



## Article

# Transformation Is ‘Experienced, Not Delivered’: Insights from Grounding the Discourse in Practice to Inform Policy and Theory

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**Abstract:** Calls for transformation, transformative research, and transformational impact are increasingly heard from governments, industry, and universities to recast a course towards sustainability. This paper retraces a social, qualitative, and interpretive research endeavor to contribute to broadening the conceptual base of transformation. Drawing on perspectives of practitioners involved in working with communities to bring about change in how land and water are managed, the objective of the research was to elicit a range of practice-based encounters of transformation to inform policy and theory. In identifying precursors and processes for change, the findings bring into view the often unseen internal and experiential dimensions of transformation. As such, the research provides insights on where transformation takes place, what the first step of transformation might look like, and what might be deemed transformational. The paper also builds on social practice theory to produce an explanatory model of transformational capacity that is enabled and constrained by structures, processes, understanding, and authority that impact on social practices of knowledge generation (including science) and land and water decision-making.

**Keywords:** sustainability; transformation; transformational capacity; transformative research; transformational impact; experience; social practice theory; theories of change; knowledge co-production

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*Whakatapiri atu te Ao Kohatu ki te Ao Hou, kia tupu ake ai nga tangata, kia tipu, kia hua, kia puawai,  
ka ora te whanau mo nga ra kei mua.*

Adding on the ancient world to the new world, then people will be prosperous, be developing,  
be flourishing, be productive in growing a healthy family for the days into the future.

Rawiri Smith

## 1. Introduction

Looking back, we can see that human activities have transformed the ecological systems that sustain our societies, cultures, and economies. With impacts of human activity now recognized

as planetary in scale and effect, the need for change in how humans encounter and use natural resources is being driven by ecological shifts that are undermining existing governance systems and revealing our vulnerabilities in adjusting to resource limits [1–11]. In light of the social, economic, cultural, and environmental challenges facing humankind, nothing short of system transformation appears warranted. Governments, industry sectors, and universities have been responding. Calls for transformation, transformative research, and transformational impact (or claims that such change can be delivered through research and innovation in science and technology) are now commonplace (e.g., [12–16]). In New Zealand, in the setting for this research, hundreds of jobs are now tagged to ‘transformation’ across many sectors of the economy, with industry and government geared up for transformation through partnerships that are expected to have “transformational impact” and deliver “transformative science” [17] (p. 1); see also [18–20].

It is within this institutional and discursive context that our research began. The research was contracted to reflect on the concept of transformation and what it might mean for New Zealand’s Our Land and Water National Science Challenge (“the Challenge”), which has been tasked with “transform[ing] the way we use and manage our land and water” [21]. To briefly explain the context within which the Challenge is seeking transformation, the management of New Zealand’s land and expansive freshwater resources has become a hotly contested political issue over the last decade (e.g., [22–24]). A raft of government and industry reforms has sought to establish improved management practices across the primary sector, and resource limits, in order to address concerns about the current state of water quality and water allocation (e.g., [25–31]).

New Zealand, like many countries, is trying to address the diffuse pollution associated with industrial-scale agriculture. The losses of contaminants such as nutrients, sediment, and pathogens are often small from individual farms, but can be significant when they accumulate in rivers, lakes, streams, estuaries, and off-shore marine areas, moving in water flowing across the land or through groundwater. For some contaminants, the present state of water quality reflects what has occurred in the past, and depending on biophysical, geological, and management factors, movement from land into waterways can take decades [32–36] and is referred to as the ‘lag effect’ [37]. Importantly, the time lag also applies to seeing the impacts of changes in practice to manage water quality, such as better farm practices and the implementation of stricter rules and regulations that are progressively being put in place across the country under central government’s National Policy Statement for Freshwater Management, 2014 [38]. The ‘lag-effect’, and the different ways water quality problems can be conceived, given the uncertainties, exacerbates the politicization of New Zealand farmers and the primary sector (e.g., [22,30,39]).

Furthermore, the dominance of Pākehā agriculture within New Zealand’s political economy [40] has had profound implications for Māori (New Zealand’s indigenous people), who have been excluded from culturally meaningful and sustaining engagement as tangata (people) with whenua (land), or what Pākehā (European-descent New Zealanders) might describe as natural resources. Through cogovernance arrangements, legislation, and Treaty settlements through the Waitangi Tribunal, pathways have been created for Māori to participate in environmental decision-making to exercise mātauranga Māori (Māori knowledge informed by Māori worldviews), tikanga (Māori customs and law), and kaitiakitanga (stewardship). However, these pathways are challenging to navigate, for both Māori and Pākehā, for a range of cultural, institutional, economic, and political reasons [41–43]. Hence, the social, cultural, economic, and political stakes are high for both Māori and farmers to find a way to cooperatively access, care for, and manage land and freshwater.

An isolated review of the academic literature could have been undertaken for the Challenge to explore the concept of transformation. However, given the profoundly complex dimensions of managing land and water discussed above, we embarked upon a coproduction research process [44,45]. The research brought together a core team of practitioners (some of which were also researchers) and drew on the knowledges and experience of both Māori and Pākehā. Wearing multiple hats, our practitioners brought insights to the table from working with water governance groups,

local government, individual farmers, farming communities alongside Māori groups, collectives, and communities.

The research team's opening discussion recognized that language is important; in particular, its implications for the way transformation is promoted and how it might be conceptualized by government and industry with plans for transforming New Zealand's primary sector and water management. Therefore, it was agreed that a critical perspective on transformation would be needed to ensure those who use the term are not blinded by positive connotations with which the term is often imbued. Our fifth author, our Māori practitioner, highlighted that any perspective on transformation comes from somewhere, and that one person's transformation might be someone else's collapse or injustice. Hence, who controls transformation is central, as there are likely to be winners and losers. Questions were raised about the envisaged goal of transformation as well as where in a system one would actually look for transformation. Our fifth author also identified that cultural change requires a conception of culture as residing not only with the indigenous people, Māori, but also in other settings, for example, Pākehā rural and urban groups and communities. Our sixth author, our farmer practitioner, contended that seeing a desire for change can be a transformation, given where a person might be coming from. Hence, it was recognized that where someone is standing to assess transformation is crucial to how transformation is experienced and interpreted. Both our Māori and farmer practitioners talked about the 'heart model' versus the 'mental model', with the former believed to be a far more powerful motivator for change. They explained that policy-makers, researchers, and practitioners need to listen carefully to understand and see someone else's perspective. This conversation was encapsulated by our third author, a researcher and practitioner, with the phrase 'transformation is experienced, not delivered'.

From our discussion, the following questions were identified to pursue through the research project:

- What is transformation?
- Would we know transformation if we saw it?
- What exactly is to be transformed—people, technologies, practices, institutions, identities, systems?
- What is the scale of transformation to be?
- Do small changes accumulate to a transformation?
- How does transformation occur in a systems context with a range of temporal and spatial scales, interconnections, and feedbacks?
- Should transformation be actively planned and directed or allowed to emerge?
- What should be the role of science in transformation?

This paper addresses these issues and questions by examining what the concept of transformation means and involves from different practitioner perspectives. Our research approach and findings highlight the importance of developing a nuanced understanding of the concept of transformation, which currently appears so alluring. As such, the findings of this research contribute to broadening the conceptual base of transformation by bringing into view the often unseen internal and experiential dimensions of transformation and, thereby, opening important questions about where transformation takes place, what the first step of transformation might look like, and what might be deemed transformational.

## 2. Insights from the Literature on Transformation

Transformation is widely agreed to involve significant and fundamental change [2,3,6,7,46–49]. However, Feola [2] concludes from a review and analysis of emerging transformation and transition concepts that important questions remain about what actually constitutes a fundamental change and how transformational change comes about. Feola [2] also illustrates how conceptions of 'the system', within which significant changes are envisaged to occur, differ markedly across the various schools of

thought (see also [1,6,9,48,50]). The following snapshots drawn from the transformation and transition literature illustrate the concerns raised by Feola [2].

The scale of transformation has been characterized by social–ecological system scholars as ranging from a household finding a “new direction for making a living” to larger-scale changes from “agrarian to a resource-extraction economy” [3] (p. 5). At different scales, the extent of such fundamental change might be different, but the magnitude or impact are, arguably, similar. In other words, changing the direction of earning a living can be as significant and fundamental to householders as a shift in industry is for a government running an economy.

To illustrate, Feola [2] explains how, in Colombia, government policy to encourage (with support from key agricultural industry sector organizations) modernized agriculture through mechanization and efforts to build economic efficiency has had disastrous social, economic, and cultural consequences for traditional peasant communities of the Andes. While there are exceptions, Feola [2] explains that many have not been able to retain traditional means of subsistence and access to land, which has meant moving to urban areas or selling their labor to enterprises such as mining. While the transformation of Colombian agriculture would be hailed as a success of government policy, when looking at what has occurred in practice (i.e., how the application of the idea is experienced on the ground), it has been devastating for many. Of course, state-led transformation of agricultural land has been occurring worldwide since the enclosures of England’s industrial revolution, and the effects remain the same—a loss of autonomy for those without secure land tenure. The Colombian case illustrates how visions of transformation espoused by powerful actors can embody quite different motives and theories of change compared to the people required to change their ways or who might even be asking for change [2]. Feola [2] (p. 386) uses this example to illustrate the “blind spots and policy implications” of transformation that can be missed and how transformation can be used by powerful actors, or those with vested interests, as a metaphor to promote and justify change. Hence, an assessment of whether a new way of making a living or changing how natural resources are used is a sustainable or exploitative transformation depends on how the system is conceived, where you are located in the system, and on what basis transformation is being pursued and assessed, and for what purpose.

Socio-technical transition scholars conceive transformation as characterized by a period of nonlinear and unpredictable changes as path dependencies and self-reinforcing feedbacks are overcome at multiple scales in a multilevel process. Change at smaller scales can influence what occurs at larger scales and vice versa [6,48,51]. From these unpredictable interactions, a new dynamic equilibrium can be created [49,52,53]. In other words, fundamental change can occur in a system at any scale with unpredictable results. As shown in the Colombian example, the possible dynamic equilibriums that can emerge from transformation can lead to new environmental and social risks, create winners and losers, and open social justice issues [2,6,7,48,54–56].

At an institutional level, transformative change is expected to involve “a dominant shift in the ‘rules of the game’” [6] (p. 324), shifts in values and identities [11], challenges to existing structures of meaning [7], innovations in governance [46], and shifts in patterns of interactions, including leadership and power relations [3]. Clearly, where fundamental change could occur varies considerably, even within one subsystem (i.e., institutional level) of a system. Furthermore, how values, identities, and structures of meaning might change is not explained.

It is argued by Kates et al. [57] and Walker et al. [58] that transformation can be a reactive and involuntary response or an anticipatory and voluntary response to a challenge to the status quo or vulnerability in ecosystems (see also [7,48]). Either way, transformation is expected to involve “the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable” [11] (p. 1).

The work of Clément and Rivera [59] illustrates the challenges for analysts to identify what might trigger transformation, what level of change might be deemed adaptive (i.e., change that is considered to be minor or incremental) or transformational (i.e., change that is considered significant and fundamental), and what might be interpreted as reactive or anticipatory. In applying social–ecological

systems to organizations and extending the concept of organizational resilience to include the natural environment, Clément and Rivera [59] (p. 346 citing Hollnagel, 2006 and Sutcliffe, and Vogus, 2003) examine the concept of “ecological adversity”. They highlight how a business might respond to what it might perceive as ecological adversity by expending time and energy to retain access to a limited resource [59] (see also [3,7,11]). Falsely believing it is building system resilience, incremental or adaptive responses are characterized as “protective adaptation” [59] (p. 353). Clément and Rivera [59] argue this is a likely strategy under conditions of low to medium levels of ecological adversity. For example, actions might include the introduction of changes to a water supply system to ensure water is available for irrigation under drought conditions. When these protective measures are further affected by intensifying ecological adversity, the farm business might then respond with investment in water efficiency, source water elsewhere, or transition to better-suited crops, while others might leave land fallow or go out of business. However, with too much ecological adversity, “adaptation limits” will be breached, thus requiring transformation to mitigate the ecological risks, pressures, and threats [59] (p. 247 citing Dow et al., 2013). Examples that Clément and Rivera [59] give of transformative scale operations include snow field operators marketing themselves as year-round tourism destinations and small farms diversifying revenue streams through tourism.

The concept of ecological adversity, adaptation limits, and related distinctions between what might be adaptive, incremental, protective, and transformational are useful theoretically and can help explain what contributes (or not) to shifts and resilience in a social–ecological system. However, an account of what might appear in retrospect to be transformational or incremental change or protective adaptation can leave out much about what was occurring at the time for the people making decisions in the midst of a myriad of institutional, social, and economic factors and inevitably conflicting and uncertain information about what level of ecological adversity they face [9].

If transformation is to be anticipatory and voluntary, while recognizing the journey is emergent and needing to occur across multiple pathways, experimentation and learning are argued to be necessary responses [6,8,48,51,56,60–63]. A focus on experimentation and learning to open up pathways into the future, rather than seeking to find and specify the ‘right’ transformative pathway, significantly changes how transformation is framed and approached [7,64]. So too do the words of Miller (2011 cited by Bai et al. [64]) (p. 360) who maintains “the challenge is not finding ways to know the future, but rather to find ways to live and act without knowing the future”.

Social practice theory is another way of interrogating the recursive relations between structure and agency (i.e., institutions and people) [9,10,65] that are deemed to be important in any of the above renditions of transformation and transition [66]. With its unit of analysis as practice (i.e., what we do, how we do it, and why), social change is conceptualized as the dynamic product of long-term and often cross-cutting processes of linking and unlinking the elements of both sustainable and unsustainable practices. Drawing on structuration theory [67] and a long lineage of practice theorists, Shove et al. [10] (pp. 1–11) conceptualize the elements of social practices for analytical purposes as meaning (i.e., what makes this activity significant and worth doing), competency (i.e., what are the skills and knowledge needed to undertake the activity), and materials (i.e., the physical objects of an activity as well as the broader socio-technical and political systems that make obtaining and using them possible). Considering the material components of social practices is crucial in the context of resource use, as material objects (e.g., cars, washing machines, taps) and what enables their use (e.g., road networks, transport authorities within government, road engineers) or access to a resource (e.g., water supply infrastructure including dams and pipelines and hidden household pipes) are often not recognized for the role they play in shaping and perpetuating what people do, how, and why.

A social practice theory perspective on social change examines how institutions shape the fabric of daily life and how daily life feeds back to influence institutions [10,65]. For example, daily patterns of diet and exercise are socially, institutionally, and infrastructurally shaped [68] by not only how and what we eat, but also by patterns of time (when we eat and exercise), mobility (how and where we live, work, and eat), and the social meanings attained from and reflected by particular food habits.



Understanding transformation in terms of social practices can sideline notions of problems and solutions (which can invoke blame and prescription towards individuals who are deemed to be ‘the problem’) and open opportunities to learn about the range of social, economic, cultural, historical, political, and ecological relations that hold practices in place and what it might take to ‘undo’ them. As such, social practice theory bypasses deficit-based theories of change [9,65]. For example, if a problem is framed as individual attitudes that are assumed to drive problematic behaviour, research tends to focus on identifying what those attitudes are, how they differ across populations, and designing messages intended to change individual (problematic) behaviours. Assuming people are deficient in knowledge is similar in approach and invokes its own solution—the production of more knowledge to fill assumed gaps. When people do not change, more attitudinal studies or information is the assumed antidote, and on the cycle goes until regulation is deemed warranted due to a lack of change.

With a theory of change focused on the relations and connections of practice rather than individual behavior and driving forces, Feola [2] (p. 384) identifies social practice theory as a “descriptive-analytical approach” and sees the field as seeking to understand “the complexity of human–environment interactions” to produce knowledge that can deliver “practical solutions” and policy advice. Feola [2] appears to question how this research is sometimes done. However, our assessment is that a considerable body of research is developing, using novel methodologies to generate unexpected and useful insights on relations between, for example, householders and resource managers and how people use, store, and relate to water and other resources (e.g., [58,69–73]).

In summary, notwithstanding the expanse of transformation and transition concepts, Feola [2] maintains that important questions remain open about what actually constitutes a fundamental change and how transformational change occurs. While the reviewed literature traverses much important ground, as concluded by Feola [2] (p. 386), practice-based perspectives are needed to identify “blind spots and policy implications”, which is the contribution of this practice-based study.

### 3. An Interpretive Approach

Our interpretive methodological approach sought to ground the concept of transformation in the lived experience of a range of people chosen for their potential to recognize transformation in practice. The research team, while encompassing some diversity of practice-based insights, decided to canvass a wider range of perspectives in order to develop a rich picture of perceptions of transformation. This was done by brainstorming an invitation list of around 50 people that represented additional perspectives, and inviting them to contribute examples, experiences, and reflections on transformation from their practice. We received 29 contributions from which 22 were chosen, based on their length, to seed a one-day dialogue workshop.

We adopted a naturalistic [74] phenomenological, sense-making approach [75–77] to conceptualizing transformation; that is, we did not define transformation for our participants, but relied on the ability of those contributing episodes and workshop participants to recognize transformational experiences and events in everyday life, and used that human capability and dialogue to derive insights into transformation as a phenomenon.

The invitation to provide a contribution to the workshop posed the following questions developed through discussions within the research team:

- What is a transformation you have experienced or witnessed?
- What made it transformative?
- What was transformed?
- What frameworks could be used to think about transformation?
- What are motivators for transformation?
- What capabilities and capacities help or hinder transformation?
- How would you explain the case for transformation?

- What role could/should science play in transformation?

These questions were designed to elicit lived experience and grounded reflection on experience. Respondents were asked to answer at least one of these questions to draw out key characteristics of what they considered was an example of transformation. Responses included, variously, personal experiences, observations, and illustrative video clips of what were identified as episodes of transformation. Specifically, a lawyer explained how he had charted a new course for his law firm after the earthquakes in Christchurch. A domestic violence counselor explained a conceptual tool he used to help the men he worked with rebuild their identities. Stories from Māori participants explained the anger, frustration, and discontent with the current socio-political regime. These stories showed how a vision for an alternative future, Māori leadership, and indigenous values have been highly successful in establishing prosperous ventures and changing futures for Māori communities. Several contributors reflected on their life's journey and what instigated change, while others recounted change (as well as failure) in organizations and in their communities when they took a stand. There were stories of sadness about ecological degradation, and one about a farmer working with local Māori to open access to a significant site. We were also directed to a performance from *Britain's Got Talent* and a report on the use of microgrids in Puerto Rico that were identified as transformations.

These contributions were then used in the second stage of our investigation: a workshop to reflect together on what could be learned about transformation. We designed the workshop as deliberative dialogue [78,79], seeded by the experiences or observations perceived by contributors to be transformational [80,81]. The workshop was designed to have people with a range of perspectives engage with the stories of transformation we had collected before the workshop, and with one another, to elucidate the concept of transformation. Some of those invited to contribute stories were also invited to the workshop.

Including a member of the research team as facilitator, the other 20 workshop participants were variously involved in working with communities to bring about change in how land and water are managed. They included farming and business entrepreneurs (including Māori), representatives from the agricultural industry sector, regional councils, conservation groups, iwi (Māori tribe), a government policy-maker, an economic consultant, and a Māori researcher, alongside environmental and social science practitioners and researchers.

The workshop combined individual responses, small group dialogue (dyads or triads), and table group conversation (four or five participants). Dialogue was prompted by the exploratory questions set out in the Insights section of this paper. Following this interpretive process, participants were invited to work together to identify what, in their view, enabled and what constrained the transformations being considered. This dialogue was structured using four 'windows of systemic appreciation' [82]. The four windows offer a way of looking at phenomena from differing 'angles' in order to appreciate systemic dimensions of a phenomenon. The four windows are sometimes labelled: Systems of Structure (what makes for effectiveness); Systems of Process (what makes for efficiency and reliability); Systems of Meaning (what gives this meaning); Systems of Knowledge/Power (what are the dynamics of distribution and exercise of expertise, knowledge, and power) [82]. We adapted that framework to form a template to structure and record dialogue. The template asked:

- In what ways can institutional, infrastructural, legal, and political structures influence transformation? (*Structures*)
- *Processes* are the way we do things. Processes may facilitate efficiency and reliability, or may get in the way of efficiency and reliability. In your experience, what processes seem to enable transformation? What processes constrain transformation?
- How may the ways people find significance and make sense of the world influence transformation? (*Meaning*)
- In what ways can the distribution of *knowledge and power* enable or constrain transformation?

Finally, we invited workshop participants to move from dialogue to public deliberation. “Public deliberation is a naturally occurring phenomenon that makes use of the human faculty for judgement” [80] (p. 1). The focus moved from deriving insights about transformation from examples to choices about “what should be done” [80] (p. 1); in this case, participants were asked to put themselves in the role of designing or reviewing transformative research. As the Challenge was particularly interested in understanding the role of science and research in transformation, we asked participants to deliberate on what they would be looking for to be confident that the proposed research would be transformative.

Workshop contributions, which were in the form of participants’ collective group-based answers to questions written on pre-prepared A3 sheets and post-it notes, were transcribed by the lead author into tables in Word documents. The lead author conducted an inductive thematic analysis to collate (rather than synthesize) the ideas into thematic categories [83].

#### 4. Insights

The words used by participants are provided here to convey the richness and diversity of responses. It should be noted that the questions used in the workshop were to enable and focus dialogue, rather than to produce atomized data. What the team were seeking was patterns of how transformation is recognized by those practicing and experiencing transformation. The outputs from the workshop, therefore, provide a grounding for our discussion, and have informed an explanatory model to promote further reflection on how researchers and policy workers might conceptualize transformation.

##### 4.1. What Is Transformation and What Does Transformation Require?

At the beginning of the workshop, and prior to any encounters with the stories we had assembled, each participant was asked to write down a response to two questions: “Transformation is . . . ” and “Transformation requires . . . ”. From the responses, there was agreement that transformation involves a significant shift or change, but what this involved varied considerably. For example, a Māori participant explained that transformation was: “Māori students entering tertiary education; Māori students succeeding, meaning the first person in an entire family to enroll into tertiary education; learning to speak Māori; self-determination based on the collective aspirations of mana whenua [i.e., rights of Māori to have authority over land]; healing from intergenerational trauma”. Other Māori participants identified transformation as “major movement through internal fortitude”, “empowering to learn a new way of thinking and being”, and “enquiry to see how one fits”. Transformation required: “mātauranga Māori heard, seen, normalised; Te Reo heard [Māori language]; moral, ethical, spiritual elements found in Māori culture; acknowledgment and challenge of sites of oppression; people, champions with open minds”; “different thinking that aligns with the heart; courage; our group”; “an open mind; acceptance to change; listening and feeling; context”; “a viable alternative to move to”; “willingness to change”.

Our farm business participants described transformation as an “ability to change a direction, perspective, or view from a current position to perceive a place that is not necessarily beneficial to the person. Usually this can be encouraged or enforced to create the movement required to change”. This participant noted that transformation required: “trust, understanding, patience, grace, respect, positioning”. Another maintained it required “shifting the nature of relationships between parts and wholes” and “a reason, a disruption, a change of thinking”.

Our policymakers identified transformation as “a fundamental shift in the way things are done—it’s ‘big’ and involves change at the systems level—it’s much more than tinkering or optimizing, because it requires a shift in the mental model on the part of all actors; different ways of gaining and sharing knowledge; shifts across society—institutions/regulatory frameworks/social arrangements and networks”; transformation is: “to take or change a position or place . . . into a new form that



signifies a departure from the original to a new that can be seen as new; transformation requires: drivers to instigate change or shift; disruption and disharmony providing an impetus to change”.

For our researchers, transformation is “when one to many people undergo a fundamental change and then the new normal has a degree of resilience” and “a significant change in the way things are done. Not just adapting existing ways of operating. Taking a new path.” They maintained that it requires: “a new way of thinking and doing, thinking that challenges the status quo, creating thinking outside the box and action”; “shift in behaviour—either driven from new habit, new regulations, or new belief”.

Our environmental groups identified transformation as “changing attitudes/opinions; making a difference; rethinking previous ‘knowledge’; changing assumptions; moving away from preconceived ideas, especially as learned when younger from peers/whanau [family]/study”. It requires “new experiences, space to rethink, energy, knowledge, people to walk alongside to share their stories of different ways of thinking/visioning the world; knowing it’s OK to change views and be comfortable with that; being able to move in small steps”; transformation is “a change in state, a shift of paradigms” and requires “a will to do things differently or change self; often requires external pressures or drivers or even a crisis; may require compromise; achieving greater good, altruism/empathy; respect; an understanding [of] how to transition and what to transition towards, ability to test, work around barriers”.

#### *4.2. What Was Transformed and What Made It Transformative?*

Participants were asked to work with a story of transformation selected for them from the material collected before the workshop. They were asked to interpret: what was transformed, and what made the experience transformative for the person telling the story? Participants were asked to use their interpretation of the transformation episode they were given to discuss these questions with their group (and record responses on the A3 sheets). It was the internal and experiential aspects of transformation that were identified to have changed: people, stories, attitudes, mindsets, beliefs, knowledge, perceptions, motivation, expectations, ways of seeing and thinking, mental maps, understandings, willingness to learn, identities, openness to others, understanding other’s starting points, Māori values and identity, reflection on individual and collective values, and relationships between people, water, and land. What made these changes transformative was interpreted to involve changes in paths, how the past is viewed, outcomes, power relations, the ability to act and change, models of operation, technological processes, states of being, views, perspectives, paradigms, cultural approach, ways of doing things, direction, relationships, extent of resilience, experiences, thinking, how things are connected, how things are used, and the living environment.

#### *4.3. Who Was Transformed?*

From the transformation episodes, participants were also asked: for whom was this a transformation? While written responses identified a range of expected actors (e.g., those that benefited, society at large), the discussion that followed the viewing of video contributions of transformation stories provided deeper insights. With some suggesting that what they were seeing was not a transformation and others maintaining that it was, it became clear that where transformation is assumed to occur and how it is defined are very important considerations. From this discussion, there was concern that the scale of any measure of transformation (e.g., at the system level) risked, in the words of a participant, “insulting people” that had transformed internally or within a group who were changing practices that were large leaps for them. Hence, starting points were also recognized as important to consider. A question that resonated across the room as fundamentally important to ask was: what does the first step of transformation look like? Invalidating small change that was significant at a personal or community level could disempower people who were on a transformation journey and could leave some transformations unrecognized.

#### 4.4. Who Was Affected, and What Capabilities and Capacities Help or Hinder Transformation?

Responses to the question of who might have been negatively affected in the transformation story identified vested interests, established actors, those that had put their faith in what are now seen as failing systems, those that deemed a one-size fits all approach was acceptable, those now implicated in the current state of resource use resulting from values not considered in the past, those that have to give ground to accept another's viewpoint, and those with rigid ideas who are not willing to engage.

Participants were also asked what capabilities and capacities might have helped or hindered transformation. For the former, participants identified prior knowledge that helped leadership, knowledge/expertise, motivation to help, ability to see another's viewpoint, talking, collaboration, strategic thinking, reflection, persistence, being able to identify a failure quickly, Māori culture, values and identity, investment of resources and time, open minds, trust and trustworthiness between those involved, opportunity to get to know individuals, being willing to engage with values and change, leaders, and those that support leaders; and, with respect to what hindered: judgmental attitudes of power holders and gatekeepers, institutional rules that discourage local responses, economies of scale that displace local responses, entrenched knowledge and expertise, lack of capacity building, institutional structures that disempower people and change, attitudes towards change, ignorance of indigenous knowledge systems, and lack of acceptance of new ways of thinking and doing.

Overall, transformation was viewed as emergent, as systems are not static; practice changes had multiple starting points and actions are cumulative across society. It was agreed there is no recipe for transformation. The ripple effect of a drop in the water provided a useful analogy for capturing how small changes or changes at multiple and different points could have large and disruptive effects. It was also argued that transformation should not be the goal of change, but if it is, it should be defined in terms of scale and impact.

#### 4.5. Structures, Processes, Meanings, and Knowledge/Power

Drawing on the work they had done with the examples of transformation, participants were asked to identify in what ways the windows of structures, processes, meanings, and knowledge/power might enable and constrain transformation. Structures (i.e., institutional settings and legislation) and processes (i.e., the way we do things) were both identified as having considerable potential for transformation, but were also implicated in creating some of the resource use problems we now have. For example, the metaphor of railway tracks was used to explain how existing institutional structures can impede transformation by being too prescriptive, rigid, narrow, and weighted towards institutional needs (e.g., reporting requirements and metrics). There was also recognition that rules, regulations, and standards (e.g., required for health and safety or necessary for economies of scale in production) can disempower local collective action and entrench unsustainable practices in unexpected and potentially unnecessary ways. Physical infrastructure was also implicated in entrenching unsustainable practices. The discussions opened important questions about whose interests existing structures served and their role in constraining but also enabling transformative change.

Thinking about how meanings (i.e., how we make sense of the world) might enable and constrain transformation elicited insights on the role of meaning in fostering social cohesion and collective action, building identity that can help establish goals and instigate action, the sharing of language and concepts—especially through Te Ao Māori (i.e., the Māori worldview), the diversity of understandings and worldviews and the importance of acknowledging their value, and the challenges of aligning values. There was also recognition that meanings can be exclusive and used to deploy power, can diminish diversity of thinking and action, and can cause some individuals to withdraw. Discussion about knowledge highlighted its importance for instigating ideas and learning from others with diverse perspectives. This conversation opened questions about accessibility and what knowledge is produced, which could be influenced by broader political agendas and imperatives. When examined in relation to power, attention focused on how and where knowledge is produced, how vested interests can influence what knowledge is produced, and the role of knowledge in entrenching unsustainable practices.

While there was recognition of how knowledge can be used to open new pathways and redistribute authority and power, there was also concern that unrealistic criteria on what counts as knowledge can disempower Māori knowledge systems and modes of enquiry, as well as local knowledge.

#### 4.6. Roles for Research and Science in Transformation

The deliberation role play, which asked participants to identify what they would be looking for in a transformative research proposal, identified inclusiveness, relationship building, a systems approach, and evidence of creating enduring change as important criteria. Notably, inclusiveness and relationship building extended to the need for conversations to collectively develop realistic and codesigned theories of change with practitioners through their knowledges, narratives, and experiences. A systems approach extended beyond the farm system to a system with interconnecting ecological, social, cultural, economic, historical, institutional, and political dimensions. There was concern that metrics (i.e., government measures of transformation based on the quantum of change) could disempower collective action to remedy past wrongs. To illustrate, conversations about how ‘we used to fish here, versus this is the nitrate level’ (or we want to fish here or see others fish here, versus you need to get to this nitrate level) can instigate quite different conversations and actions that are likely to deliver quite different outcomes. It was conveyed that an emotional connection to land and water can be a powerful motivator for transformation in thinking and action. It was also felt that research needs to look beyond individual behaviour to cross-cutting policies and practices. Connections were discussed not only in terms of people and conversations, but also as opportunities across institutions to discourage unsustainable practices and create new connections for more sustainable practices. It was also argued that understanding past successes of novel industry clusters in regions (e.g., kiwifruit, pip fruit, wine, goat milk) could tell us much about conducive institutional settings for innovation and socio-technical change.

The following themes were derived inductively from the data:

- *Catalysts for change*: for example: external drivers (e.g., economic, trade, climatic, food preferences), collective action, disruption, disharmony with the current situation, new options and alternatives, government policy, regulation and incentives, concerns about quality of life, vision, leadership.
- *Precursors to change*: for example: linked hearts and minds, internal fortitude, recast identity, courage, finding a new fit, values, open minds.
- *Processes for change*: for example: connection, collaboration, communication, vision, finding shared values and common ground, testing and experimenting, support, building new perspectives, safe spaces to empower dialogue and enable action, nonthreatening language and assumptions.
- *Barriers to change*: for example: closed minds, language, simplistic ideas about theories of change, vested interests, institutional settings and structures, existing standards and metrics, lack of catalysts, precursors and processes for change, existing infrastructure, hidden agendas, unequal and unrecognised power relations.
- *Power relations*: for example: who are the winners and losers of transformation, how are the effects of past transformations reconciled today, who decides what is transformation, the direction of transformation and how is it to be measured, who are the experts, whose knowledge counts, and what is the purpose of research (e.g., for learning or generating knowledge outputs).

In summary, a number of catalysts were identified, with some recognized as underway and culminating in precursors to change (i.e., the foundation or first steps of transformation). Importantly, what we have interpreted as precursors to change are often unseen and assumed. Some catalysts and processes for change have been instigated through government and industry water management reforms, while others are grassroots responses that seek to connect hearts and minds and find a new fit or identity in a rapidly changing world. While some barriers to change were recognized as being overcome, and power sharing was occurring, it was understood that there is still a way to go. Institutional structures were recognized as embodying power and barriers to change that can

have significant effects (both negative and positive) on precursors and processes for change. It was also recognized that building capacity for individual and collective transformational change could be thwarted or enabled by top-down incentives and institutional structures. Power relations were also identified within the research process, with unequal and sometimes unrecognized power relations between practitioners and researchers in co-design and co-innovation processes.

## 5. Discussion

As explained, important questions remain from the literature about what actually constitutes a significant and fundamental change that might identify transformation, and how transformational change occurs [2]. It has been recognized that investigating what occurs in practice is needed to identify “blind spots and policy implications” of the application of the idea of transformation, which is often used imprecisely and as a metaphor to promote and justify radical change [2] (p. 386). The objective of our research was to elicit a range of practice-based perspectives on transformation to inform policy and theory.

Our interpretive approach grounded the concept of transformation in the lived experience of a range of people chosen for their potential to recognize transformation in practice. In addition to our research team, we canvassed a wide range of perspectives in order to develop a rich picture of perceptions of transformation. Examples, experiences, and reflections of transformation in a range of contexts were elicited and then used to seed a dialogue workshop attended by a broader network of practitioners involved in working with communities to bring about change in how land and water are managed. Overall, through its three phases, our research brought together a diverse group of practitioners and collectively draws on the knowledges and experience of both Māori and Pākehā.

A key finding is that transformation is experienced, not delivered; that is, transformation is emergent rather than a direct effect of activity or an outcome of a preordained order [84]. Our practice-based research contributes to policy and theory through extending our understanding of *where* transformation takes place, what the first step of transformation might look like, and what might be deemed transformational. Specifically, alongside the expected social and political barriers to change and power relations, it was the internal and experiential dimensions that came to the fore for our practitioners in thinking about transformation.

We now return to the questions posed in the introduction:

- What is transformation?

It was shown that there was agreement across the literature and in our study that transformation involves a significant shift or change (e.g., [2,3,6,7,46–49]). However, what this involved varied considerably. Hence, while it might be possible to measure the extent of a significant change in land use as an example of transformation, what might have led to the emergence of such transformation is far more difficult to discern. We have shown that transformations are most readily identifiable in retrospect and can look different depending on where you are looking from.

- Would we know transformation if we saw it?

While incremental adaptations could be argued to accrue to transformational change [85], the increments discussed across the literature are usually conceptualized as tangible and visible forms. Transformation for Māori is complex and related to culture, social relations, and identity. These are also key dimensions of transformation for farmers. This was highlighted in the discussion of a video story on transformation that showed how a farmer and iwi (Māori tribe) had worked together to help iwi gain access to a significant site for Māori. With some in the workshop arguing what we were seeing in the video was not transformation, our Māori practitioner, who had worked with the farmer, posed the question: what does the first step of transformation look like? The journey of the farmer and iwi that occurred on a fine day along a river of New Zealand’s North Island would not be deemed to be a transformation according to theory or policy. Yet, from the perspective of a person who witnessed

what occurred, it was a relational and transformational experience for both the farmer and iwi. On that day, there was a significant shift in identities and meanings. Once again, it was evident that it is important to consider from where and when one is looking for transformation, what criteria one is using to assess it, and what is being looked for. By the time what could be described as a transformation (i.e., a big shift) is detectable, much would have occurred that is unseen and not readily retraceable. These observations raise important questions about relying on retrospective accounts of transformation to prescribe policy, and about the unit of analysis that research is focused upon (e.g., the isolated behavior and attitudes of individuals or the relations connecting practices within a socioecological system) [2,9].

- What exactly is to be transformed—people, technologies, practices, institutions, identities, systems?

In asking what is to be transformed, we found that a narrow conception of a system (e.g., a farm system, which is usually conceived in biophysical and economic terms) can overlook the social, political, historical, and cultural dimensions of change, how individual and collective identity are influenced in relation to one another, and the institutional structures within which a particular system exists and operates. Ultimately, the object of desired transformation is sustainable change (e.g., in relation to land and water use and management). Such change, however, is the product of shifts in perception, knowledge, materiality, and practical decision-making.

- What is the scale of transformation to be?

Transformation within a system is widely agreed to be emergent and coevolving, with a range of temporal and spatial scales, interconnections, and feedbacks [6,48,49,51–53]. Our research, in thinking through what transformation is, gave us insight into some unexpected contexts for transformation. For many participants, transformation was to be found in people's hearts and minds (i.e., precursors to change) and within processes of change that encourage individuals to reflect and work with others on existing practices and imagine new ways of knowing and doing. Processes can be spaces in which to grieve what has been lost and to collectively find ways forward. Therefore, from a practice-based perspective, transformation may start small and might not even be visible, but it has the potential to ripple out.

- Do small changes accumulate to a transformation?

The extent to which small changes might accumulate to a transformation is also dependent upon an assessor's position in time and space and the scale at which an assessment is occurring. It was made clear from our research that any assessment of transformation has to consider starting points. In the estimation of the practitioners informing our research, transformation appears to be more than the accumulation of small changes, but may involve such an accumulation.

- How does transformation occur in a systems context with a range of temporal and spatial scales, interconnections, and feedbacks?

When transformation is seen as emergent rather than as the direct effect of an activity or preordained order, it is not so much where and when transformation is situated, but when and where it is enacted and experienced. While it is recognized in theory that an intervention at one scale or place may be perceived as transformational at another place in a wider system (e.g., [51]), the implication is that there is no necessary correlation between the temporal and spatial scale at which transformation is desired and the temporal and spatial scale at which interventions are enacted, or where transformation is experienced. Transformation appears to be systemic by nature; to change a part of a system is to change the whole, albeit in a non-linear way.



- Should transformation be actively planned and directed or allowed to emerge?

Again, our research reinforces an understanding of transformation as emergent. That does not negate the role of planning and directed activity, but it does suggest a nonlinear relationship between intentional activity and transformation. This supports understanding transformation as an outcome of interlinking systems of practice that involve experimentation and learning and recursively reshape how practices are understood by decision-makers, as well as how and where research is conducted.

- What should be the role of science in transformation?

Our research suggests that transformation may have a non-linear causal relationship with science. The complex relationship between science and transformation is portrayed in Figure 1. The conduct of scientific research sits in a dynamic relationship with how research is understood and thought about, how the field of practice (e.g., land and water management) is understood and thought about, and practical decision-making in the field.

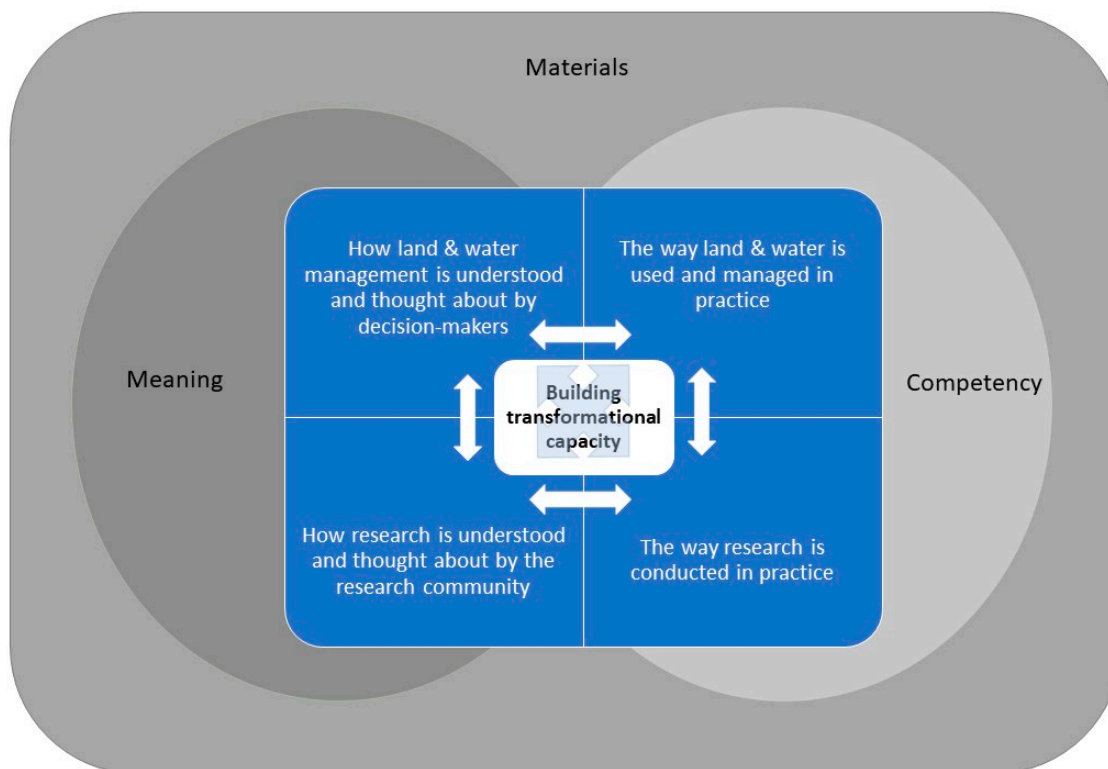
Bringing the unseen yet pivotal internal and experiential dimensions of change into view, our research contributes not only to the transformation and transition literatures, but also social practice theory. Social practice theory [10], with its focus on practices and how the elements of practices (i.e., material, meanings and competency) are linked and unlinked, has proved useful for understanding why existing practices are difficult to change. Figure 1 builds on social practice theory to represent some of the key insights of our research. Its purpose is to generate discussion on the role of science and research in transformation and to think about the potential interactions between decision-makers and researchers in building “transformational capacity” [62,63] (p. 1) through practice [65]; see also [86].

It was identified at our workshop that who and what influences practices extends well beyond individuals that directly use land and water, to policy-makers and the institutions that structure how land and water are managed and used through, for example, council planning schemes, licences, regulations, infrastructure, trade agreements, and international branding (see also [86]). The perspectives we collated on transformation can be used with social practice theory to significantly widen the field of vision on what and who influences (intentionally or not) what happens on land and in water (see Figure 1). These are useful insights for developing a future research agenda and for taking into account in the increasingly politicized debates over freshwater.

The key to understanding how social practice theory can help build transformational capacity is its potential to shift the research focus from the behavior of individuals to social practices and to conceive practices as emerging from meaning, competencies, and materials that are an integration of diverse elements and relations at a range of scales. Individuals are not lost, but seen as carriers of practices in coevolving processes and systems of practice [10,69–73,87]. On this basis, transformational capacity could be built through focusing on practices as social and institutional phenomena and enabling the linking and unlinking of the elements of practices. Our model of building transformational capacity (Figure 1) highlights a key question for assessing transformative research to deliver sustainability: how will the research enable or enhance the ‘system’ of influence between the four domains in the model and across the elements of practice, in ways that promote desired transformational capacity? This is an important question given the internal and experiential dimensions of transformation our research has identified.

Our interpretations of transformation might suggest that meaning (the left side of Figure 1) precedes the development of competencies (the right side of Figure 1). However, looking at our findings through the lens of social practice theory (Figure 1) [65,87], change in the way research is understood and thought about (bottom left) and how land and water management and use are understood and thought about (top left) (i.e., meaning) do not appear sufficient for on-the-ground practice change (top right). Furthermore, seeking to build transformational capacity through undertaking research (bottom right) and practical decision-making (top right) (i.e., competency) is also unlikely to be sufficient, if the meanings of existing on-the-ground practices and research practices (and the

potential for new practices) are not understood and aligned. Meanings and competencies are relational and co-evolve [9,10,65,69–73,87]. Our research also highlighted material elements of practices (i.e., the physical objects of an activity as well as the broader socio-technical, ecological, and political systems that make using them and accessing resources possible) and how they can constrain action and practice change, but are also key to enabling it [9,10,65,69–73,87].



**Figure 1.** An explanatory model that uses the elements of social practice theory to examine the dynamics of building transformational capacity to change how land and water are used and managed (using and extending, [10]) (p. 25).

Therefore, in terms of locating research to promote desirable transformations, there may be knowledge gaps for research to respond to in any of the domains in Figure 1, and in the interactions between the domains. As proposed above, the important question is, *how will research enable or enhance the ‘system’ of influence between the domains in ways that promote desired transformation?* So, science for transformation needs to present a credible case that the design and the way of carrying it out will not only produce knowledge about the direct object of the study, but will also facilitate change through the interplay between the four domains, resulting in transformed practice. One legitimate form of research would be to study explicitly the interplay between domains as the research object. That would enable new knowledge about what enables or constrains the interplay, and therefore desired transformation. However, even that form of research would need to meet the criterion in the key question (italicized) above.

## 6. Conclusions

To conclude, our research identified themes relevant to the dominant theoretical versions of transformation; namely catalysts for change, barriers to change, and power relations. Our research identified accompanying precursors for change (e.g., linked hearts and minds, recast identity, courage, finding a new fit, values, internal fortitude, open minds), and processes for change (e.g., for connection, collaboration, communication, vision, finding shared values and common ground, testing and

experimenting, support, building new perspectives, safe spaces to empower dialogue and enable action, nonthreatening language and assumptions). Precursors and processes for change are often missing in accounts of transformation, and from increasingly loud calls for transformation, transformative research, transformational impact, and the claims that it can be delivered. Our practice-based research suggests these are the foundations of change, where the first steps of transformation take place, and where the transformation journey begins. Our explanatory model (Figure 1) indicates that science is deeply implicated in transformation, but is not in a linear relationship with it. Shifts in any of the four domains of the model are relational, which means one can influence, but not determine, shifts in the other domains. Our research also suggests that without a shift in how practices are understood and thought about (be that the practice of science, the practice of policy making, or the practice of using and managing land and water), there is unlikely to be an experience recognizable as transformation.

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