enterprises”. Many scholars, particularly those focusing on pastoral and irrigation systems, have stressed the importance of nesting smaller common-property systems in larger and still larger ones, given the high probability that the social systems have cross-scale physical relationships when they manage different parts of a larger resource system and thus may need mechanisms to facilitate cross-scale cooperation.

Table 1 shows the papers in the literature review that concur with the eight principles of Ostrom (1990).

Table 1 Reviewed papers and documents that concur with the eight principles of Ostrom (1990).

Ostrom’s Principles	Papers or documents that support Ostrom’s Principles	
	Grey Literature	Academic Literature
1 Well-defined boundaries	Allen and Clarke Policy and Regulatory Specialist Limited (2010); Hungerford (2015); Parminter et al. (2007).	Coombes (2007); Cradock-Henry et al. (2017); Memon and Weber (2008); Youl et al. (2006).
2 Congruence between appropriation and provision rules and local conditions	Allen and Clarke Policy and Regulatory Specialist Limited (2010); Hungerford (2015); Hungerford (2017); Newman (2016); Wendy Boyce Consulting (2015).	Allen et al. (2011); Allen et al. (2017); Memon and Weber (2008); Morrar (2015); Rijswijk and Brazendale (2017).
3 Collective-choice arrangements	Allen and Clarke Policy and Regulatory Specialist Limited (2010); Mackenzie and Harcombe (2011); Ministry for the Environment (2015); NZ Landcare Trust (2012b); Wendy Boyce Consulting (2015).	Memon and Weber (2008); Mills et al. (2011); Sinner et al. (2015).
4 Monitoring	Connolly (2018); Loney (2018a); Steel (2018); Waugh (2011).	Fenemor et al. (2011) Jarrett et al. (2015); Memon and Weber (2008); Mills et al. (2011); Rijswijk and Brazendale (2017).
5 Graduated sanctions	Mackenzie and Harcombe (2011); Perkins (2016); Stowell (2019); Tikkisetty and McLay (2011).	Memon and Weber (2008); Parsons (2016).

6 Conflict-resolution mechanisms	Allen and Clarke Policy and Regulatory Specialist Limited (2010); Connolly (2018); Dodd et al. (2009); Ministry for the Environment (2015); Tikkisetty and McLay (2011).	Allen et al. (2011); Eppel (2013); Jarrett et al. (2015); Kilvington et al. (2011); Mills et al. (2011) Sinner et al. (2015).
7 Minimum recognition of rights	J. Brown (2018); Connolly (2018); Loney (2018a); Perkins (2016); Waikato Regional Council (2016); Wendy Boyce Consulting (2015); Hungerford (2015).	Memon and Weber (2008).
8 Nested enterprises	Hungerford (2017).	Fielke and Srinivasan (2017); Oakden et al. (2014); Wilson (2012); Rijswijk and Brazendale (2017)

From table 1 it is evident that the New Zealand and international grey and academic literatures strongly support the eight principles of Ostrom (1990) for Common Pool Resource management. This means these principles could be used as guidelines for farmer-led, collaborative, sub-catchment and catchment policy methods and plans in the Waikato Catchment.

9. Appendix 1: Summary of Ostrom's (1990) rules for governing Common Pool Resources

This box is from Jarrett et al. (2015, p. 12).

Box 1: Ostrom's (1990) rules for the successful governance of Common Pool Resources (CPRs) (as summarised by Mills et al. 2012, p.17):

1. Clear definition of areas, people and entitlement to resources.
2. Rules are individually tailored to local circumstances rather than generally or universally imposed.
3. Individuals affected by the rules can participate in collective-choice modifications of those rules.
4. Self-monitoring – Those monitoring the condition of the land (or CPR), and behaviour of its participants, are either participants themselves or answerable to them.
5. There are graduated sanctions for those breaking rules, and these are applied by fellow participants.
6. There are low-cost local arenas to resolve conflicts amongst participants or between officials and participants.
7. Minimal interference – the right to devise institutional arrangements are not subject to external interference by government authorities. The participants 'own' the design.
8. Where CPRs are parts of larger systems, there are nested enterprises to ensure monitoring, enforcement and conflict resolution.

10. References

- Allen and Clarke Policy and Regulatory Specialist Limited. (2010). *'What Works' to achieve effective collaboration between community organisations – a literature review. Final Report.* Retrieved from Wellington: www.allenandclarke.co.nz
- Allen, W., Cruz, J., & Warburton, B. (2017). How Decision Support Systems can benefit from a Theory of Change Approach. *Environmental Management*, 1-10. Retrieved from <http://dx.doi.org/10.1007/s00267-017-0839-y>. doi:10.1007/s00267-017-0839-y
- Allen, W., Fenemor, A., Kilvington, M., Harmsworth, G., Young, R., Deans, N., . . . Smith, R. (2011). Building collaboration and learning in integrated catchment management: the importance of social process and multiple engagement approaches *New Zealand Journal of Marine and Freshwater Research*, Sept.
- Bay of Plenty Regional Council. (2019, 01 February 2019). Farmers from the Rerewhakaaitu community are taking practical steps to protect water quality in their local lakes. Retrieved from <https://www.boprc.govt.nz/your-council/news/news-and-media-releases/media-releases-2019/february-2019/rerewhakaaitu-farmers-managing-nutrients-to-protect-local-lakes/>
- Beckford, C., & Barker, D. (2007). The role and value of local knowledge in Jamaican agriculture: adaptation and change in small-scale farming. *The Geographical Journal*, 173(2), 118-128. Retrieved from <https://rgs-ibg.onlinelibrary.wiley.com/doi/abs/10.1111/j.1475-4959.2007.00238.x>. doi:10.1111/j.1475-4959.2007.00238.x
- Bewsell, D., Mackay, A., Kaye-Blake, W., Dynes, R., Montes de Oca Munguia, O., & Brown, M. (2017). Collaborative processes for exploring rural futures: The Exploring Futures Platform. *Rural Society*, 26(1), 48-68. doi:10.1080/10371656.2017.1283734
- Botha, C. A. J., Parminter, T., & Bewsell, D. (2008). *Learning from success: Adoption of nutrient budgeting at Rerewhakaaitu and Toenepi.* Retrieved from Hamilton: https://www.researchgate.net/publication/282121345_Learning_from_success_Adoption_of_Nutrient_Budgeting_at_Rerewhakaaitu_and_Toenepi
- Botha, N., Turner, J. A., Fielke, S. J., & Klerkx, L. (2017). Using a co-innovation approach to support innovation and learning: Cross-cutting observations from different settings and emergent issues. *Outlook on AGRICULTURE*, 46(2), 87-91. Retrieved from <http://journals.sagepub.com/doi/pdf/10.1177/0030727017707403>. doi:10.1177/0030727017707403
- Brower, A. L. (2016). Is collaboration good for the environment? Or, what's wrong with the Land and Water Forum? *New Zealand Journal of Ecology*, 40(3), 390-397. Retrieved from <http://newzealandecology.org/nzje/3272.pdf>.
- Brown, J. (2018). *Likely trends of dryland farming as a permitted activity in the Hurunui and Waiau Zone (In the context of water quality discussions). On behalf of Hurunui District Landcare Group.* Retrieved from <https://www.google.co.nz/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwiB0oPerYrhAhUWUI8KHUOC4sQFjAAegQIABAC&url=https%3A%2F%2Fapi.ecan.govt.nz%2FtrimPublicAPI%2Fdocuments%2Fdownload%2F3459836&usg=AOvVaw0n18IUTV8zHMdArG04QHew>
- Brown, M., Fielke, S., Mackay, A., Nelson, T., Payne, P., Rhodes, T., . . . Walcroft, J. (2016). *It's everybody's business: whole farm plans – a vehicle for implementing policy.* Retrieved from
- Brown, M. A. (2018). *Research report: Transforming community conservation funding in New Zealand.* Retrieved from
- Burton, R. J. F., & Paragahawewa, U. H. (2011). Creating culturally sustainable agri-environmental schemes. *Journal of Rural Studies*, 27(1), 95-104. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0743016710000720>. doi:<https://doi.org/10.1016/j.jrurstud.2010.11.001>

- Carolan, M. S. (2006). Social change and the adoption and adaptation of knowledge claims: Whose truth do you trust in regard to sustainable agriculture? *Agriculture and Human Values*, 23(3), 325-339. Retrieved from <https://doi.org/10.1007/s10460-006-9006-4>. doi:10.1007/s10460-006-9006-4
- Connolly, J. (2018). *TANK plan change: Barriers and risks to the adoption of proposed mechanisms to coordinate management action* (HBRC Contract #SD-18-007). Retrieved from <http://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/TANK%20barriers%20report.pdf>
- Coombes, B. (2007). Defending community? Indigeneity, self-determination and institutional ambivalence in the restoration of Lake Whakaki. *Geoforum*, 38(1), 60-72. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0016718506000637>. doi:<http://dx.doi.org/10.1016/j.geoforum.2006.05.006>
- Coudel, E., Tonneau, J.-P., & Rey-Valette, H. (2011). Diverse approaches to learning in rural and development studies: review of the literature from the perspective of action learning. *Knowledge Management Research & Practice*, 9(2), 120-135. Retrieved from <https://doi.org/10.1057/kmrp.2011.12>. doi:10.1057/kmrp.2011.12
- Cox, M., Arnold, G., & Villamayor Tomás, S. (2010). A review of design principles for community-based natural resource management. *Ecology and Society*, 15(4), 38. Retrieved from <http://www.ecologyandsociety.org/vol15/iss4/art38/>.
- Cradock-Henry, N. A., Greenhalgh, S., Brown, P., & Sinner, J. (2017). Factors influencing successful collaboration for freshwater management in Aotearoa, New Zealand. *Ecology and Society*, 22(2). Retrieved from <https://www.ecologyandsociety.org/vol22/iss2/art14/>. doi:10.5751/ES-09126-220214
- Crofoot, A. (2016). *Impact of Government and regulatory policy on hill country farming*. Paper presented at the New Zealand Grasslands Society Conference.
- Cullen, E. M. (2010). Extension specialist roles in communities of interest and place: An example from the agriculture-wildlife interface. *Journal of Extension*, 48(1).
- Deavoll, P. (2017, 27 April). New Hurunui landcare group coordinator role grows out of regulatory chaos. *Stuff*. Retrieved from <https://www.stuff.co.nz/business/farming/91973127/new-hurunui-landcare-group-coordinator-role-grows-out-of-regulatory-chaos>
- Dodd, M., Wilcock, B., & Parminter, T. (2009). *Review of recent rural catchment-based research in New Zealand*. Retrieved from https://icm.landcareresearch.co.nz/knowledgebase/publications/public/MAF_Catchment_Review_final_June2009.pdf
- Ekboir, J. (2012). How to build Innovation Networks. Thematic Note 2. In *Agricultural Innovation Systems: An Investment Sourcebook* (Vol. 1. Coordination and Collective Action for Agricultural Innovation, pp. 44 –51): International Bank for Reconstruction and Development / International Development Association/World Bank.
- Ekins, P., Dresner, S., & Dahlström, K. (2008). The four-capital method of sustainable development evaluation. *European Environment*, 18(2), 63-80. Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1002/eet.471>. doi:10.1002/eet.471
- Eppel, E. (2013). Collaborative Governance: Framing New Zealand Practice [Working paper]. *Working Paper*. Retrieved from <http://ips.ac.nz/publications/files/07705653e38.pdf>
- Fenemor, A., & Bowden, B. (2001). *Integrated catchment management for the Motueka River: bridging the gap between hydrology and the human dimension*. Retrieved from https://www.researchgate.net/publication/228412932_Integrated_Catchment_Management_for_the_Motueka_River_bridging_the_gap_between_hydrology_and_the_human_dimension
- Fenemor, A., Phillips, C., Allen, W., Young, R. G., Harmsworth, G., Bowden, B., . . . Collins, A. (2011). Integrated catchment management—interweaving social process and science knowledge.

- New Zealand Journal of Marine and Freshwater Research*, 45(3), 313-331. Retrieved from <https://doi.org/10.1080/00288330.2011.593529>. doi:10.1080/00288330.2011.593529
- Fielke, S. J., Kaye-Blake, W., Smith, W., & Vibart, R. (2017). *Operationalising rural community resilience: Framing indicators for measurement* (RE500/2017/001). Retrieved from Hamilton, NZ:
- Fielke, S. J., Nelson, T., Blackett, P., Bewsell, D., Bayne, K., Park, N., . . . Small, B. (2017). Hitting the bull's-eye: Learning to become a Reflexive Monitor in New Zealand *Outlook on AGRICULTURE*, 45, XXXXX.
- Fielke, S. J., & Srinivasan, M. S. (2017). Co-innovation to increase community resilience: influencing irrigation efficiency in the Waimakariri Irrigation Scheme. *Sustainability Science*, 1-13. Retrieved from <http://dx.doi.org/10.1007/s11625-017-0432-6>. doi:10.1007/s11625-017-0432-6
- Fioret, C., Johnson, K., Lam, S., Thompson, M., & Hargreaves, S. (2018). *Towards farmer-led research: A guidebook*. Retrieved from https://www.researchgate.net/publication/326426675_Towards_farmer-led_research_A_guidebook
- Gillespie, K. (2016). *What makes a strong rural community?* Retrieved from http://www.kellogg.org.nz/uploads/media/Gillespie_Katherine_What_makes_a_strong_rural_community.pdf
- Greiner, R., & Gregg, D. (2011). Farmers' intrinsic motivations, barriers to the adoption of conservation practices and effectiveness of policy instruments: Empirical evidence from northern Australia. *Land Use Policy*, 28(1), 257-265. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0264837710000682>. doi:<https://doi.org/10.1016/j.landusepol.2010.06.006>
- Heringa, P. W., Horlings, E., van der Zouwen, M., van den Besselaar, P., & van Vierssen, W. (2014). How do dimensions of proximity relate to the outcomes of collaboration? A survey of knowledge-intensive networks in the Dutch water sector. *Economics of Innovation and New Technology*, 23(7), 689–716. Retrieved from http://www.vandenbesselaar.net/_pdf/2014%20EcnNewTech.pdf.
- Hobbs, M. (2000). Hurunui Farmers [Press release]. Retrieved from <https://www.beehive.govt.nz/release/hurunui-farmers>
- Hoes, A.-C., Beers, P. J., & van Mierlo, B. (2016). Communicating tensions among incumbents about system innovation in the Dutch dairy sector. *Environmental Innovation and Societal Transitions*, 21, 113-122. Retrieved from <http://www.sciencedirect.com/science/article/pii/S2210422416300296>. doi:<http://dx.doi.org/10.1016/j.eist.2016.04.005>
- Horizons Regional Council. (2016). *It's everybody's business: whole farm plans - a vehicle for implementing policy*. Retrieved from Palmerston North: <https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/It%27s-everybody%27s-business-Whole-Farm-Plans.pdf>
- Hungerford, R. (2015, October). *Waikato based environmental sector: Research report*. Trust Waikato and Waikato Regional Council.
- Hungerford, R. (2017). *The Waikato community-based environmental sector phase II research report*. Trust Waikato and Waikato Regional Council.
- Hurlbert, M., & Gupta, J. (2015). The split ladder of participation: A diagnostic, strategic, and evaluation tool to assess when participation is necessary. *Environmental Science and Policy*, 50, 100-113.
- Isidiho, A. O., & Sabran, M. S. (2016). Evaluating the Top-Bottom and Bottom-Up Community Development Approaches: Mixed Method Approach as alternative for rural un-educated communities in Developing Countries. *Mediterranean Journal of Social Sciences*, 7(4).

- Jarrett, J., Morris, C., Wheeler, R., & Winter, M. (2015). *Literature review on farming collaboration* (LM0302). Retrieved from <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18803>
- Kilvington, M., Allen, W., & Fenemor, A. (2011). Three frameworks to understand and manage social processes for integrated catchment management. *New Zealand Journal of Marine and Freshwater Research*, 45(3), 541-555. Retrieved from <https://doi.org/10.1080/00288330.2011.593182>. doi:10.1080/00288330.2011.593182
- Kiser, E. (1999). Comparing Varieties of Agency Theory in Economics, Political Science, and Sociology: An Illustration from State Policy Implementation. *Sociological Theory*, 17(2), 146-170. Retrieved from <http://www.jstor.org/stable/202095>.
- Klerkx, L., & Nettle, R. (2013). Achievements and challenges of innovation co-production support initiatives in the Australian and Dutch dairy sectors: A comparative study. *Food Policy*, 40, 74-89. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0306919213000213>. doi:<http://dx.doi.org/10.1016/j.foodpol.2013.02.004>
- Loney, J. (2018a). Project Parore draws large crowd. *Katikati Advertiser*. Retrieved from <https://www.pressreader.com/>
- Loney, J. (2018b, 25 January 2018). Project Parore to clean up streams in Katikati NZ Herald/The Country. Retrieved from https://www.nzherald.co.nz/the-country/news/article.cfm?c_id=16&objectid=11981892
- Mackenzie, A., & Harcombe, M. (2011). *Collaborative governance for successful outcomes in rural New Zealand*. Retrieved from https://www.planning.org.nz/Folder?Action=View%20File&Folder_id=217&File=MACKENZIE_HARCOMBE_2011.pdf
- MacMillan, T. (2018). Learning from farmer-led research. *For whom? Questioning the food and farming research agenda*. Retrieved from <https://www.foodethicscouncil.org/resources/publications/research-agenda-2.html>
- McEntee, M. J. (2010). *More carrot and less stick: Lessons from agricultural extension in New Zealand*. Paper presented at the ALARA World Congress, Melbourne. Conference paper retrieved from
- Memon, A., & Weber, E. (2008, June 2008). *Collaborative water governance in New Zealand: Turning the tide in the Canterbury region?* Paper presented at the International Symposium on Society and Resource Management conference, University Vermont, USA. .
- Mills, J., Gibbon, D., Ingram, J., Reed, M., Short, C., & Dwyer, J. (2011). Organising collective action for effective environmental management and social learning in Wales. *The Journal of Agricultural Education and Extension*, 17(1), 69-83. Retrieved from <https://doi.org/10.1080/1389224X.2011.536356>. doi:10.1080/1389224X.2011.536356
- Ministry for Primary Industries. (2012). *Survey of technology transfer services to farmers and growers in New Zealand*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/3740-survey-of-technology-transfer-services-to-farmers-and-growers-in-new-zealand/logged-in>
- Ministry for the Environment. (2015). Making Collaborative Groups Work: A guide for those involved in collaborative processes. In. Wellington: Ministry for the Environment.
- Morrar, R. (2015). Technological Public–Private Innovation Networks: A conceptual framework describing their structure and mechanism of interaction. *Technology Innovation Management Review*, 5(8). Retrieved from https://timreview.ca/sites/default/files/article_PDF/Morrar_TIMReview_August2015.pdf.
- Nelson, T., Parminter, T., Makin, T., Poussard, H., Atkins, K., Wilson, J., & Hanes, L. (2003). *Investigations into the role of trees in protecting water quality and biodiversity on dairy farms in South West Victoria*. Retrieved from

- Neumeier, S. (2016). Social innovation in rural development: Identifying the key factors of success. *Geographical Journal*. Retrieved from <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84977177772&doi=10.1111%2fgeoj.12180&partnerID=40&md5=060a55c02abad80db45001080ee44ba1>. doi:10.1111/geoj.12180
- Newman, N. (2016). Water quality governance. The Collaborative Governance model: Implementation of the Canterbury Water Management Strategy in New Zealand Retrieved from <https://www.oecd.org/environment/resources/New-Zealand-case-study-water-quality-governance-diffuse-pollution.pdf>
- NZ Landcare Trust. (2012a). *Aorere and Rai project review*. Retrieved from <http://www.landcare.org.nz/Regional-Focus/Nelson-Office/Aorere-Catchment/Aorere-Catchment-Project> and <http://www.landcare.org.nz/Regional-Focus/Nelson-Office/Aorere-Rai>
- NZ Landcare Trust. (2012b). *Community-owned Rural Catchment Management: A guide for partners*. Retrieved from <http://www.landcare.org.nz/catchmentguide>
- NZ Landcare Trust. (2014). *Farming for the Future: Farmers leading positive action in the Waitangi River Catchment*. Retrieved from <http://www.landcare.org.nz/files/file/1342/Farming%20for%20the%20Future.pdf>
- Oakden, J., King, J., & Allen, W. (2014). *Evaluation of the Sustainable Farming Fund*. Retrieved from <https://www.mpi.govt.nz/document-vault/3769>
- Ooms, W., Werker, C., & Caniëls, M. (2018). Personal and social proximity empowering collaborations: the glue of knowledge networks. *Industry and Innovation*, 25(9), 833-840. Retrieved from <https://doi.org/10.1080/13662716.2018.1493983>. doi:10.1080/13662716.2018.1493983
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- Pannell, D. J., Marshall, G. R., Barr, N., Curtis, A., Vanclay, F., & Wilkinson, R. (2006). Understanding and promoting adoption of conservation practices by rural landholders. *Australian Journal of Experimental Agriculture*, 46(11), 1407-1424. Retrieved from <https://www.publish.csiro.au/paper/EA05037>. doi:<https://doi.org/10.1071/EA05037>
- Parker, J. (2013). How business analysts can identify quick wins. Retrieved from <http://enfocussolutions.com/how-business-analysts-can-identify-quick-wins/>
- Parminter, T., Barrett-O'ha, O., & Wilson, J. (2007). *Adoption of Nutrient Budgeting at Rerewhakaaitu* Retrieved from
- Parsons, O. J. (2016). *Cooperation, incentives and punishment in common pool resource management*. (Master of Management Studies (MMS) Masters), University of Waikato, Hamilton, New Zealand. Retrieved from <https://hdl.handle.net/10289/10645>
- Patterson, J. J. (2016). Exploring local responses to a wicked problem: context, collective action, and outcomes in catchments in subtropical Australia. *Society and Natural Resources*, 29(19), 1198-1213. Retrieved from <http://dx.doi.org/10.1080/08941920.2015.1132353>
- Perkins, A. (2016). *Local Indigenous Biodiversity Strategy (LIBS) - Community Engagement Workstream. Final report May 2016*. Retrieved from <http://www.groundworkassociates.co.nz/home-page/talking-biodiversity-waikato-landowners>
- Peters, M. (2018). *Understanding the context of conservation community hubs*. (Prepared for the Department of Conservation).
- Phillips, C., Allen, W., Fenemor, A., Bowden, B., & Young, R. (2010). Integrated catchment management research: Lessons for interdisciplinary science from the Motueka Catchment, New Zealand. *Marine and Freshwater Research*, 61(7), 749-763 Retrieved from <http://dx.doi.org/10.1071/MF09099> doi:10.1071/MF09099

- Pinxterhuis, I., Dirks, S., Bewsell, D., Edwards, P., Brazendale, R., & Turner, J. A. (2018). Co-innovation to improve profit and environmental performance of dairy farm systems in New Zealand. *Rural Extension & Innovation Systems Journal*, 14(2). Retrieved from https://www.researchgate.net/publication/331533538_Co-innovation_to_improve_profit_and_environmental_performance_of_dairy_farm_systems_in_New_Zealand.
- Poland, M., & Maré, D. C. (2005, June). *Defining geographic communities*. (Motu Working Paper 05–09). Motu Economic and Public Policy Research.
- Predator Free Hauraki Coromandel Community Trust. (2018). *Protecting the biodiversity of the Hauraki Coromandel: Community conservation research groups summary 2018*. Predator Free Hauraki Coromandel Community Trust.
- Red Meat Profit Partnership. (2018). *Farm results booklet*. Retrieved from [https://www.actionnetwork.co.nz/site_files/16853/upload_files/TrialFarmerA5booklet2018\[web\]\(1\).pdf?dl=1](https://www.actionnetwork.co.nz/site_files/16853/upload_files/TrialFarmerA5booklet2018[web](1).pdf?dl=1)
- Rijswijk, K., & Brazendale, R. (2017). Innovation networks to stimulate public and private sector collaboration for advisory services innovation and coordination: the case of pasture performance issues in the New Zealand dairy industry. *The Journal of Agricultural Education and Extension*, 23(3), 245–263. Retrieved from <http://dx.doi.org/10.1080/1389224X.2017.1320643>. doi:10.1080/1389224X.2017.1320643
- Robertson, J. (2011). *Key elements for engaging dairy farmers in action towards healthy waterways: a case study in the Aorere Catchment, New Zealand*. (Master of Environmental Studies a 90 point thesis), Victoria University of Wellington, Wellington, NZ. Retrieved from <http://researcharchive.vuw.ac.nz/xmlui/handle/10063/2408>
- Rural Delivery, & DairyNZ. (2018). Understanding dairy production systems on peat soils in Waikato. Retrieved from <https://www.ruraldelivery.net.nz/stories/Dairying-and-Peat-Soils>
- Schusler, T. M., Decker, D. J., & Pfeffer, M. J. (2003). Exploring social learning for collaborative natural resource management. *Society and Natural Resources*, 16, 309–326.
- Schut, M., van Asten, P., Okafor, C., Hicintuka, C., Mapatano, S., Nabahungu, N., . . . Vanlauwe, B. (2016). Sustainable intensification of agricultural systems in the Central African Highlands: The need for institutional innovation. *Agricultural Systems*, 145, 165–176. Retrieved from <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84962137596&partnerID=40&md5=96863f4c6f1bee981c9bfb5f1ab6c03c>. doi:10.1016/j.agsy.2016.03.005
- Sinner, J. M., Newton, M., & Duncan, R. (2015). *Representation and legitimacy in collaborative freshwater planning: Stakeholder perspectives on a Canterbury Zone Committee*. Retrieved from Nelson, New Zealand: <https://www.cawthron.org.nz/publication/science-reports/representation-and-legitimacy-collaborative-freshwater-planning-stakeholder-perspectives-canterbury/>
- Steel, C. (2018, 25 October). Caring for Te Mania catchment (Project Parore). *NZ Herald/The Country*. Retrieved from http://www2.nzherald.co.nz/the-country/news/article.cfm?c_id=16&objectid=12148637
- Stowell, L. (2019, 3 February). Rangitikei tourism operator bemoans drop in river water quality *Whanganui Chronicle*. Retrieved from https://www.nzherald.co.nz/farming/news/article.cfm?c_id=195&objectid=12199161
- Šumane, S., Kunda, I., Knickel, K., Strauss, A., Tisenkopfs, T., Rios, I. D. I., . . . Ashkenazy, A. (2017). Local and farmers' knowledge matters! How integrating informal and formal knowledge enhances sustainable and resilient agriculture. *Journal of Rural Studies*. Retrieved from <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85014063647&doi=10.1016%2fj.jrurstud.2017.01.020&partnerID=40&md5=7b889ef080ce38ebcb4b6dadb9fd40e9>. doi:10.1016/j.jrurstud.2017.01.020

- Taylor, S. (2017). Farmers active in setting rules (in the Hurunui). *Farmers Weekly*. Retrieved from <https://farmersweekly.co.nz/#>
- The Treasury. (2018). The Living Standards Framework. Retrieved from <https://treasury.govt.nz/information-and-services/nz-economy/living-standards/our-living-standards-framework>
- Tikkisetty, B., & McLay, C. (2011). *From eyesore to asset - Care Groups Review* (Docs # 2084935 Report to Land and Water Sub-committee November 2011). Retrieved from
- Turner, J. A., Klerkx, L., Rijswijk, K., & Barnard, T. (2016). Systemic problems affecting co-innovation in the New Zealand Agricultural Innovation System: Identification of blocking mechanisms and underlying institutional logics. *NJAS - Wageningen Journal of Life Sciences*, 76, 99-112. Retrieved from <http://dx.doi.org/10.1016/j.njas.2015.12.001>. doi:<http://dx.doi.org/10.1016/j.njas.2015.12.001>
- University of Massachusetts. (undated). What is experimental economics? Retrieved from <https://www.umass.edu/resec/what-experimental-economics-and-public-policy>
- Valentine, B. H. (2015). *New Zealand farmers and environmental legislation*. (Master in AgriCommerce), Massey University, Palmerston North. Retrieved from https://mro.massey.ac.nz/bitstream/handle/10179/10013/02_whole.pdf
- Vereijssen, J., Srinivasan, M. S., Dirks, S., Fielke, S. J., Jongmans, C., Agnew, N., . . . Turner, J. A. (2017). Addressing complex challenges using a co-innovation approach: Lessons from five case studies in the New Zealand primary sector. *Outlook on AGRICULTURE*, 46(2), 108-116. Retrieved from <http://journals.sagepub.com/doi/abs/10.1177/0030727017712321>. doi:doi:10.1177/0030727017712321
- Waikato Regional Council. (2016). *Local Indigenous Biodiversity Strategy (LIBS) Pilot Project: Source to the Sea* (Document # 9168751). Retrieved from <https://www.waikatoregion.govt.nz/assets/PageFiles/40706/Full-report-Source-to-the-Sea-Te-Puna-o-Waihou-ki-Tikapa-te-Moana.pdf>
- Waters-Bayer, A., Kristjanson, P., Wettasinha, C., van Veldhuizen, L., Quiroga, G., Swaans, K., & Douthwaite, B. (2015). Exploring the impact of farmer-led research supported by civil society organisations. *Agriculture & Food Security*, 4(1), 4. Retrieved from https://www.researchgate.net/publication/276866691_Exploring_the_impact_of_farmer-led_research_supported_by_civil_society_organisations.
- Waugh, N. (2011). *Farmer adaptation to change with the threat of regulation: The Carrot or the Stick*. Retrieved from online: <https://www.agfirst.co.nz/wp-content/uploads/2016/06/N-Waugh-Nuffield-2011-Summary-report.pdf>
- Wendy Boyce Consulting. (2015). *Collaboration in the Waikato catchment A description of the establishment phases of the Healthy Rivers Wai Ora project from a council practitioner's perspective* Retrieved from <http://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/collaboration-in-the-waikato-catchment.pdf>
- Willock, J., Deary, I. J., Edwards-Jones, G., Gibson, G. J., McGregor, M. J., Sutherland, A., . . . Grieve, R. (1999). The role of attitudes and objectives in farmer decision making: Business and environmentally-oriented behaviour in Scotland. *Journal of Agricultural Economics*, 50(2), 286-303. Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1477-9552.1999.tb00814.x>. doi:10.1111/j.1477-9552.1999.tb00814.x
- Wilson, G. A. (2012). Community resilience, globalization, and transitional pathways of decision-making. *Geoforum*, 43(6), 1218-1231. Retrieved from <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84868706138&partnerID=40&md5=fa42bdde52499dfbdbab7ebe5c88b60d>. doi:10.1016/j.geoforum.2012.03.008

Youl, R., Marriott, S., & Nabben, T. (2006). *Landcare in Australia. Founded in Australia*. Retrieved from http://www.agriculture.gov.au/SiteCollectionDocuments/natural-resources/landcare/communiques/landcare_in_australiaJune08.pdf