

Talking about 1080: risk, trust and protecting our place

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Abstract

The use of 1080 for pest control by the Department of Conservation (DoC) and the Animal Health Board (AHB) is officially considered the only viable means of preventing environmental damage from possums and protecting farming from the spread of bovine tuberculosis in the West Coast region. Although 1080 has been used for decades in New Zealand, opposition to its use has intensified in recent years, particularly to aerial 1080. The public discourse revolves around the magnitude and likelihood of risks to the environment and human health, within a wider societal climate where the importance of avoiding such risks is taken for granted. Public health staff in the region spend significant time investigating complaints about misapplied 1080 baits and discussing health concerns. To date, however, there has been little formal investigation of community attitudes and reasons for the opposition to 1080. This study sought to discover how different sectors of the community perceived 1080, and how they explained why they held those views. In-depth interviews were held with twelve key informants recruited from organisations and groups that were already publicly identified as supporting or opposing 1080. Data from the interviews were analysed thematically within a framework of contemporary socio-cultural risk theory.

The analysis showed that opinions on risk were nuanced and individualised, ranging from total opposition to total support with many positions in between, rather than being sharply divided into pro- and anti-1080 blocs as is generally assumed. All participants, including those who asserted that their support for 1080 was derived from scientific evidence, drew on both quantitative information and subjective, contextual experience to explain their views. Moreover, perceptions about risk were strongly mediated by two other important factors: deep attachment to the natural environment, and issues of trust and distrust in the way pest control was managed by the local and national authorities of DoC and the AHB. Fundamentally conflicting philosophies about the way the natural environment should be managed appeared to be behind claims by both supporters and opponents that those who did not agree with them had hidden agendas, and were putting the region at risk. Health concerns were not only about physical health risk but more about overall wellbeing, especially in relation to water contamination. Only the Māori

rūnanga and DoC had a positive view of their reciprocal relationship which had developed through a combined forum over the past decade.

Key recommendations include the need for changes to community engagement and increased transparency on the part of DoC and the AHB. Insights from this study may also apply to other parts of New Zealand where 1080 is hotly contested, as well as to situations where environmental and health risks are raised in opposition to developments such as wind farms or water resource management.

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Abbreviations

| | |
|-------|---|
| AHB | Animal Health Board |
| DoC | Department of Conservation |
| ERMA | Environmental Risk Protection Authority |
| FATE | Farmers Against Ten Eighty |
| HSNO | Hazardous Substances and New Organisms Act (1996) |
| KEA | Kumara Environmental Action |
| KAKA | Karameans Advocating Kahurangi Action |
| LTCCP | Long Term Council Community Plan |
| MAF | Ministry of Agriculture and Forestry |
| MoH | Ministry of Health |
| NZGAC | New Zealand Game Animal Council |
| OIA | Official Information Act (1982) |
| PCE | Parliamentary Commissioner for the Environment |
| RMA | Resource Management Act (1991) |

Definition of Lesser Known Terms

| | |
|-------------------------|---|
| Aerial control: | The dropping of 1080 bait using custom-designed bait applicators incorporated into modified top dressing aircraft or suspended from helicopters. |
| Auger: | In the context of aerial 1080 use, the auger is the rotating piece of machinery in the bait applicator that spins round and ejects the 1080 baits. |
| Bait stations: | Containers that avoid exposing livestock, people, pets, or native wildlife to 1080 poison and protect the baits from the rain so that they last longer. |
| Farm-forest margin: | The interface between the farm pasture and forested land. Also sometimes called the bush-pasture margin. |
| Ground control: | The use of 1080 baits on the ground or in bait stations. |
| Prefeeding: | The dropping of non-toxic baits prior to poisoning operations as a means of overcoming aversion to poisoned baits and attracting more possums to the bait when the toxic baits are dropped. |
| Residual catch numbers: | Similar to the trap catch index, but measured after a 1080 operation to determine how many possums remain. |
| Trap catch index: | A nationally recognised measurement of possum numbers obtained by laying out possum leg-hold traps over several nights. The numbers caught are used to determine possum density in a particular area. |
| Vector: | Describing possums as vectors of bovine tuberculosis indicates that they can not only become infected but have become a self sustaining reservoir of infection which they can then transmit to cattle and deer. |

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Chapter 1: Setting the scene

Background to 1080 use in the West Coast region

Introduction

The West Coast region of the South Island of New Zealand stretches 600 kilometres from Kahurangi Point in the North to Awarua Point in the south. It is a place of spectacular natural landscapes where forests, glaciers, and rivers sweep down from the spine of the Southern Alps in the east to the wild sea coast of the Tasman Sea in the west. Much of the rugged terrain is inaccessible by road and the region is correspondingly thinly populated.¹ The people who live there, often referred to as “Coasters” have a reputation for independence and resilience, and a dislike of bureaucracy (Sampson and Goodrich, 2009, Grubb, 2005). Many of them make their living and spend their leisure time in the outdoors, and the natural environment is a vital part of their lives (Development West Coast, Undated). Possums are a problem pest in the West Coast environment because of their destruction of the forest and their effect on bird life (DoC, undated-b, Payton, 2000). They also spread bovine tuberculosis, a serious threat to cattle and deer farming, one of the region’s main income streams (AHB, 2009). Because of the large land area and the rugged landscape, aerial 1080 is used as the key tool in possum control. Its use is highly controversial, with those who oppose it raising a wide range of concerns about risks to the environment and human health. The scientific evidence consistently reports that the risks are small and are outweighed by the environmental and economic benefits, but the level of opposition has intensified rather than declined over recent years, and tends to reach a peak when an aerial operation is due to take place (Carroll, 2008b, Cox, 2007, Easton and Watt, 2008, KAKA, 2008). In spite of the level of controversy, there has as yet been no in-depth investigation into the reasons why people support or oppose 1080. The aim of the current study, therefore was to fill this knowledge gap.

This introductory chapter sets the scene for the study by establishing the wider general

¹ West Coast Regional Council figures currently give the population as approximately 35,000. (West Coast Regional Council, undated)

context for the 1080 debate. The first sections cover the environmental and economic problems that possums pose and the use of 1080 as a means of controlling them. This is followed by an outline of what is known about public attitudes for and against 1080 and a brief overview of the scientific investigations that have been done on its effects. Next, the chapter focuses on the specific issues for the West Coast region, and the final section states the aims of the study and why it is important for public health.

The possum problem in New Zealand

Between 1858 and 1930 the Australian brushtail possum (*Trichosurus vulpecula*) was repeatedly liberated in New Zealand in an effort to establish a fur industry (Wodzicki and Wright, 1984). Over several decades possums spread throughout the country (Clout and Ericksen, 2000) and today are a wildlife pest. Because New Zealand has no native land mammals, the forests evolved without natural defences such as thorns, tough leaves or plant poisons that would deter browsing mammals, or mechanisms to exploit mammalian behaviour for pollination or seed dispersal (Wodzicki and Wright, 1984). Moreover, in the New Zealand environment, possums and other introduced animal pests² are without the natural competitors and predators that control their numbers where they originate (ERMA, 2007b, Green, 2004). Possums browse on new shoots, buds, flowers and fruits of plants and can kill trees by defoliation. Their browsing reduces food supplies for birds, bats, lizards and invertebrates, affects bird breeding and nesting success, reduces seed dispersal and the regenerative capacity of native plants (Payton, 2000). Possums also eat invertebrates, birds' eggs, and nestlings (Sadleir, 2000). The number of possums in New Zealand was widely quoted at 70 million for many years (Hutching, 2009) based on studies carried out during the 1980s (Keber 1985; Brockie 1986 cited in Warburton 2009), but more recently has been estimated at nearer to 30 million (Warburton et al., 2009).

As well as causing environmental damage, possums are a reservoir host (or vector) for bovine tuberculosis, a disease that affects cattle and deer. Stock infected with bovine TB must be slaughtered and the remainder of the herd is then subject to movement restrictions and increased testing regimes. According to Environmental Risk

² Primarily stoats, rats, ferrets, and rabbits. All except rabbits also endanger native birds by eating their eggs and young.

Management Authority (ERMA) (2007b, p.7) wild animals, mainly possums,³ cause 90% of all livestock infection and are the greatest barrier to the eradication of bovine TB. Infected herds have a negative economic and social impact on individuals and families from loss of livelihood, and the flow-on effect is felt in the local community (Anonymous, 2007). There are also wider political and economic implications if access to international markets is lost because of actual or perceived loss of control of the disease (ERMA, 2007b). Bovine TB is transmissible to humans through contact with infected animals, drinking unpasteurised milk or handling infected meat. Although it accounts for only around 3% of laboratory-confirmed human cases of tuberculosis, the New Zealand rate is higher than for other developed countries and represents significant morbidity and potentially fatal illness (Baker et al., 2006).

The use of 1080 (sodium fluoroacetate) in New Zealand

The principal means of controlling possums is the poison 1080. 1080 was developed as a pesticide in the 1940s and was originally welcomed enthusiastically in public health circles because of its success in controlling rodents (Davis, 1949, Gray, 1948). Soon, however, the danger to non-target organisms and humans was recognised and it was declared unsafe for widespread use (Anonymous, 1952, Barnett and Spencer, 1949). 1080 kills by interfering with the Krebs cycle, the metabolic pathway that allows cells to function. Death eventually results from breathing problems, heart and central nervous system failure (Eason, 2002, Green, 2004). 1080 is highly lethal to all mammals, though species vary in their sensitivity.⁴ Dogs are the most sensitive and fish and aquatic organisms the least (O'Hagan, 2004, Suren and Lambert, 2006). Birds are less sensitive than mammals but their small size means that they can easily ingest enough to be fatal (Green, 2004). Human sensitivity has been estimated at between 2.0 and 10.0 mg/kg of body weight, based on extrapolation from animal studies or cases of deliberate or accidental poisoning (Eason et al., 2011, Toxnet, 2003). Most studies have been on acute toxicity; less is known about the risk of chronic exposure at low doses. Animal studies suggest that low level exposure may be carcinogenic, and may affect cardiac and endocrine function, the male reproductive system, and foetal development (Eason et al.,

³ In some areas, ferrets are also vectors of bovine TB.

⁴ Toxicity is expressed as LD₅₀, being the dose in milligrams per kilogram of bodyweight that would be sufficient to kill 50% of an exposed population. For example, dogs have an LD₅₀ of 0.06, rabbits 0.35, cattle 0.4, weka 8.0, waxeye 9.25. Eason (2002) and Green (2004) list the sensitivity of various species.

2011). A review of the effects of chronic exposure by Weaver (2006) found that there was insufficient evidence to establish any definite conclusions.

1080 has been used in New Zealand for pest control since the mid-1950s (Eason et al., 2011). New Zealand is the major user of the world supply of 1080, taking between 80% and 90% of the product manufactured in the United States.⁵ On entry into New Zealand the raw product is converted into soluble concentrate and then to cereal based pellets for use in pest control operations (Eason, 2002). Baits containing 1.5mg 1080/g bait, (i.e. 0.15% concentration) are used for both aerial applications and in ground control bait-stations. They are dyed green which is believed to make them less attractive to birds, and flavoured with cinnamon to mask the taste of the poison (Eason, 2002). In the past 1080 has been used in other forms, as a gel, a paste, and on treated sliced carrots.

The Animal Health Board (AHB) and the Department of Conservation (DoC) are the two principal users of 1080.⁶ DoC's primary focus is to protect biodiversity by controlling possum damage to forests and native wildlife, whereas the AHB aims to reduce the spread of wildlife infected with bovine TB so as to protect domestic farming and agricultural exports (PCE, 2011). Registered contractors carry out much of the field work, particularly the specialised aerial operations. As a consequence of improvements in bait quality, prefeeding,⁷ and increased accuracy of aerial distribution, the amount of 1080 applied has declined markedly from more than 15 kg/hectare in the early 1970s to 2–5 kg/hectare in the early 2000s (Eason and Turck, 2002, p.9), and recently good results were reported with rates as low 0.75kg/hectare when preceded by prefeeding (AHB, 2010).

The Environmental Protection Agency⁸ controls the use of 1080 under the Hazardous Substances and New Organisms (HSNO) Act 1996 . The provisions of the Act include a requirement in Section 95A that prior written permission must be obtained from a

⁵ 1080 is used in a limited way in the United States, Mexico, Australia, and Israel.

⁶ Other users are local and regional councils and some private landowners.

⁷ Prefeeding: the dropping of non-toxic baits prior to poisoning operations as a means of overcoming aversion to poisoned baits and attracting more possums to the bait when the toxic baits are dropped (Ross, 1997)

⁸ The direction of the Environmental Risk Management Authority (ERMA) is now under the direction of the Environmental Protection Authority which was formed in 2011.

Medical Officer of Health before an aerial 1080 operation. Section 97(g) of the Act gives the Chief Executive of the Ministry of Health powers to ensure that the provisions of this Act are enforced where it is necessary to protect public health. These powers are delegated to a designated public health officer⁹ in the region where the 1080 operation is to happen. All aerial 1080 operations also need a consent from the relevant Regional Council under the Resource Management Act (RMA) 1991. One of the criteria for obtaining the consent is that consultation has been carried out with relevant Māori groups. Section 6(e) of the RMA recognises the kaitiakitanga (stewardship)¹⁰ that Māori have over their lands, stating that “the relationship of Māori and their culture and traditions with their ancestral lands, shall be recognised and provided for by ...all persons exercising functions and powers under [the Act], in relation to managing the use, development, and protection of natural and physical resources, as matters of national importance”. Section 8 of the Act further requires that the principles of the Treaty of Waitangi must also be taken into account.¹¹

Attitudes to 1080

Throughout almost 60 years of its use in New Zealand, 1080 has been supported by government policy and public funding. A detailed reassessment of 1080 in 2007 by Environmental Risk Management Authority (ERMA) (2007a) concluded that its use must continue because there was as yet no viable alternative and the environmental and economic benefits offset any disadvantages. 1080 is supported by the conservation group Forest and Bird (2009), and a recent report from the Parliamentary Commissioner for the Environment also advocated strongly for its continued and intensified use (PCE, 2011). The supporters of 1080 acknowledge that it kills some non-target wildlife, especially birds, but believe that populations increase overall because of the reduction of predators (including stoats and rats as well as possums), and that this far outweighs any short term losses (ERMA, 2007a). 1080 is also generally supported by the agricultural sector because of fears that without it, bovine TB would get out of control, compromising the viability of individual farms, and, potentially the entire agricultural

⁹ Powers are delegated to a designated officer of the Ministry of Health (either a Medical Officer of Health or a Health Protection Officer who also holds a HSNO warrant).

¹⁰ Usually translated as “stewardship” or “guardianship” though these words are considered inadequate to convey the full meaning of the concept (see Jefferies et al (2002)

¹¹ The legislation that applies to 1080 is considerably more complex than can be covered here. The Parliamentary Commissioner for the Environment noted in a recent report (PCE 2011) that the aerial use of 1080 is controlled under 15 different laws.

sector including export markets (TB Free New Zealand, 2009a).

There has been little formal study of public perceptions of 1080. Several telephone surveys on attitudes to pest control using random population sampling found a consistent preference for trapping and shooting as being more humane than poisons, but none of them focused specifically on 1080 (Fitzgerald et al., 2005, Fitzgerald et al., 1995, Wilkinson and Fitzgerald, 1999, Sheppard and Urquhart, 1991, Fitzgerald et al., 1994, Fitzgerald et al., 2000, Wilkinson and Fitzgerald, 2006).¹² Most of the recent evidence comes from media reports, most of which feature opposition to its use (Acker, 2008, Anonymous, 2008c, Carroll, 2008a, Carroll, 2008b, Murray, 2008) and the websites of individual organisations opposed to it (1080 National Network New Zealand, 2008, Willems, 2002, New Zealand Deerstalkers Association, 2006). These sources demonstrate that many opponents reject the premise that the benefits outweigh the risks, and believe 1080 is a serious threat to ecosystems and especially to native birds with small populations that are struggling to survive. Health risks raised include accidental poisoning, contamination of drinking water and wild foods, anxiety and stress, and the effect on pregnant women and foetal development. Chronic exposure to low levels of 1080 and its accumulation in the environment has been another concern, with fears that long term and intergenerational effects could be building up, which are as yet unknown. The effect on recreational hunting, the inhumaneness of the poison, the accidental poisoning of domestic pets, especially dogs, and the damage done to New Zealand's image as a "green" tourist destination and provider of uncontaminated agricultural produce have also been raised. Generally, opponents find aerial 1080 less acceptable than ground control.¹³

There has been some investigation of Māori attitudes to 1080. These have found just as wide a spectrum of opinion as there is among non-Māori, ranging across a continuum from strong support to strong opposition (Ataria and Ogilvie, 2007, Horn and Kilvington, 2002, Para, 1999). Although Māori acknowledge the need to manage the impact of introduced pests, they generally find the use of toxins in the environment unacceptable and contrary to tikanga Māori (the right way of doing things according to custom). Additionally, they have been disappointed at their lack of involvement in

¹² Some of these surveys asked only about biological control methods and some did not include possums.

¹³ See the objectives of the KAKA group, one of which is to "force an effective ban on 1080 air drops" http://kaka1080.co.nz/kaka_press_releases.html

setting priorities for pest control strategies that fit with the local Māori community's own particular views on 1080 and their relationship with their natural resources (Ataria and Ogilvie, 2007).

Scientific studies on 1080

Much of the research on 1080 has been carried out in New Zealand as the small amount of its use elsewhere has meant there has been limited interest in research and publication in other countries (Beasley et al., 2009). Early New Zealand investigations were primarily concerned with 1080's effectiveness in controlling target animals (Batchelor, 1978, Staples, 1976). Much of the subsequent research has been driven by the need to investigate potential adverse effects. There have been numerous investigations¹⁴ of the effect of 1080 on native birds (Calder and Deuss, 1985, Powlesland et al., 1998, Powlesland et al., 1998, Spurr, 1989) and other non-target wildlife (Brown and Ulrich, 2005, Hutcheson, 1996, Lloyd, 1994, Perfect and Bell, 2005, Pierce and Montgomery, 1992). Other studies have examined levels of 1080 in soil, water, vegetation, and the rate at which it biodegrades in the environment (Anderson, 1996, Foronda, 2007, Huser, 1990, Ogilvie et al., 2009, Ogilvie et al., 1998, Ogilvie et al., 1996). There have been technical papers on quality control of baits, methods of spreading aerial 1080 more effectively (Morgan, 2004, Thomas, 1991, Thomas and Hickling, 1989, Warburton, 1996) and the health effects of occupational exposure (Beasley et al., 2009, O'Connor et al., 2003). Alternatives to 1080 continue to be investigated, including better trapping methods (Warburton and Poutu, 2008, Warburton and Yockney, 2009), new poisons (PCE, 2011), and vaccines against bovine TB for cattle and deer (Buddle et al., 2006). Research into biological methods to reduce possum fertility or to develop a possum specific virus appeared promising but interest has declined in recent years (PCE, 2011).

Possums, 1080 and the West Coast region of the South Island

More than half (58%) of the total land area of 2,335,151 hectares of the West Coast is covered in native forest. Eighty-seven percent of the total land area is administered by the Crown, 78% of which is Conservation Estate. Five national parks¹⁵ fall fully or partly

¹⁴ Representative examples only are given of the many studies that have been done.

¹⁵ Arthurs Pass National Park, Paparoa, Kahurangi, Westland Tai Poutini, and Mt Aspiring.

within the region. Private land ownership is correspondingly small. The broadleaf forests of Central Westland where rata and kamahi predominate are particularly attractive to possums. A 1992 study estimated that 20% of the forest canopy had been affected by dieback in the previous forty years (Rose et al., 1992). These forests are home to species of native birds such as kiwi and kaka which are found in more abundant numbers there than elsewhere (DoC, undated-b). Although beech itself is not liked by possums, beech forests have sub-canopy fruiting and flowering species that birds rely on and which are also badly affected by possums (Cochrane et al., 2003). Possums as vectors of bovine tuberculosis are also a problem to farming.¹⁶ Many of the farms include patches of forest, and this farm-forest margin is where possums come into contact with the cattle and deer herds. At 30 June 2010 there were 38 infected herds in the region, down from 48 the previous year, but considerably higher than any other area (AHB, 2010). The incidence of bovine tuberculosis in humans is also above the national average (Baker et al., 2006). Although there is considerable ground laying of 1080 (DoC, 2011), both DoC and the AHB see aerial 1080 as being the most practicable method for the West Coast because of the mountainous terrain and the size of the area to be covered (DoC, undated-a).

The use of 1080 is highly contentious in the region. Those who support it have serious concerns about the ability to control environmental damage and bovine TB without it (Lash, 2008). However, there also appears to be a significant group of people with equally serious concerns about its adverse effects. Among the local groups that have been formed specifically to oppose 1080 are KAKA (Karameans Advocating Kahurangi Action), KEA (Kumara Environmental Action) and FATE (Farmers Against Ten Eighty).¹⁷ KAKA is unusual among the groups in having a website¹⁸ that states its concerns and objectives; the other groups are known primarily through media reports of their statements, and letters to the West Coast and Canterbury newspapers (Acker, 2008, Carroll, 2008a, Carroll, 2008b, Mills, 2007, Taylor 2008). There are also individuals whose strong views are known through media coverage but who are not affiliated with any group. Apart from written submissions and political lobbying, there have been outdoor

¹⁶ There are around 140,000 dairy cattle (West Coast NZ 2009 figures), 39,000 beef cattle, and around 33,000 farmed deer (Statistics New Zealand 2006 figures).

¹⁷ The Fluoride Action Network also opposes 1080 though its primary aim is to oppose water fluoridation rather than 1080 per se.

¹⁸ See <http://kaka1080.co.nz/>

protests, attempts to blockade operations, and occasional harassment of the staff or damage to the premises of those who carry out 1080 operations (Carroll, 2008a, Mills, 2007). The resulting publicity indicates concerns about environmental and human health risks of 1080, and scepticism about official assurances of its safety. There are also fears about the adverse effects that 1080 operations have on tourism, given that the use of poison directly conflicts with the promotion of the West Coast as a pristine environment with natural, unspoilt beauty (Murray, 2008).

Public health implications of 1080 use in the West Coast region

The community unease caused by the controversy over 1080 has implications for the health and wellbeing of the people of the West Coast. At its most extreme it has the potential to affect the physical and mental health of residents, cause exodus from the district, and affect the economic viability of the entire region. At present, however, the way the risks are perceived appears to be poorly understood and to vary considerably between different sectors of the community. In 2008, TB Free New Zealand commissioned a survey of West Coast residents and land owners about their beliefs around 1080, but the few results that were made public (TB Free New Zealand, 2009b) provided little further understanding of the issues. The dispute over 1080 has also had a significant impact on the public health authorities in the area in their role of assessing each aerial 1080 operation for risks to human health under the HSNO Act (1996). They need to respond to many enquiries and complaints about 1080, yet because there has been no formal investigation undertaken, they lack an in-depth understanding of what perceptions are held, who holds them, and how they have been formed. They deal with particularly intense concern in the period leading up to aerial operations, and frequently come under pressure from some in the community who do not understand the limits of their mandate (Community and Public Health West Coast, 2010).

Aims of the current study

This study, therefore, set out to answer the following research questions:

- How do different sectors of the community on the West Coast perceive 1080, and for those that believe there are risks, how do they understand them?
- How do people explain why they came to believe what they do about 1080?

The answers to these questions aimed, firstly, to fill the knowledge gap about how the risks were perceived and why people held particular views. Secondly, by providing a more in-depth understanding of risk perception about 1080, it was hoped that the answers would assist public health and other officials to communicate with the relevant groups in a way that would address their known concerns. Lastly, the study aimed to provide a basis for further examination of perception of risk in this and other similar situations. The next chapter goes on to describe how the study was designed and carried out.

Chapter 2: Methodology and methods

Introduction

The key focus of my research was to gain an insight into the issues around 1080 from people who had direct experience and knowledge of them. I wanted to understand why opposition to 1080 seemed to be increasing and was focused around risks to health and the environment, yet scientific studies continued to find these risks were minimal. I was intrigued by this apparent paradox, and wanted to investigate these different viewpoints at first hand rather than from information selected and presented through other media. I had not been able to find any studies that had asked the people involved what they thought, and it seemed to be a topic begging for investigation. I was also aware that the public health professionals who worked in the West Coast region found their involvement in the 1080 debate difficult, and would welcome any research that gave them further understanding and insights which would assist their work.

Methodological approach

I was not expecting to derive objective conclusions about the “truth” of any particular perspective but instead to make a critical examination of the topic using qualitative methods. The strength of qualitative research lies in its ability to ask how people explain why they think and behave as they do, so that areas of human experience can be accessed which are not open to quantitative research such as surveys (Casswell, 2003, Davidson and Tolich, 2003, p.131, Pope and Mays, 2000). Therefore, I hoped to gather direct accounts which would give insights into the attitudes and views of the people who had strong views either in favour or against 1080, as they appeared to be the ones driving the debate. I wanted to find participants who would be willing to be interviewed, and hear why they believed what they did and how they had come to think that way (Crotty, 1998, Guba and Lincoln, 1994). While this would focus on the subjective experiences of the participants, it would not merely be a report of a series of personal stories. Instead, by analysing and comparing the various accounts of the interviewees, I aimed to develop

the theoretical understanding and nuanced analysis described by qualitative theorists (Green and Thorogood, 2009, p.95, Rubin and Rubin, 2005, p.4) to reveal underlying beliefs about 1080. This analysis, supported by the theoretical framework I had chosen, might develop an understanding of the topic that had not been previously available, including to the participants themselves (Green and Thorogood, 2009, p.29). Because I did not know in advance exactly how the study would develop, choosing a qualitative approach had the advantage that it would be flexible enough to adapt and change if, during the project, the data being gathered suggested that a shift in perspective or a new line of enquiry was needed (Green and Thorogood, 2009, p.26).

Positionality

In qualitative studies, researchers apply reflexivity to the research process, that is, they critically analyse their own position and acknowledge that their analysis and conclusions are inevitably influenced by their own background and life experiences (Green and Thorogood, 2009, p.24, Rice and Ezzy, 1999, p.25). A fundamental consideration is the ontological and epistemological position of the researcher, which affects how they generate and analyse the data, and how they view the topic within the broader social and political context (Green and Thorogood, 2009, p. 24). Positions about the nature of reality form a continuum ranging from positivist assumptions that reality is something fixed and has an existence independent of human perception at the one end, through to the constructionist view that reality is entirely dependent on human processes at the other. An individual researcher may have a position at either end of this spectrum or at any place in between (Green and Thorogood, 2009, p.18).

At the outset of the study, my views on 1080 were based on what I had read about its benefits in the scientific literature, and the opinions I had gathered about its potential adverse effects from the news media. In terms of the continuum described above, I had taken a modified objectivist epistemological position, believing that I could piece together one overall understanding, albeit imperfectly grasped, from the data I would gather. Before starting the interviews I had imagined that the participants would work through the various risks, giving me their views on each one in turn, so that their views could be compared. However, it became clear from the first interview that I had overestimated my own understanding and that the issues were far more complex and

varied than I had imagined. Additionally, the rich and detailed data I was gathering did not fit with my preconceptions of how the participants would frame their responses. I realised that I had accepted the viewpoint of the scientific and official publications on 1080 fairly uncritically as “fact” and been sceptical of the newspaper reporting as overstated and sensationalised. Once I started to interview people who had first-hand experience and knowledge, I quickly came to realise that my understanding of the debate had been simplistic and that there were many other interpretations and viewpoints of which I had been entirely unaware. My perspective shifted some way along the continuum of assumptions about reality to a more constructivist view as I came to see that my interviewees’ accounts presented many different realities. The ability of qualitative research to be carefully planned, but flexible enough to change and adapt (Green and Thorogood, 2009, p.26, Hansen, 2006, p.139) meant that this shift was a positive development for both the study and my own experience as a researcher. I was able to accommodate the departure from my original conception and draw out richer and more complex information than I had anticipated, particularly as I gained in confidence and experience in interviewing. So even though my prior reflections were not entirely accurate, the reflexive process itself was valuable preparation for the fieldwork.

Interviewees in qualitative studies are not passive “subjects” but take an active part in collaboration with the interviewer in constructing meaning (Pope and Mays, 2000, p.16, Rice and Ezzy, 1999, p.54). It is pertinent therefore to consider how they might position themselves in relation to the researcher. Interviewees are likely to “place” an interviewer in terms of their social and cultural characteristics such as gender, age, education and ethnicity (Green and Thorogood, 2009, p.105), and this may affect how openly they express themselves. The meeting between the researcher and the interviewee is usually one between strangers, and while this provides certain freedoms for the interviewee in being able to speak without being overheard by their peers (Rice and Ezzy, 1999, p.68), what they choose to reveal is likely to be influenced by the rapport which the interviewer has been able to establish (Green and Thorogood, 2009, p.106). I had expected that as an urban outsider, a student, and an inexperienced interviewer, people might be reluctant to talk to me and I would not have the necessary skills to overcome their reservations. My fears, however, proved groundless, as all participants readily gave me their views in detail. In this respect my lack of history of being aligned with any group that supported or opposed 1080 may have been an advantage. It may also have helped that I was near

in age to many of the interviewees and familiar with the history of pest management over past decades that many of them referred to. On the other hand, some of them may have felt constrained by the knowledge that they would be identified by their organisational affiliation in the finished thesis and therefore they may not have felt entirely free to express opinions that were different from those of their organisation. As Green and Thorogood remark (2009), interviewing provides access only to what people say (rather than what they do or think) and they may present a strictly “public account” (p. 106) tailored for the purpose of the researcher. Of course, even though I was aware of all these factors, it is impossible to know how they influenced the way each interviewee selected and framed their comments.

The power differential between the interviewer and interviewee also needs to be considered. Much of the theoretical writing on this aspect of interviewing tends to assume that the interviewer will be in a more powerful position than the participants, who may be at a disadvantage (Green and Thorogood, 2009, p.108-9, Pope and Mays, 2000, p.15). The interview setting is another factor that helps to “... construct the power and positionality of the participants...” (Elwood and Martin, 2000, p.650). I considered these factors, but felt that in my case they were not particularly relevant. All the participants held influential positions in their own organisations, and all but one were interviewed in their own workplace or home¹⁹ where they had chosen to invite me. If anything, each of them was more powerfully positioned than a student researcher. Nevertheless I was acutely conscious of the trust they had placed in me by giving me not only the opinions of the organisations or groups they represented, but by inviting me into their own space and sharing their personal experiences and viewpoints. I felt a keen sense of responsibility to represent them as faithfully as possible in my analysis.

Methods

I chose in-depth qualitative interviews as being the most suitable method of collecting the data because they work well with an inductive approach when new and unknown information is being sought (Pope and Mays, 2000, p.18, Rice and Ezzy, 1999, p.68). In-depth interviewing makes use of the flexibility of the qualitative research process as it

¹⁹ The only one who was not, was interviewed in a seminar room at the University department to suit the interviewee’s tight schedule on the day after previous arrangements had to be deferred.

allows understanding to be developed early on, which can then be carried forward into subsequent interviews, thus drawing out more detail as new issues come to light (Green and Thorogood, 2009, p.94, Pope and Mays, 2000, p.12, Rice and Ezzy, 1999, p.59). Interviewing allows the perspective of a single person to be explored in more detail than would be possible in a focus group or observational study. It allows time to develop a relationship between the researcher and the interviewee and the data gathered is correspondingly richer. In-depth interviews were also the most practical option in a thinly spread population where many of the participants worked irregular hours in remote locations²⁰ and where it would have been unrealistic to attempt anything other than meeting them individually.

The purposive sample

As it was important to find key informants who had first hand experience of the issues around 1080 in the West Coast context (Casswell, 2003, Davidson and Tolich, 2003, p.131) I used purposive sampling, that is, explicitly selecting interviewees from a range of groups that would have a different orientation on the topic (Green and Thorogood, 2009, p.138, Rice and Ezzy, 1999, p.44) and were therefore likely to generate appropriate and useful data that could be analysed thematically. Because of the polarised nature of the debate, the purposive sample was made up of people who were known to hold strong views on 1080. I did not seek out participants whose views might sit in the middle. I identified a total of thirteen viewpoints that it would be valuable to include. These were made up of organisations that administered 1080, groups that were known through media reports to oppose it, and the two Māori rūnanga (councils) of the region. Letters with information about the study were sent to contact people in early December 2009 asking if they would agree to participate. As I was unable to locate a contact person for a hunting organisation, a hunter was identified through a personal contact on the West Coast. Of the thirteen people approached, twelve agreed to participate.²¹ In qualitative research it is always difficult to know in advance how many people to interview (Green and Thorogood, 2009, Rice and Ezzy, 1999). The final number of

²⁰ Although a focus group study might have been an alternative method in theory, the logistics of getting people together at the same time would have been extremely challenging, particularly participants whose livelihoods were ruled by the weather.

²¹ The Fluoride Action Network, who were known to oppose 1080, replied by email: “ Considering this is the biggest row ever to hit the Coast, and is unlikely to be bettered in the next 20 years, the group has zero confidence in the study process for a number of reasons. In all we do not consider that the researcher will be allowed to report balanced and objective information. We therefore decline to participate.”

twelve participants was both realistic within the scope of a Masters thesis, as well as covering almost all the major viewpoints that had been identified. Moreover, it was also the number found by Guest et al (2006) to be the point at which saturation²² is likely to occur in qualitative interviewing.

Ethical approval

As with any piece of research, it was my responsibility to provide full information to potential participants, and ensure their confidentiality. A specific issue for this particular study was the nature of the small West Coast community which meant that participants would potentially be identifiable from their viewpoint or organisational affiliation in the finished thesis even if they were not mentioned by name. However, as most of them were already publicly associated with their position, either through statements to the media or by positions they held in the organisations that used 1080, it was considered acceptable as long as this was drawn to their attention and their informed consent was given. The University of Otago Ethics Committee ruled that the proposal for the study could go forward for Departmental approval and this was granted in August 2009.

Although I knew 1080 was highly controversial in the region, I was nevertheless surprised that my mail-out generated unsolicited contacts from people I had not approached. One of them persisted in contacting me several times, asking for the names of the people I was going to interview and demanding to know my credentials for undertaking such a study. The value of the ethics process became clear at this time as a protection not only for the participants but also for myself as it allowed me to confidently refuse to divulge details that would breached the confidentiality of the participants and potentially jeopardised the willingness of people to participate.

Data collection

The interviews took place over two separate weeks during early 2010: seven in the week 1-5 February 2010, and a further four between 16-18 March 2010. One interview was conducted in Christchurch on 9 March, 2010, at the interviewee's request. As the interviews were semi-structured, I drew up a broad general outline for myself to ensure that I covered all areas of interest. All interviews took place face-to-face and were

²² Saturation: the point where new data are not adding to emerging theory (Green & Thorogood 2009).

recorded using two Olympus digital recorders (one as a back up). Before each interview I went over the consent form and explained my own background and reasons for doing the study.²³ I emphasised to interviewees that the recorders could be switched off at any time if they were uncomfortable, or they could stop the interview altogether. One person requested the recorders be stopped for a short personal anecdote. The interviews ranged from 38 minutes to almost 90 minutes in duration. I found that asking each participant to tell me about their background and how their interest in 1080, (or position, if in a user organisation) came about was a useful opening and led naturally into the other relevant areas with a minimum of prompting. To conclude I asked the interviewee for any further comments or questions. The value of choosing the semi-structured approach was confirmed, as a number of new issues of which I had been unaware were raised and these were able to be incorporated into subsequent interviews, greatly adding to the depth of coverage by drawing on the rich knowledge and experience of the interviewees.

I reviewed each recording as soon as possible after completing it so that I could critique my technique. I was able to rectify some weaknesses, such as making too many affirming noises, and not framing my questions clearly, and I managed to reduce, even if not entirely eliminate, phrases such as “you know” and other fillers. I also found that I might have occasionally cut the interviewee short and that I therefore needed to allow a longer pause when an interviewee stopped speaking. However, although I could hear that I made significant improvements, every interview had some aspects that could have been better. Another useful discovery was that the provisional title for the study (a case study in community perception of risk) was confusing and needed to change as almost half the participants initially thought that I wanted to know about “community perception” rather than hear their personal views.

Data transcription

Because of the amount of interviewing and travel that had to be compressed into a few days in the area, it proved unrealistic to transcribe each interview before conducting the next one. On returning home the recordings were transcribed promptly. As the purpose of gathering the data was for a thematic content analysis rather than a discourse analysis, I omitted my own short affirmations (“really”, “Mmm”, etc). This facilitated the

²³ This had already been explained in the original information sent to the interviewee but several months had elapsed since sending these.

transcription considerably and allowed the responses of the interviewees to read more smoothly. The interviewees' hesitations and "fillers" ("you knows" and "I means") were initially transcribed, but most have been omitted from the quoted excerpts in the following chapters when they added nothing to the meaning. Once each transcript was completed it was mailed to the relevant participant with a letter of thanks inviting them to check the transcripts for accuracy and to provide any corrections, deletions, or additions within the next month. Allowing a defined period for changes worked well in enabling the analysis to go ahead without having to follow up participants who had not responded. One interviewee asked for the voice file of the interview on CD and I subsequently sent this to everyone so that they could compare the transcript and recording directly if they had any doubts about the accuracy of my transcription.

Data analysis

The data were analysed using a systematic iterative thematic approach to identify recurring patterns, following the process described in the literature on qualitative methods (Attride-Stirling, 2001, Braun and Clarke, 2006, Green and Thorogood, 2009, Hansen, 2006, Pope and Mays, 2000). First I read the transcripts through several times and coded them by noting recurring words or themes, but without attempting any interpretation. Next I reviewed the codes and sorted them into eighteen broader level themes and began to consider how the themes with shared features could be grouped together coherently. The themes were then reviewed again and refined into a thematic map (Attride-Stirling, 2001, Braun and Clarke, 2006, Pope and Mays, 2000), resulting in five higher level themes, each based around a different type of risk. I made several unsatisfactory attempts at collating data under these five themes and developing an initial analysis. Eventually I realised that I was still clinging to my original idea of framing the study as a checklist of risks with opinions for and against each one, and which I had already realised was the wrong approach during the interviews. I abandoned these five themes and returned to look afresh at the eighteen themes I had gathered in the previous stage. The work that I had done already was not wasted, however, because I became more and more familiar with the data as I worked through it many times. Eventually I arrived at three top level themes: risk, trust, and the importance of attachment to place.

The emergence of these important additional concepts around which I would base the

critical analysis and discussion, meant that I needed to return to the literature and expand what I had already reviewed on risk to include theoretical writing on trust and place attachment. This turn of events was not a set back but an exciting development, and aptly demonstrated the strength of qualitative research to "...utilize, adapt and devise methods of inquiry and bodies of literature as the need arises throughout the project (Denzin & Lincoln 1998 cited in Green and Thorogood 2009, p.26.) The next chapter moves on to these bodies of literature on risk, trust, and place attachment, showing how they are linked and how they work, both separately and in combination, to underpin the study.

Chapter 3: The theory and literature of risk

Introduction

The word “risk” came into English from French *risque* and Italian *risco* (danger) in early modern times. At this time taking a risk did not necessarily mean danger, but also implied the chance of good fortune (Bernstein, 1996, p.95, Skjong, 2005).²⁴ In contemporary society, the neutral meaning of risk as something that may have either a good or bad outcome has largely been replaced in both scientific and popular discourse by the meaning of risk as a threat, a danger, or something that is likely to have an unfavourable outcome. Avoiding risk has become an important theme, even an obsession (Lupton, 1999, p.8), though paradoxically, voluntary risk-taking activities continue to flourish (Lupton, 1999, Zinn, 2008). Risk management, risk analysis, and risk communication have become major fields of research and practice in a wide range of disciplines including engineering, medicine, economics and personal relationships (Keey, 2000, p.2, Lupton, 1999, p.10).

One explanation advanced for the contemporary dominance of the discourse of risk is post-modern disillusionment with science and technology. In spite of the many advantages they have brought, they have also caused unexpected and sometimes catastrophic accidents, pollution, and diseases (Beck, 1992, Lupton, 1999, p.11). Other explanations focus on societal changes such as increasing secularisation, the break up of traditional family structures, and the nature of risks themselves, which have become more globalised, less identifiable, and more serious in their consequences (Douglas, 1992, Lupton, 1999, p.10). This study focuses primarily on environmental risk as it is the release of the poison 1080 into the environment that has generated the current dispute over its use. Even though economic, health, and interpersonal risk issues were raised by the participants, they all arise from views on

²⁴ Bernstein discusses in more detail the need for forecasting the extent of risk taken by the newly emerging insurance businesses which coincided around the beginning of the 17th century with developments in maritime trade by adventurous entrepreneurs who were prepared to ship goods over long distances (Bernstein 1996, p. 95).

environmental risk, and this is therefore the focus of the theoretical approaches discussed in this chapter.

Theories of environmental risk perception have been approached from both positivist and constructionist perspectives. Positivist avenues of enquiry focus on the inherent characteristics of the type of risk itself. They largely rely on psychometric surveys with investigator-generated questions administered to a general sample of the public. The results are then analysed to try and explain why people find some risks intensely worrying but are unconcerned about others which may be just as potentially damaging. In contrast, social theories of risk perception focus on the person who perceives the risk and examine how people construct their own views of what is risky and what is not. It is this latter approach which is the one adopted here, as being the most suitable conceptual framework with which to investigate the reasons why people say they support or oppose 1080.

This chapter begins by outlining realist theories of risk, followed by an examination of some of the most influential streams of socio-cultural risk theory, drawn from the work of three major theorists (Beck, 1992, Beck, 2000, Beck et al., 1994, Douglas, 1966, Douglas, 1992, Lupton, 1999, Tulloch and Lupton, 2003). The second section focuses on theories about the way people interact in relation to environmental risk issues (Tesh, 1999, Tesh, 2000), and the shaping of environmental debates by conflicting socio-cultural perspectives about the nature of risk (Nelkin, 1979, Nelkin, 1989). Ideas about expert and lay perceptions of risk, and the validity of contrasting the science-based views of the former with the values-based perceptions of the latter are discussed. The third section highlights the theoretical basis of two other concepts that were found in this study to be important mediators of environmental risk perception: theories of trust (Beck, 2000, Slovic, 1993, Giddens, 1990), and of attachment to place (Guiliani, 2003, Proshansky et al., 1983, Stedman, 2002).

Contemporary theories of risk

Realist approaches

Realist approaches view risks as real events or dangers which can be assessed and measured without being confounded by subjective and social factors (Zinn, 2008, p.5).

Scientific risk assessment and analysis takes this approach using the same mathematical concepts of probability that were developed in the early modern age, albeit with modern refinements (Bernstein, 1996). Quantitative measures are used to calculate the probability that an adverse event will occur given exposure to a hazard, and to identify the magnitude and likelihood of the consequences (Nelkin, 1989). The more data (or samples) that have been previously recorded, the more likely it is that future occurrences will fall within the same range of previously recorded values and so, at least in theory, make the future knowable (Bernstein, 1996, p.144). This idea of events or values falling with a “normal distribution” forms the core of most systems of risk management. Models and scenarios are developed to find how to act if knowledge is limited, and more research is undertaken to fill gaps in understanding. Even with the most sophisticated of mathematical techniques, however, the world of pure probability exists only theoretically, and nature has a randomness that makes it impossible to predict or control risk all the time (Bernstein, 1996, p.329). The realist perspective dominates insurance, toxicology and epidemiology, engineering and economic approaches, including risk-benefit comparisons.

High profile incidents continue to demonstrate that expert risk assessment of the safety of technologies is not always correct. Beginning with the influence of early environmentalists such as Rachel Carson²⁵, grassroots community groups and larger national organisations have protested about risks and harm arising from technology such as air pollution, oil spills, polluted rivers, and the siting of nuclear power stations and waste disposal plants (Tesh, 2000, p.44). Other highly publicised events have been the Three Mile Island nuclear reactor accident,²⁶ the gas leak from the Union Carbide plant at Bhopal in India in 1984,²⁷ and, recently, the leakage from the nuclear reactors at Fukushima.²⁸ Apart from sudden events like these, others have become apparent only with time, such as the birth defects caused by thalidomide or the delayed effects of exposure to asbestos or Agent Orange (Brown, 1992). All these and other similar cases

²⁵ The author of *Silent Spring* (1962) which examined the consequences of using artificial pesticides on crops from a scientific, ethical and political point of view.

²⁶ Three Mile Island Pennsylvania: a combination of equipment malfunctions and human error led to a loss of coolant in one reactor on 29 March 1979. See US Energy Information Administration http://www.eia.doe.gov/cneaf/nuclear/page/at_a_glance/reactors/threemileisland.html

²⁷ Bhopal, India. Methyl isocyanate gas leaked from the Union Carbide plant over a residential area on 3 December 1984. An estimated 3,800 people died at the time and an estimated 20,000 later from after-effects (Bennett et al., 2005).

²⁸ Fukushima: the nuclear reactors at Fukushima were damaged by a magnitude 9 earthquake near the east coast of Honshu, Japan, on 11 March 2011

have caused people to question assurances that novel technologies and chemicals are safe. Moreover, while risk assessment experts consider the risk for the population as a whole, non-experts are likely to think more personally about how a risk might affect them or people they know and are less convinced by data about the low probability of adverse events happening (Bennett and Calman, 1999).

Public resistance to technological innovations is a concern to politicians and technologists as it erodes what was previously an unquestioning acceptance of the priority of technical and economic progress (Zinn, 2008, p.11, House of Lords, 2000). The need to understand and predict "... people's extreme aversion to some hazards, their indifference to others and the discrepancies between these reactions and opinions of experts" (Slovic, 1987, p.281) gave rise to research into public attitudes using psychometric surveys (Sandman, 1989, Sandman et al., 1993, Slovic, 1987, Slovic, 1997). Findings from these surveys established that the lay public has a broader view of risk which is largely independent of technical detail about probability and magnitude but is influenced by other factors such as familiarity, equitable distribution, the benefit gained, and the possibility of unknown long-term negative effects (Sandman, 1989, Sandman et al., 1993, Slovic, 1987, Slovic, 1993, Slovic, 1997). Two characteristics – dread and outrage – were identified as being particularly important in determining public response to risk. Dread, influenced by lack of personal control combined with the possibility of catastrophic, potentially fatal consequences, and outrage generated by lack of trust in authorities and failure to share risk management with the affected community (Sandman et al., 1993, Slovic, 1987). Findings from psychometric survey-based studies such as these underpin much of the work on guidelines for risk communication that have been widely adopted by government agencies for contentious issues (Tesh, 2000). Quantitative surveys using structured questionnaires and administered to random samples of a population are now a frequent form of assessing public perception of risk in many countries. Canada, for example, has a regular survey of risk perception of health hazards (Krewski et al., 2006, Krewski et al., 2008) and the European Commission Eurobarometer series²⁹ covers a wide spectrum of topics such as air pollution, water quality and other environmental issues (European Commission, 2009).

²⁹ See http://ec.europa.eu/public_opinion/index_en.htm for the range of surveys carried out.

Social theories of risk

The development of sociological risk research in the 1980s was a response to controversies over technological risks that were taking place and the limited ability of scientific and psychometric analyses, which treat “the public” as a block, to explain the “dynamic of risk discourses and responses” (Zinn, 2008, p.12) and to take account of the different social and cultural contexts in which risks are understood (Lupton, 1999, Nelkin, 1989). All sociological theories view risk as being socially mediated or constructed to a greater or lesser extent. People’s prior dispositions, their group membership and cultural values, and the wider social climate of the time are all influential in determining why they may react with concern to some risks while ignoring others (Gaskell et al., 2004, p.185, Lupton, 1999). Constructionist theories are further divided into “weak constructionist” (risk is an objective hazard or threat that can never be known in isolation from social and cultural processes) and “strong constructionist” (nothing is a risk in itself but all risks are socially constructed through historical, social, and political “ways of seeing”) (Lupton, 1999, p.35).

Risk and culture

Cultural theories of risk (Douglas, 1992, Douglas and Wildavsky, 1982) developed out of Douglas’s earlier anthropological work on purity and contamination which focused on “taboo- thinking” in so-called primitive cultures to uphold community values and avoid the danger of exposure to “others” (Douglas, 1966). Because the perception of danger among people sharing the same cultural context was related to the group’s moral principles, “other” marginalised groups were often identified as threatening or polluting the mainstream. In applying these same concepts to risk perception, Douglas found that social and cultural influences in modern society have resulted in certain risks related to the morals and politics of the culture being particularly singled out for attention. She noted that the language of danger had now turned into the language of risk and in the process often made “... a spurious claim to be scientific...” (Douglas, 1992, p.14). The discourse of risk is thus seen by Douglas as a way of interpreting and explaining misfortune and as acting as a secular replacement for the concept of sin. Rather than the scriptural “... sins of the fathers, ... the risks unleashed by the fathers are visited on the heads of their children even to the nth generation” (Douglas, 1992, p.26).

The global risk society

Another major influence on sociological risk theory has been the concept of the risk society (Beck, 1992, Beck, 2000). Instead of the central problem of society being to use the benign forces of science and technology to produce wealth and “goods” for the creation of economic growth, the problem has become how to minimise the “bads”, or risks from the same science and technology which have resulted in irreversible threats to the life of plants, animals, and people. Moreover, the threats are no longer locally or regionally limited but have become global, creating “*supra-national and non-class specific global hazards...*” (Beck, 2000, p.13, original emphasis). In response to these threats, modern society has become aware enough of the risks it has created to acknowledge and analyse them – termed “reflexive modernisation”³⁰ by Beck – but has not been able to control them adequately:

Industrial society – *systematically* produces its own endangerment and a questioning of itself through the multiplication and the economic exploitation of hazards... it ‘nourishes’ itself from the hazards it produces and so creates the social risk positions and political potentials which call into question the foundations of modernization as it has so far been known.

(Beck, 1992, p.57 original emphasis)

Because of this awareness, individuals in the global risk society have lost traditional norms and certainties in their social structures and have become distrustful of science and governments. They are now left to their own devices to decide what is a risk, what is not, and how to respond to each one (Beck et al., 1994). This “individualisation” has both positive and negative aspects. On the one hand, it implies freedom to decide for oneself, but on the other, it involves new demands and responsibilities for the choices one has made (Lupton, 1999, p.70).

Risk in everyday life

The socio-cultural theory proposed by Lupton (1999) sees all ways of looking at risk as being part of a continuum rather than being mutually exclusive. For Lupton, their epistemological approaches range from realist at one end of a wide spectrum, through a

³⁰ The writer Anthony Giddens has a similar approach to the risk society and collaborated with Beck in some works. A comparison of their similarities and differences is found in Lupton (1999, p. 81-83).

weak constructionist position, to a strong constructionist position at the other (Lupton, 1999, p.35). Where Lupton differs from other theorists, however, is in viewing risk as much more individualised and subjective than abstract theorising acknowledges:

... the writers from whom these perspectives are drawn have tended not to explore in detail the diverse and dynamic ways in which lay people respond to risk... construct[ing] their risk knowledges in the context of their everyday lives.” (Lupton, 1999, p.104-105)

She acknowledges the critical importance of Douglas’s work in emphasising that risk judgments are cultural, moral, and symbolic but finds her approach static with “little explanation for how things might change” (Lupton, 1999, p.56). For Lupton, not only does a person’s life experience interact with a range of social and cultural factors on their perception of risk but their perspectives also change over time according to new experiences, their changing position in the life course, as well as changes in local knowledge networks and new expert knowledge becoming available (Tulloch and Lupton, 2003).

Lupton also builds on Beck’s concept of the risk society and post-modern reflexivity, but finds his theory limited and incomplete in that it considers reflexivity as based on cognitive judgements and in response to expert knowledge. For her, reflexivity is not necessarily on a conscious level - it may include both active seeking out of advice or self-reflection, but also includes responses which are experienced as second nature (p. 120). In this way, people “... construct their own expert knowledge about risk, with or without risk professionals’ knowledge” (Lupton, 1999, p.110). Lupton particularly challenges assumptions which assume a generalised “public view”. Rather, she holds that risk perceptions are strongly shaped by factors such as gender, age, occupation, nationality and sexual identity. In her view, individual constructions of risk are also formed through personal taste and interpretations that are developed through the particular culture and context of a person’s background - their social groups and networks, access to resources, and their age and social standing in relation to power structures (Tulloch and Lupton, 2003).

Like Douglas, Lupton relates risk to the boundaries of space and place, to the

inside/outside and self/other concepts of bodily purity, and the importance of maintaining controlled borders to exclude risky “others”. She links this to modern anxieties about contamination from:

... viruses and bacteria, pollutants, food, drugs and other people’s body fluids....
In this new politics, hygienic standards come to stand for ways of identifying self and Other, with the Other standing as the contaminated, polluting threat to the purity of self.
(Lupton, 1999, p.128-9)

These risk beliefs and practices go beyond the physical body and extend to include anything that threatens to flout the autonomy or integrity of individuals or social groups. Being threatened or “at risk” in this way generates temporary alliances between disparate groups who become united by their anxieties to keep the threatening substance or people out (Lupton, 1999, p.113).

The three contemporary sociological perspectives outlined above are important ones for the insights they offer into environmental risk perception, and are of key relevance to the current study. Drawing from the theoretical framework they provide not only enables a more coherent analysis of the data gathered, but also allows the possibility that the findings may be extrapolated to settings broader than the one in which the research was conducted (Willis et al., 2007). Before, leaving socio-cultural risk theory, however, two other streams of contemporary thought about risk should be briefly acknowledged. The first of these is the approach known as governmentality, derived from the ideas of Michel Foucault³¹. Governmentality sees expert knowledge as a tool used by governments to assist in social control of populations. Particular groups or behaviours are identified as “at risk” or “high risk”. Individuals are encouraged to internalise approved societal norms and monitor themselves to reduce their own risk (for example to stop smoking), or to allow the government to put in place measures that will reduce risk for the whole of society (Lupton, 1999, p.87). While governmentality may well be a relevant approach for a future study examining the contrast between official and personal perspectives of health and environmental risk, it would have taken this study in a different direction, and

³¹ For more detail on the application of Foucault’s ideas within social risk theory see Lupton (1999 p. 84-103), and O’Malley (O’Malley, 2008).

could not be covered within its current scope. Lastly, mention should be made of voluntary risk taking, or “edgework”, the counter discourse to risk as danger (Lyng, 2008). Uniquely, it emphasises the positive associations of risk. While this might also be an interesting framework to explore within a setting such as the West Coast where many people have occupations and leisure activities that are deemed to be high risk by wider society, but have concerns about other risks which are held to be of low probability, it has not been explored here. The next section, therefore, returns to the theoretical framework relevant to the current study, to look at the way conflicting perspectives of risk occur in environmental debates.

The expert-lay divide in risk disputes

Scientific risk assessment is still sometimes assumed by those who work in this paradigm to be correct, factual and the only way of looking at risk, with social perceptions held by the lay public believed to be misguided, ignorant, and emotional (Davies, 2008).

However, to some extent this view has been replaced by an acknowledgement that risk cannot be reduced “... into a single objective function, such as a mean probability fatality rate, or some product of likelihood and consequence.” (Keey, 2000, p.3). There is a recognition that public perception is richer and more complex than quantitative risk analysis allows and is based on values and preferences held by individuals and groups (Frewer et al., 1996, Keey, 2000, Madsen and Sandoe, 2005, House of Lords, 2000). Increasingly, “... a combination of the psychometric, cultural, and affective approaches is desirable to provide a fuller understanding of the individual and sociocultural dynamics of risk perception” (Gaskell et al., 2004, p.186). These ideas are now frequently incorporated into commentary and studies of environmental risk, with examples being available in diverse fields such as toxic waste disposal (Brown, 1992), natural resources engineering (Gough and Hooper, 2003, Pyle and Gough, 1991), genetic modification of crops (Gaskell et al., 2004, Madsen and Sandoe, 2005), zoonotic food risks (Jensen et al., 2005), and biosolids waste management (Beecher et al., 2005).

Less often acknowledged is the fact that many citizen activists are well versed in science, and capable of producing their own scientific arguments to lobby administrators and governments (Tesh, 1999, Tesh, 2000). Instead of the lay public (values) opposed to experts (facts), disputes are often between two groups of experts each using arguments drawn from science to argue different points of view. Tesh (1999) describes the

successful banning of the pesticide Alar by a citizen advocacy group showing that it was done with "...the same reductionist, scientific rationality that [other researchers] have labeled "expert..." (p. 49). Large group actions like this in turn have a significant influence on grassroots groups (who cannot afford to hire scientists) and on individual citizens who have no affiliation to any group. Communities concerned about environmental risk have gathered data themselves, and worked with experts to direct and marshal their knowledge and resources so as to address their concerns (Brown, 1992). Moreover, the agenda setting by environmental groups has had an influence on science itself, encouraging scientists to see new and different things outside the normal paradigm (Tesh, 2000).³²

Although the incorporation of public values and preferences has been an improvement from seeing public opposition in risk disputes as ignorant and misguided, the view that experts deal only in facts and lay people only in values is an oversimplification (Tesh, 2000). Experts too have socially constructed perceptions of risk that influence which topics to investigate, the choice of study design, the methods used to derive the data, and the variability and uncertainties that arise between individual experts in analysing their findings. Much risk assessment is dependent on theoretical models which contain assumptions and judgements about the inputs and end points used (Slovic, 1997, p.23). Moreover, scientific risk assessment may be based on technical data, but the framing of the decision problem for which it is being undertaken is based on political, economic and social values:

... risk assessment views the world through a 'risk window' that only makes visible that which has been predefined as relevant risks; and the particular size and structure of the 'risk window' depends on value judgements as to what is considered to be an adverse effect within what is considered the relevant horizon of time and space.

(Madsen and Sandoe, 2005, p.321).

The next sections take up two such themes outside the usual "risk window" used in scientific assessment that proved to be of key significance for this study. The theoretical

³² As an example of such influence Tesh cites the study of endocrine disrupters that developed during the 1990s and the study of specific population groups such as children, and disadvantaged groups (Tesh 2000 p.62-80)

background for these themes needed to be investigated in its own right, drawing in a broader literature that added complexity to the overall framework and therefore to the analysis and conclusions. The first of these was the significance of trust in mediating the way people think about environmental risks.

Trust and environmental risk perception

Trust is a difficult concept to define, but is most often referred to as the positive expectations that people have about their own or others' intentions or behaviour (Chrysochoidis et al., 2009, Earle, 2004). A fundamental role of trust is that it offers a way to minimise concern about possible risks and uncertain outcomes that are outside personal knowledge and routine experience (Chrysochoidis et al., 2009, Lupton, 1999, p.78). Trust allows people to reduce the complexity of their lives rather than examine every interaction for its possible negative consequences (Webber and Carter, 1998). Trust also involves risk, because there is always the potential for the "other" in whom trust has been placed to prove less reliable than expected. Trust has cognitive aspects (deciding whom to trust), behavioural aspects (taking action based on the assumptions that others are trustworthy), and an aspect of emotional investment, which becomes particularly intense if trust is found to have been misplaced (Webber and Carter, 1998, p.8).

These ideas about trust apply not only to interpersonal relationships but also to interactions between individuals and the institutions and expert systems that are part of modern society. Giddens (1990, p.83) writes that no one in modern society is able to opt out of having contact with expert systems, the nature of which is "...deeply bound up with the mechanisms of trust in [them]."³³ Both Giddens (1994, p.184) and Beck (2000, p.218) draw attention to past mistakes which have demonstrated that those who control expert systems cannot always be trusted to apply expert science and technology wisely or understand their potential for adverse effects. Reflexive individuals - well aware of these past disasters - are sceptical, or at least cautious, and are therefore more likely to make up their own minds about what is safe, rather than trusting assurances from authorities.

The psychometric studies of risk perception described earlier in this chapter have also

³³ Some commentators limit trust to personal relationships and prefer the word 'confidence' for trust in institutions, but no distinction is made in this study.

identified “pervasive distrust” as being one of the key factors that cause outrage about exposure to risk, and one that is linked to resulting political activism (Slovic, 1993, Sandman et al., 1993). Low trust in scientific experts and public agencies responsible for risk management has been frequently reported in large opinion polls in western countries (Barnett et al., 2007) The findings are most often derived from surveys of the general public where respondents give ratings based on predetermined scales, using experimenter-generated questions, out of context of any particular hazard type (Krewski et al., 2008, European Commission, 2010, Ipsos MORI Social Research Institute, 2011). In Britain, for example, a House of Lords report (2000) found that “... public confidence in scientific advice to government ha[d] been rocked by a series of events culminating in the BSE fiasco.”³⁴ This report believed that the distrust of those in public office to manage risk effectively had the potential to inhibit the many future benefits that could be derived from science and technology, and would therefore affect the future wealth and welfare of society.

Findings from other studies, however, have contested the blanket assumptions derived from such surveys (Cook and Gronke, 2005, Earle, 2004, Frewer et al., 1996, Peters et al., 1997, Poortinga and Pidgeon, 2003):

“... low trust in government and low confidence in institutions does not automatically mean distrust, cynicism, alienation... we suggest instead [it] reflects ... an unwillingness to presume that political authorities should be given the benefit of the doubt.”

(Cook and Gronke, 2005, p.785).

Although this research is quantitative and categorises people into groups by their trust response, rather than investigating the diverse ways in which individuals construct their ideas of risk, these studies too have concluded that people will decide for themselves whether or not authorities are dealing appropriately with a particular issue of risk. Thus their overall conclusions that people use critical trust (Poortinga and Pidgeon, 2003) or active trust (Cook and Gronke, 2005) are largely consistent with the ideas of social theorists such as Giddens (1990, 1994) and Lupton (1999).

³⁴ BSE: bovine spongiform encephalopathy, a fatal disease of cattle which can be passed on to humans from eating the meat of infected animals. The “fiasco” refers to attempts to keep the problem secret from the public.

The actions and communications of institutions are key factors in how trustworthy they are perceived to be. In particular, perceptions about their competence, honesty and commitment to the public good have been found to be the most critical in engendering trust (Chrysochoidis et al., 2009, Peters et al., 1997, Poortinga and Pidgeon, 2003, Frewer et al., 1996). It takes a long time to build trust through demonstrating these qualities, but public perception of trustworthiness can be destroyed very quickly and is hard to restore (Slovic, 1993). Moreover, attempting to reduce public unease by undertaking detailed risk assessment studies may even exacerbate distrust if nothing is done to address the underlying issues that have undermined public confidence in the first place (Laird, 1989, Slovic, 1993).

Responses also differ between individuals depending on the way they see the world and therefore how they interpret what an organisation says and does. Wildavsky and Drake (1990) for example, propose that people who view nature as fragile and focus on environmental and technological risks are more likely to respond positively to citizen groups and negatively to government institutions, whereas those who focus on scientific knowledge and the economy are more likely to accept the position of public agencies and distrust citizen groups. Rather than categorising people into different “types” who are always more or less inclined to invest their trust one way or the other, Lupton’s view is that trust, like risk, is influenced by developing circumstances and acquired knowledge, all of which are incorporated into the different shades of trust or scepticism that people draw on to construct their response to issues that affect them (Lupton, 1999, p.104-105). Who trusts whom and why they trust them is therefore one of the most important issues in risk management by public institutions who are responsible for informing the public and protecting them from environmental risk (Frewer et al., 1996). Moreover, when trust, or lack of it, involves the management of a natural environment that is meaningful for the people who live there, a further concept comes into play. This was the second additional theme outside the usual “risk window” that enhanced and extended the theoretical framework for this study: that of place attachment.

Place attachment and environmental risk perception

Place attachment – the positive emotional bond that people experience in relation to places they know and love – assumes particular importance when people believe there is

a risk to a natural environment they care deeply about, and when they do not trust the authorities to deal with it appropriately. Place attachment theory has its roots in psychology and sociology, and a variety of theoretical frameworks, concepts, and definitions have been proposed (Guiliani, 2003, Proshansky et al., 1983). Much research on place attachment has looked at the importance of place in personal identity (Proshansky et al., 1983) and as a setting for shared activities and memories (Fried, 2000). However, more recently place attachment has been examined in the light of its influence on environmental risk perception (Scannell and Gifford, 2010, Stedman, 2002, Vorkinn and Riese, 2001, Cheng et al., 2003).

Psychological theories see place attachment as a sub-structure of personal identity, consisting of:

... memories, ideas, feelings, attitudes, values, preferences, meanings, and conceptions of behavior and experience which relate to the variety and complexity of physical settings that define the day-to-day existence of every human being.

(Proshansky et al., 1983, p.59)

Within psychological interpretations of place three separate dimensions have been identified. Cognition, or place identity, consists of the cognitive assessment of a place through memories and knowledge whereby people feel affiliated to a place that they see as inseparable from the way they think about themselves and others think about them (Trentelman, 2009, Vorkinn and Riese, 2001). Behaviour, or place dependence, consists of the behaviours and activities associated with a place, and without which those activities would be difficult or impossible (Devine-Wright, 2009, Trentelman, 2009). Place affect encompasses the positive emotions, happiness, pride and wellbeing that are associated with a place (Halpenny, 2010, Scannell and Gifford, 2010).

Social theorists, on the other hand, see place as being socially constructed through shared interactions, activities with family and friends, past and future meanings and values which bind an individual to a place or a community (Milligan, 1998, Rollero and De Piccoli, 2010, Woldoff, 2002, Fried, 2000). Social interpretations of place attachment have similarities with community attachment theory, but are distinct from it, in that the former

focuses on the community as a place, whereas the latter involves the social dynamics within a particular neighbourhood (Trentelman, 2009). Place attachment plays a role in fostering self-esteem, self-worth, self-pride, and social wellbeing, feelings of belonging and familiarity (Raymond et al., 2010, Rollero and De Piccoli, 2010). Forcible relocation or displacement from the community is likely to cause dislocation and grief (Fried, 2000). Although social constructs of place attachment are almost always viewed as being positive, there is a potentially negative side if strong place attachment inhibits personal mobility and individual progress (Rollero and De Piccoli, 2010).

Relatively recently, place attachment has been put forward as a multi-dimensional construct in environmental risk research, with the physical attributes of the place itself, its limits and opportunities, being a critical component in conjunction with the psychological and social aspects of place attachment (Stedman, 2002, Stedman, 2003):

Physical features do not produce a sense of place directly but influence the symbolic meanings of the landscape ... Humans then become attached to the meaning they have constructed for the landscape. Elements of the natural environment thus underpin the symbolic meaning on which attachment is based. (Stedman, 2003, p.674)

Recent theoretical frameworks of place attachment for natural resource studies have drawn on Stedman's work. The "tripartite organising framework" (Scannell and Gifford, 2010, p.2) brings together the person (identity and cognition), the place (physical attributes of the place), and the processes (psychological and social) that constitute place attachment. Another model suggests three similar components: personal context (place identity and dependence), community context (social bonding), and the natural environmental context (affinity with nature) (Raymond et al., 2010, p.425). There are marked similarities between these multi-dimensional theories of place and the Māori world view of the inter-dependency between the tangata whenua (people) and the natural world (te ao mārama). In this view, humans and nature are not separate entities but an integral part of each other with whakapapa (genealogical relationship) binding the mountains and waters and all life supported by them (Roberts et al., 1995, Te Rūnanga o Ngāi Tahu, 2000). All things are considered to have a spiritual dimension (wairua) and life force (mauri). Place is a crucial part of individual and group identity, with the mihi

(each person's short speech of welcome and self-introduction) referring to the place they come from and its natural features as a way of defining themselves:

Our natural environment - whenua,³⁵ waters, coasts, oceans, flora and fauna – ... is crucial to our identity, our sense of unique culture and our ongoing ability to keep our tikanga and mahinga kai practices alive. ... Wherever we are in the world, these things give us our tūrangawaewae.

(Te Rūnanga o Ngāi Tahu, 2000, p.8).

There is also a heavy responsibility to ensure that the natural world is taken care of. This is kaitiakitanga (guardianship or stewardship), a complex concept which has deep spiritual and emotional significance. It encompasses “...nurturing and involves protection, management and development ...the process by which mauri is protected...” (Jefferies et al., 2002, p.13). Those who are charged with the duties of kaitiakitanga (the kaitiaki - guardians) must do everything in their power to ensure that the place is protected, as if it is harmed, it affects the mauri not only of the land but also of the people (Roberts et al., 1995).

In place attachment theory, threats to a natural environment that is important to the identity of an individual or community are likely to lead to place-protective behaviour . Action is taken to resist the threat and defend the place (Guiliani, 2003, p.153, Stedman, 2002). Moreover, when the attachment is to public lands such as national parks and recreation areas, which are often controlled by policies set by urban authorities remote from the natural setting and local communities, there can be a heightened awareness of risk and intense concern if the controlling agencies are not trusted (Eisenhauer et al., 2000). In this respect, place attachment links with ideas in risk theory about the importance of maintaining the boundaries of space and place and the danger that is posed by the outsider (or “other”) who threatens to flout these boundaries (Lupton, 1999, p.113). However, people who have similar feelings about a place may differ in what they perceive to be a threat because place attachment develops on an individual level through personal experiences in a particular environment (Vorkinn and Riese, 2001, p.261). Therefore, place attachment may also explain both support for as well as

³⁵ Māori terms are translated in footnotes to this document as follows: whenua (soil, country, land); tikanga (meaning, custom, obligations, and conditions); mahinga kai (food gathering area or cultivation); turangawaewae (home, place to stand, ancestral homeland); mihi (greet, admire, congratulate).

opposition to actions which affect the natural environment, depending on whether an individual perceives them as being detrimental or beneficial.

Lack of trust in the management of public lands where there is a high level of place attachment among members of the local community has been shown to prompt outrage, conflict and protest action. This is especially so when there is a threat that access to traditionally available areas may be restricted, or commercial activities encroach on wilderness areas, changing or spoiling their nature (Cheng et al., 2003, Devine-Wright, 2009, Vorkinn and Riese, 2001, West et al., 2006). In cases where there is distrust and no personal control over the outcome, issues of politics and power come into play. Indeed, Cheng et al. (2003, p.87) state that place is an “integrating concept” in natural resource politics, and that many environmental controversies revolve around competing place meanings that are deeply held and vigorously defended. Moreover, groups on either side of the conflict will “...intentionally manipulate the meanings of places hoping to influence the outcome of natural resource controversy” (Cheng et al.p. 97). Cheng’s view on natural resource politics echoes the assertion by Douglas that “... in all places at all times the universe is moralised and politicized” and those who feel concern about threats of community-wide pollution are likely to use their interpretation of the threat as “... a weapon for mutual coercion...” to protect society from behaviour that will wreck it (Douglas, 1992, p.5-6).

Conclusion

Risk, trust, and place attachment, then, prove to be interdependent in environmental risk perception and each will be considered in the analysis of this study of 1080 use in the West Coast region. At stake is a vast area of wild natural environment, much of it public land, to which the inhabitants are deeply attached. A poison (1080) is used to protect the area from one sort of risk (possums) but in the process may create another (environmental contamination) and there are widely different views about the current and possible future impact of the respective risks. The management of the poison and its impact is controlled by large, publicly-funded organisations, ultimately responsible to national rather than regional interests, and most of the people of the area have no control over how it is done. There are claims and counterclaims about the trustworthiness (or not) of the official organisations as well as the groups that oppose

them. The next three chapters take up the discussion from the point of view of the participants who were interviewed for this study, and in the light of the theories outlined in this chapter, each of the three themes of risk, trust and attachment to place is examined.

Chapter 4: Perception of risk about 1080

Solving one problem or creating another?

Introduction

The debate around the use of 1080 on the West Coast has been primarily framed using competing constructions of risk – to the environment, to the economy of the district, and to health. In Chapter Three the dominance of risk in modern society was outlined and major streams of risk theory that have influenced contemporary thought, both realist and socio-cultural approaches, were discussed (Beck, 1992, Beck, 2000, Beck et al., 1994, Bennett and Calman, 1999, Davies, 2008, Keey, 2000, Lupton, 1999, Madsen and Sandoe, 2005, Nelkin, 1989, Tesh, 1999). The objectivist approach to risk as a quantifiable reality (Healy, 1978, Keey, 2000), was contrasted with socio-cultural approaches in which all risk is seen as being socially constructed to a greater or lesser extent (Beck, 1992, Beck, 2000, Beck et al., 1994, Douglas, 1992, Lupton, 1999). Other avenues of research highlighted were the psychometric studies that have investigated the characteristics of a particular risk that influence its public acceptability (Sandman et al., 1993, Slovic, 1987) and studies that have teased out different interpretations of the expert/lay divide over perspectives on risk (Nelkin, 1989, Tesh, 1999, Tesh, 2000). Three major streams of thought within socio-cultural risk theory were reviewed: risk arising from culture (Douglas, 1992); concern over global risks that threaten modern society and which require cognitive assessment and individual reflexivity (Beck, 1992, Beck et al., 1994); and risk as containing elements of all these but which is subjective and dynamic, changing according to a particular individual's culture, experiences, and place in the life course (Lupton, 1999).

Ideas drawn from these three major socio-cultural theories of risk are used in the chapter to frame and reflect on the comments made about 1080 by the participants in this study. The chapter has three sections: the first looks at the arguments and counter-arguments that were made about possums and the respective environmental risks and benefits of 1080; the second deals with perceptions of the economic risk from 1080 to farming and tourism; the third examines what the participants said about health risk, particularly

about 1080 and water contamination.

Environmental risk perception

Possums as risk

The use of 1080 for environmental reasons is based on the belief that possums create unacceptable damage to the ecosystem in native forests, therefore their numbers must be kept at low levels to minimise such damage. In 2007 the Environmental Risk Management Authority (ERMA) reassessed 1080 (ERMA, 2007a) and concluded that it remained the best available option for possum control and the benefits to the environment outweighed any risks if used in conformity with prescribed conditions. All the research participants who supported this official view also viewed possums as a risk that needed to be controlled for the sake of the forest and native bird life:

Unfortunately southern rata and totara particularly are quite a preferred species for possums and as colonisation advanced through these forests they allowed populations – possum populations – to build up to quite high numbers and when they got to their peak ... they essentially defoliated so many trees so often that whole stands would just simply die... And one thing that devolved from that we noticed ... was the decline in kaka numbers. So where these southern rata forests were degraded badly, kaka numbers dropped down very quickly because there's a food-breeding relationship between the two...

(DoC Advisor)

Judging by public information on the DoC and Forest and Bird websites (DoC, undated-c, Forest and Bird, 2009, Green, 2007), it would appear that views about the risk possums pose to the forest are uncontroversial and universally held. However, it became apparent right at the beginning of the interviews for this study that this was not the case. No one denied that possums did a certain amount of damage to native forest and birds, but the assumption that possums were an ever-present menace requiring constant poisoning to control them was regarded as exaggerated, and questionable. It was not a simple matter of what to kill possums with – 1080 or something else – but whether possums really were as harmful as supposed, and if they were not, why was so much effort being put into killing them:

...[DoC] talk about degraded forests, but every time I say but well where are these degraded forests? I've got a mate with a helicopter, you show me, we'll go down and take some photos. I can never quite find out where they are.

(KEA spokesperson)

Certainly there seemed few, if any, pressing issues with possum damage to the environment. Everyone, including the DoC Advisor himself, used the past tense when referring to possum damage and his description of the programme as one of “*sustained control*” seemed to indicate that the major task had been achieved. Many of the other research participants, both supporters and opponents of 1080, talked about problems they had once had with possums invading their gardens and damaging roses and fruit trees, but no one spoke about current environmental issues. It would have been possible for the 1080 supporters to argue that the pest control programme had been so effective that memories had faded and people had forgotten just how much damage possums could do. However, no one presented this as an argument or even acknowledged that their view about possum damage might be contested by some.

Opponents of 1080 also believed that evidence of possum damage had been uncritically extrapolated from other areas of New Zealand³⁶ and was not as applicable to the West Coast region. In regard to the often quoted damage to southern rata, the FATE spokesperson showed me scientific work noting that rata dieback in Westland valleys has occurred independently of possum colonisation of the area or of control operations (Bellingham, 2005).³⁷ Other participants also mentioned this as being local knowledge:

On the West Coast you get an unhealthy animal, he's not going to last through the winter. Maybe up in the North Island where they've got all their pobutukawas, you've got a friendlier environment which is a lot warmer and you've got one tree that they really like, they'll eat it out. But I myself have seen stuff on TV not even in the areas they're talking about – quoting it being the West Coast – I can actually honestly say I've never seen a rata that's been killed by possums on the West Coast ... There'll be people will quote certain big bush faces of rata and say look what the possums have done. Those trees were dead before possums were even on those

³⁶ Damage in the Ruahines in the 1950s and 1960s is widely cited and was mentioned by the DoC Advisor. The pest control contractor also cited examples from the North Island.

³⁷ According to this work, possums may contribute when trees are already weakened but dieback is more likely to result from nutrient-poor soils as a result of the heavy rainfall. This predisposes the trees to damage by wind, fungi and other agents.

faces. They've died of some kind of blight – the old timers will tell you, they just think it's a joke...

(Hunter)

Some participants believed that the numbers of possums in the West Coast region was exaggerated and based on estimates that could never be proved. Several pointed to what they believed was the selective and convenient use of statistics by official agencies:

... if I sent a staff member off with a budget to do a task I would want to know how successful that's been. And your residual catch numbers³⁸ aren't really it because that tells you how many were left. It doesn't tell you how many of the target species have actually been killed.

(Mayor of Westland)

... they've said there are 70 million possums... there might be 150 million or there might be 10 million, no one would really know. They have to put a specific number on things to make themselves sound right ... it's actually irrelevant. Is there too many? In some spots there is; in most spots there's not.

(Hunter)

But what constitutes “too many”? The DoC Advisor said that their control cycle³⁹ depended on how quickly possum populations recovered either through migration or reproduction. Where the recovery point was set by DoC, however, might have been based on a different construction of recovery from the participant quoted above.

That there should be a benefit to trade off against any potential risk has been found to be an important factor in risk perception (Frewer et al., 1996, Sandman et al., 1993). The 1080 supporters appeared to believe that the benefits of poisoning possums were self-evident but did not produce any compelling current examples. On the other hand, those who opposed 1080 tended to focus much more on lack of benefit. This same concern about taking risks that do not have a corresponding benefit has been noticed in studies of risk perception in other environmental fields. For example, lack of usefulness, rather

³⁸ Residual catch numbers: this refers to the trap catch index, a measure of possum density used to estimate how many possums are in the area. Leg hold traps are left open for a few days and the number of possums caught counted. Ground control operations are generally followed up using this method to determine how many possums are left.

³⁹ When the risk of damage reached the point where they needed to do another 1080 operation.

than risk, has been found to be an important driver of public antipathy to genetically modified crops (Madsen and Sandoe, 2005), with participants who were surveyed in one study questioning "... why society should take any risks that might be involved when the claimed benefits appeared to be non-existent, or the ends achievable by 'tried and tested' means" (Gaskell et al., 2004, p. 187). It seemed likely that the same sort of perceptions were operating here with those who believed that there was no need for 1080 to be used to the same extent, or even at all.

1080 as risk

One of the unavoidable effects of using 1080 to kill possums is that other wildlife are also poisoned by eating the 1080 baits. Among the creatures affected, deaths of native birds have been the most publicised and controversial. Studies elsewhere have found that bird by-kill from pesticides, especially when attractive song birds are killed, creates high levels of concern (Crane et al., 2006), and this has been borne out in the 1080 debate where native birds have become one of the focal points for opposition. It is clear from the amount of research commissioned and carried out in the past that the numbers of native bird deaths have also been of considerable concern to authorities (Calder and Deuss, 1985, Powesland et al., 1998, Spurr, 1989, Warren, 1984, Fanning, 1994). However, improvements in the way the poisoned baits are made and applied are now believed to have reduced bird deaths to an acceptable level even in threatened populations.⁴⁰ In this study, no one denied that bird deaths happened and everyone considered them highly regrettable. The supporters of 1080 however, believed there were overall gains to bird populations because of reduction of predators. Most of them were also aware that others disagreed with them and went to some trouble to provide convincing arguments based on their personal experiences:

I know that when I do my job not only do I kill possums but I kill rats, I kill stoats, I kill wild cats which are all known predators ... despite what people say [about birds], I've found the complete opposite. I've been in areas that have been quiet- gone back five to eight days later and found the bird noise is just phenomenal. It's like they're so happy - it's like "hey I'm not being harrassed. What about you - No! No!" You know, it's like - "we're free!" It's an almost instantaneous effect. (Pest control contractor)

⁴⁰ See Chapter 1. However, a recent study is more cautious, noting that prefeeding (of non toxic baits prior to a 1080 drop) increases the amount of bait consumed by possums, raising the possibility it could similarly affect bird behaviour and increase the risk of poisoning them (Veltman and Westbrooke, 2011).

Others had the opposite view:

They have no idea what they're killing. ... DOC has done no studies whatsoever in this area about the impact of 1080 on the native bird populations. They're basing their studies on something they did somewhere else. Right. So that's unacceptable. They don't know what's happening. They're using this large amount of poison and no idea of the impact. ... That's fact.

(KAKA spokesperson – original emphases)

Several of the interviewees shared similar views that rejected the findings of the published research into bird populations. Criticisms were made on various methodological grounds, including poor methods for estimating bird numbers (for example, the recording of dawn choruses) and a lack of locally relevant information.

As well as arguments based on critiquing the scientific method of studies, participants related their own observations which had caused them to link decline in bird numbers with 1080. Several people talked about the silent forest, contrasting it with former times:

Tāne Mahuta⁴¹ is silent. ... Going into the bush now, into Tāne now, and it's evident that there's no sound in there and why.

(Ngāti Waewae spokesperson)

Much of the discussion around whether 1080 was an overall risk or benefit to birds was divided along these lines with one group saying that birds were thriving and benefiting, and others saying they were declining. Comments about the decline in kea numbers, for example, showed how differently people from the same area with largely the same cultural background could interpret the same situation:

I know that the Department of Conservation are going to monitor their 1080 drops in relation to kea deaths in the next ten years ... well they won't have to worry – there won't be any left in ten years time. They decided that part of the problem was that they were eating lead headed nails off but roofs – have you heard that one? That's just ludicrous! I suspect that the odd bird

⁴¹ Tāne Mahuta – the forest god and guardian.

might die but you know... back country huts are not going to destroy a kea population. It's ludicrous.

(KEA spokesperson)

The kea were in decline – they killed hundreds. The government paid a bounty for hundreds of thousands of kea.⁴² I talked to a guy who shot between ten and twenty thousand not too long ago. ... People do still shoot kea. ... The dairy shed expansion – they've ripped the rubber out of all the sheds.

(Pest control contractor)

Another major environmental risk issue raised by research participants was the cumulative and unknown effect of releasing such a quantity of poison into the environment over a long period. This concern about the potentially catastrophic consequences of spreading chemicals into the environment is an important one in the 'risk society' (Beck, 1992), which sees modern science and technology coupled with the way they are managed by institutions as having produced irreversible damage to the ecosystem through a lack of understanding of their cumulative or long term effects. The same concerns have also been frequently reported in psychometric studies which have assessed public views of environmental risk (Beecher et al., 2005, Brown, 1992, Madsen and Sandoe, 2005).

Experts often tend to focus primarily on scientific uncertainties, i.e. uncertainties associated with the available data on which a risk assessment is based. ... Many [lay] people are concerned that unanticipated effects may appear after a number of years, without science being able to predict and counteract them based on current knowledge ... Furthermore, gaps in scientific knowledge are often filled, more or less transparently, by expert judgements that are rarely totally objective. (Madsen and Sandoe, 2005, p.322).

Interviewees who raised this point reflected the same sort of concerns that have been described in both socio-cultural risk theory and in psychometric studies. They talked about the eventual effect that 1080 might have on the insects and other invertebrates that

⁴² Kea are notorious for their curiosity and readiness to take food from trampers, carry off items of clothing and tear at rubber in cars or buildings. They are also known to attack sheep. Between 1907 and 1970 the government paid a bounty for shooting kea which is estimated to have killed at least 150,000 of them (Troup, 2009).

break down the forest litter and so build the soil which supports the whole forest community. Several of them believed that there had been evidence from a DoC study showing that this was already happening:

... the crux of what he [the scientist] found was ... the 1080 found its way into the bush litter ... the invertebrates were affected by 1080 and so they were unable to do what they needed to do to feed the trees, so the trees were actually starving to death, which was the end result of 1080 not possums. I don't know why that was disregarded, and it astounds me.

(Mayor of Westland)

Recent commentary on this report⁴³ had argued that the findings showed 1080 was a serious danger but that the report had been suppressed because it did not fit with current policy. This story had a high profile in the region at the time of the interviews, and it was undoubtedly fresh in the mind of many of the participants. However, while it may have served to reinforce what they thought, their views appeared to have developed from a more long-standing unease about the use of 1080. This view of the overall “wrongness” of using large quantities of poison in the natural environment was brought out by almost all the participants that opposed 1080, including the spokespeople for each of the Māori rūnanga in the region. Both of them said that they had never been happy about 1080 use, and had previously viewed it as a necessary evil, but the lack of progress had seen them change their opinion:

This constant, constant poisoning has got to stop. ... we find the use of poisons – I suppose the right word would be distasteful – because we're just not sure what the effect – the long term effect it has on the whenua – on the land. Personally I have a concern about the little greebies – the slugs and bugs and whatever – that eat the understory, the fallen leaves and the rotten trees and all the rest of it... I've asked the question several times and nobody will give me an answer on whether there's been any study done on them. I know there are all sorts of emotive arguments about how they kill the birds and all the rest of it – and that's true – but what worries me is that in ten or fifty or a hundred years time all the trees are going to start to die because there's nothing to fertilise them.

(Makaawhio spokesperson)

⁴³ This study is featured in the film *Poisoning Paradise* by the Graf Brothers which had just come out at the time of the interviews. It is also the subject of a privately published critique of the 1080 programme by two US biochemists formerly of Caltech who now live in Coromandel (Whiting-O'Keefe and Whiting-O'Keefe, 2007) which outlines the history of the controversy.

This kaitiakitanga⁴⁴ – the sense of connectedness to all the natural world and the responsibility of caring for it for future generations – was also strong among non-Māori who raised these concerns, all of whom seemed to have a genuine attachment to and care for the land.

A number of writers have suggested that environmental risk disputes arise because of clashes between expert risk assessments used by official organisations and value-based judgements by lay individuals and citizen groups (Nelkin, 1989, Sandman et al., 1993, Slovic, 1987, Tesh, 1999). However, in this study, the expert/lay dichotomy was not clear-cut. While the participants who were representatives or employees of the official organisations were all expert in their own field, they were not necessarily experts in the science on which the risk assessments about 1080 were based. Lupton has written that people respond to risk “... at the level of the local, the private, the everyday and the intimate” (1999, p.108) rather than choosing rationally between various perspectives provided by expert knowledge systems. This was indeed the impression that the research participants gave in their comments about 1080. Although all participants, no matter what their position on 1080, had made some use of scientific knowledge, they seemed to have formed their views primarily through everyday experience within local contexts. Many of them related events that had happened to them which had triggered an instinctive reaction, followed by a need to undertake their own research into expert knowledge or to think carefully about what they had seen. The following comments describe the way this happened to two of the participants and how they came to their (opposite) views:

I'd be on this side of the river for two months and then on that side of the river for two months and inside the 1080 areas sometimes you couldn't bear anything because of the birds and then you'd cross the river and there was nothing. And then I started to think for myself well maybe there is more to it. And I was also a firm believer that the loss of any native species – the killing of any native bird was just totally unacceptable for whatever reason ... I actually asked for some literature myself and then when I started to read and understand the facts behind it I realised that you know, that maybe it's not such a bad thing. It definitely had its

⁴⁴ See Chapter Three. The Māori concept of kaitiakitanga or guardianship encompasses the human obligation to exercise guardianship towards all things in the natural world which are connected through their mauri (life force) to one another.

benefits.

(Pest control contractor)

... my job ... was to go in and pick up the dead birds. That's what they told me to do. And I came out with plastic bags full of them ... the whole range of native birds... So you know since then I started to think, you know, well Christ, what is this stuff, what's it doing to the soil, what's it doing to the insects because when you're targeting deer or possums you're inclined to forget that this is a poison that kills everything that eats it, there is nothing that is immune to it.

(KEA spokesperson)

Broadly speaking there were two opposing discourses about environmental risk – on the one hand, that the predations of possums were the primary risk and needed to be managed with 1080 in the current absence of anything better; and the counter discourse, that 1080 itself was the major risk, poorly understood, and in danger of doing irreparable long term damage to the environment. However, it is important to note that rather than two defined blocks of opinion there was a range of views. While the supporters of 1080 tended to support the official line, a few opponents were adamantly opposed to any use at all, and some others believed that it had its place, though was over-used. As Wynne (1996, p.70) has noted, expert/official knowledge tends to be fairly uniform, whereas lay responses are more individual, localised, and dependent on context.⁴⁵

Economic risk and benefit from 1080

Although so much of the focus of 1080 use has been on the environmental effects, most of the 1080 is not used for environmental reasons but to kill possums because of their role in transmitting bovine tuberculosis to cattle and deer.⁴⁶ Bovine TB has a serious impact on individual farmers and could potentially threaten the viability of farming in the region or, if it got out of control, affect export markets for New Zealand meat and dairy products (see Chapter 1) . The emphasis on environmental impact of possums in scientific and popular media, however, appears to have muted discussion about the

⁴⁵ However, more recently Durant (2008) and Wynne himself (2008) have critiqued the view that expert/scientific views are always uniform and unreflexive.

⁴⁶ The DoC Advisor stated that DoC use only around 15% of the total 1080 in the West Coast region.

agricultural and economic aspects of 1080 use. A complicating factor is that many of the operations done by the AHB to control bovine TB take place on public land administered by DoC, and may be carried out by independent contractors who undertake work for both agencies. It can be difficult for those outside the organisations themselves to distinguish the individual roles and responsibilities of each of these organisations⁴⁷ and the purpose of any particular 1080 operation. Additionally, while the AHB programme is not specifically designed to achieve environmental benefit, it is carried out in the natural environment and therefore creates the same division of opinion about whether its impact is an overall benefit or risk to biodiversity.

Effect on farming

In contrast to the comments about environmental possum damage that had been phrased in the past tense, all research participants who were involved with the AHB pest control operations spoke of the current, serious threat that they believed TB-infected possums posed to stock, and the good results that 1080 had achieved. The TB Free Committee Chair vividly described the devastation she had seen in farm families whose herds had been infected because of the loss of their stock and income, and the feeling of personal failure that ensued. She pointed to the dramatic successes that had been achieved with 1080:

We were the last ones to get the good funding and in the period of time everyone else was getting the greater funding our problem got worse. We've got the funding; we've kicked the programme into gear; we've got a great, integrated programme now where our aerial controls complement our ground controls... we've been able to have a far more coordinated programme and the results have been significant. They've been huge. 257 [infected] herds not that long ago down to the 40s. It's massive, considering the farming change we've had and the growth of farming numbers on the Coast – it's massive.

Both the TB Free Committee Chair and the AHB Manager acknowledged that there were concerns about the risk and scale of 1080 use but pointed out the improvements over the last 30 years that had significantly reduced the amount of poison released into the environment:

⁴⁷ I asked three different research participants who were each employed by one of these agencies about the division of responsibilities but all gave a slightly different explanation.

... you've got perception of what 1080 does as opposed to the evidence we've found in science ... I for one respect the fact that people have got an opinion on 1080 and they have got the perception that it's risky to use, it affects water, it kills birds, it kills animals, but I think the way that we apply this toxin today is so precise and it's so exact that the risk has been averted to a large degree ... and so the technology and the manpower and the expertise that we've brought in over the years have enabled us to actually apply [them to] this operation and reduce the risk to communities, to public health.

(AHB Manager)

Another concern which was shared by the supporters of 1080 and also by some of its opponents was that out-of-control bovine TB could see the West Coast excluded from the dairy industry or even that the AHB might simply withdraw their funding if the opposition in the West Coast region became too much of a problem, and reassign it to areas where 1080 was better supported:

We cannot afford to lose the dairy industry. It's got its headquarters right here in Hokitika and it is a major employer – about 300 people are employed. So we can't afford to put that at risk. But there is a lot of fear about the impact that TB will have on the West Coast because of our geography. We are geographically isolated so it would be very simple to lock us out of the dairy industry.

(Mayor of Westland)

Comment on bovine TB was more limited among the research participants, particularly those who had no direct knowledge or experience of farming. None of those who did comment contested the fact that possums were a factor in spreading bovine TB, and all had sympathy for local farmers, but many believed that the focus on possums was exaggerated and the rate of infection was low:

... possums definitely get TB; definitely can re-infect a herd of cattle that's probably infected them or their relations in the first place. But is it blown out of proportion? Definitely. Categorically.

(Hunter)

In their enthusiasm about 1080, they argued, the AHB had lost sight of their real mission, which should be more focused on animal health and control of disease in cattle and deer. Among the criticisms made were that the AHB operations went way into the back country where there were no cattle to be infected; that aerial operations were carried out on flat terrain to save money when ground controls would have been quite feasible and less environmentally damaging; and that the AHB took no account of whether possum numbers even warranted reducing, so that 1080 was being used unnecessarily, with resulting risks to the environment.

... I would still question why it's being used on big areas. Cattle are not in those steep areas. The principle behind it is we kill the possums that are coming down onto those fringe areas. But it gets out of hand. At the moment they're 20 miles back in – into the friggin' Southern Alps.

(Hunter)

Another concern raised by several people was about illegal stock movements that they claimed spread bovine TB. They said it was common knowledge that compliance monitoring was thinly spread, poorly funded, and there were ways of getting round the regulations:

So it's becoming pretty obvious to us that the spread of TB is rather more reliant on the actual transport of stock around the district. Now there are movement controls that the Animal Health Board have put in place and many of them are very good. But there's many, many areas that they could tighten up on. ... They should send a hit squad in; they should go round the whole farm and try and find out if there's any vectors involved to stop it going anywhere else, because it's an on-farm problem.

(FATE spokesperson)

The AHB Manager and the TB Free Committee Chair agreed that keeping the regulations up to date and monitoring compliance could be a problem but said they had limited influence over these aspects which were funded and managed nationally. Though this seemed to imply a lack of resourcing and support from their central organisation, neither of them commented along these lines, and both referred to the obvious reduction in infected herds as demonstrating the success of the possum control programme in spite

of these other issues.

Opponents of 1080 also argued that its use could become just as much of a political and economic liability as bovine TB if a perception developed in overseas markets that New Zealand dairy and meat products were chemically contaminated:

I've been telling them for years, if you don't stop doing it, the overseas market is going to dry up. Not because you're trying to kill TB but the method you're using to do it. I honestly believe that. At this stage, in New Zealand, the groups that I'm involved with, are not at the point yet, where they will do that [try to jeopardise trade by raising concerns overseas]. They're too – they're too patriotic – if you want to put it that way. They don't want to destroy the farming community. But they're definitely saying you better start listening...

(KEA spokesperson)

The ERMA reassessment (2007a) considered but dismissed this issue, saying that it had never been raised by any of New Zealand's trading partners. The FATE spokesperson, however, noted that the International Forest Stewardship Council did not approve 1080 for accreditation to their sustainable management programme,⁴⁸ which may suggest that the same sort of restrictions in relation to agricultural products could not be ruled out at some future time.

Effect on tourism

Tourism is one of the most important economic drivers in the West Coast region and most of the research participants believed 1080 use was a risk to it in some way. Interestingly, however, everyone thought the risks were caused by those on the opposite side of the debate from themselves. Opponents believed that the use of poison and the prominent skull and cross-bone symbols on the warning signs were turning away the very type of tourist that was most likely to be attracted to the West Coast:

... the whole country is promoted as clean, green, New Zealand – and you'll notice that they don't use that any more... because I think that the noise we have made and the impact on the country's reputation, it's no longer viable to say ... And when the tourists arrive, every single

⁴⁸ There is a "work-around" in relation to 1080, which does in fact allow FSC certification of the forests in spite of 1080 use [Sandy Rae, Senior Forestry Advisor, Ministry of Agriculture and Forestry, personal communication, 12.6.11]

attraction here and the whole of the bush is blighted by poison signs, skull and crossbones, “don’t drink the water” “monitor your children” etc etc. What’s clean, green, 100% pure about that? I actually filed a compensation claim with the Animal Health Board for interruption to my business and restriction to trade because I felt fraudulent and irresponsible for promoting my business to the international market – ‘come and see the beautiful place we live in, come and see the pure pristine environment that we’ve got’ – and then when they arrive here, and that’s not the case.

(KAKA spokesperson)

On the other hand, people who supported 1080 believed that without it there would be no beautiful environment for tourists to come to, and rather than being concerned about the signage warning of 1080 drops:

... the worst case scenario for the Coast is that we'll have signs at the entrances and exits to the Coast saying ‘This is a TB infected region,’ and it's not going to look good for the tourism industry.

(TB Free Committee Chair)

Several commented that it was the protest action that drew attention to the signs rather than the signs themselves that were the problem. At the time of the interviews, large “Stop the Drop” signs (Figure 1) had been appearing beside the highway south of Hokitika in anticipation of a forthcoming 1080 operation. As one participant remarked:

You have to ask yourself who’s doing more damage to the tourism industry really - our signs or theirs.

(Pest control contractor)



Figure 1: 1080 protest sign

But some others dismissed the tourism argument altogether:

I know some people are getting pretty uptight with 1080 signs up and down the highways. I would suggest that most tourists wouldn't read them – they wouldn't know what they were. We read them because we know what it is and it says 1080 and then wish – and you're past.
(Makaawhio spokesperson)

The economic issues involved in 1080 have complexities that do not usually occur in disputes over environmental contaminants. Instead of a simple divide along economic versus environmental lines, as has occurred, for example, regarding mining on conservation land (Campbell, 2010), there is a mix of economic and environmental arguments across all viewpoints. Unusual alliances sometimes develop among citizen protest groups where people who normally have opposing interests find common ground (Lupton, 1999, p.113), and this is a feature of opposition to 1080. Some people with concerns about environmental risk are strong opponents, but DoC and other conservation interests such as Forest and Bird (2009) are supporters. Their support for 1080 in possum control aligns them with agricultural interests, yet there are conflicts between the two sectors elsewhere in the region and the country (Federated Farmers, 2009, Save Our Wild Rivers, Undated). Similarly, farmers, who generally support 1080,

do not all do so. Three research participants were farmers and all had entirely different views from one another. Tourism interests are also divided over 1080. The promotion of tourism is an important part of DoC's activities in the region, whereas others who promote tourism believe that DoC's use of 1080 is endangering the very quality of the environment that makes it so attractive to environmentally conscious travellers.

The framing of the economic arguments about the risk and benefit of 1080 followed the same pattern as those about the environment. A combination of arguments derived from science and others drawn from experience were again presented by both supporters and opponents of the status quo, but selected and interpreted according to underlying judgements about what was important in the view of the individual speaker. All sought to minimise the risk of the scenario they were promoting and maximise the potential risks of other views. The language used about risk may also show how a person has constructed their views (Nelkin, 1989), and it was noticeable that those who supported 1080 mostly spoke positively about "controls", whereas opponents instead consistently referred to "poison", or even "1080-ed" as a verb that tended to emphasise the risk rather than any benefit.

Economic risks and benefits seem to attract less public discussion than environmental and health issues, yet nearly all the 1080 operations in the West Coast region are driven by economic rather than environmental concerns and are supported by government policy in both agriculture and conservation. The devastation to individual farmers with TB infected cattle is the human face of the risk locally, but behind that there are underlying assumptions driven by concerns about economics and international trade. Those on the West Coast have little control over these kind of decisions, which are influenced by social, political, and economic factors beyond the region. As Douglas (1992) has written:

The dangers are real enough, and terrifying too.⁴⁹ Furthermore, action taken to avoid one, provokes another set of dangers. Choices between dangers are not simple and it would usually be preferable to have the choices directly presented as political questions, instead of sanitized and disguised in probability theory terms (p. 39).

⁴⁹ Lupton takes issue with Douglas over the view that risks are "real" but in this context it seems apt.

Many of the arguments from both sides of the debate are based on unknowable “what-ifs” and fears about potential economic outcomes that might or might not occur if the current management of bovine TB was abandoned or modified, but this kind of discussion does not seem to take place and instead is clouded by the emphasis on risks.

Health risk

Health risk has been highly contentious in the 1080 debate on the West Coast. It also has one crucial difference from the other issues of risk raised about 1080. Whereas environment and economic arguments turn largely on balancing risk and benefit, there can be no claim that 1080 directly benefits health. Health risks that have been raised include the danger of direct contact with the poisoned baits, contamination of waterways from baits and poisoned carcasses, and the risk of unknowingly consuming contaminated wildfoods, honey, or plants used for Māori medicines. New Zealand research has been done over the years into all these issues of potential acute exposure. As a result there have been improved application methods, protocols for safe occupational handling, and steps taken such as warning notices and areas closed to hunting after operations so that direct risks to people are avoided.

The Health Protection Officer, who had decades of experience, said as far as he was aware there had never been a death or accidental poisoning from 1080 anywhere in New Zealand.⁵⁰ Health effects from cumulative low-level exposure cannot be ruled out and there does not appear to have been any attempt to investigate this aspect with people who had high levels of occupational exposure in the past and in whom it might be expected that adverse effects would be showing, if they were to be found. On the other hand, neither do there seem to be any anecdotal reports of diseases or abnormalities:

I say to people, look we've got fifty years of research and stuff behind us with this one and I would have thought that if we were going to have problems with it, given the way we did it fifty years ago, that we should be seeing signs now and we're not. (Health Protection Officer)

⁵⁰ In fact, there has been one documented death in Dunedin which was attributed by a coroner's inquest to 1080 poisoning (Department of Justice, 1967).

Two of the research participants had handled pure 1080 decades ago when there were few safety precautions, but had opposite views on whether it had been harmful. The DoC Advisor said he had suffered no ill effects even though he had a job mixing the pure powder into solution, whereas the KEA spokesperson believed that handling 1080 was likely to be responsible for some of his health problems, particularly his mis-shapen hands and fingernails. Lack of harm is notoriously difficult to prove, particularly when the substance in question is known to be highly poisonous, and those opposed to 1080 were sceptical about its harmlessness. They referred to the belated recognition of the toxicity of substances such as DDT and asbestos as demonstrating the unreliability of official statements about safety. An article from a Ministry of Health publication had particularly alarmed some people (Anonymous, 2008a):

... that was the one that got a lot of people concerned because up to that date they were under the impression that there was plenty of studies done to say it was safe. And now they find out there is none ... really the public have every right to see this stuff as being dangerous to their health.

(KEA spokesperson)

Both the AHB Manager and the pest control contractor believed the risk was perceived rather than real. They separately mentioned the detailed safety protocols that they had developed, going beyond the regulations in an effort to address this perception. They talked about the time and effort they put into planning operations, consulting the public, and making sure they kept to the agreed distance from public water supplies. They ensured that the field workers had the best protective equipment, were properly trained and were monitored for exposure:

...they almost look like spacemen when they've got those overall suits and the full face masks and the gloves and so on...

(AHB Manager).

It is possible that these highly visible and detailed precautions may actually exacerbate rather than allay public anxiety, as has been reported in other environmental risk situations (Slovic, 1993, Laird, 1989). It may cause even greater anxiety, if the inference

drawn is that the chemical is so dangerous it requires extreme precautions:

Some people even think that you just have to touch the stuff and you'll be toast.

(Pest control contractor)

There was also comment on the mixed messages that were given out by authorities in their reaction to incidents involving 1080 elsewhere. On one occasion 1080 baits were sent to a government building in Wellington, and in a second incident, fake (non-toxic) 1080 baits were scattered in the Christchurch botanical gardens. In both cases the authorities reacted as if they believed there was grave danger to the urban public even though the West Coasters had been assured that 1080 was harmless:

Because what they did in Christchurch was close the Botanical Gardens – send in biosecurity teams to decontaminate the area – for, you know, fake 1080 baits. And here we are, where we live, 90 tonnes of real 1080 baits dropped round our doorstep. Now look at the double standard. Same thing happened in Wellington ... evacuate the building – decontaminate the entire building.

(KAKA spokesperson)

In another incident, advice from midwives for their pregnant patients to leave the area before a 1080 drop and stay away for up to six months (Easton and Watt, 2008), although subsequently contradicted by a Medical Officer of Health, appeared to demonstrate further that health professionals themselves were uncertain about its safety yet were prepared to give consent for the operations to proceed.⁵¹

I think the midwives did it in all good intent ... they never checked with anybody as far as I am aware, even their own organisation. They just spoke off the cuff and I think to some degree they were probably put on the spot because knowing some of those people up there that were involved in that, they can be pretty persuasive and wanted her to say something ... yes, it was unfortunate because again, midwives are one of those groups of people that people look up to and say if she said that, it's got to be correct.

(Health Protection Officer)

⁵¹ Every aerial 1080 operation requires permission from the Medical Officer of Health (acting on behalf of the Ministry of Health) under S95a of the Hazardous Substances and New Organisms (HSNO) Act 1996.

Then there are the ubiquitous “deadly poison” notices that go up in the area where 1080 has been dropped and remain for up to six months - a time fixed by regulation - but which many of the research participants felt was out of proportion, if the risk really was as low as they had been assured.

1080 and water

The contamination of water and its potential effect on health has been a significant focus of protest by opponents of 1080. The research carried out has consistently shown 1080 degrades quickly in water and is unlikely to affect edible plants such as watercress and puha (Booth et al., 1999, Ogilvie et al., 2009, Ogilvie et al., 2006, Ogilvie et al., 1998, Ogilvie et al., 1996). However, other types of warnings about 1080 falling into water have appeared to contradict the reassurances from these studies:

‘Environmental hazard to any body of water’ ... This [label] is what comes in on the [1080] drum, and they just whitewash it - say no, don’t worry about that. ‘Compound K is very poisonous to man and other vertebrates; fish and wildlife; toxic to birds and other wildlife’ And yet we’re being told don’t worry about it.

(KEA spokesperson)

The Health Protection Officer spoke about the frustration he had experienced over the water issue. He said that even in one incident when some 1080 baits fell into a water supply, 1080 was unable to be detected when the water was tested:

What we can’t seem to convince them [the protesters] is that, you know, you can dilute things and you get to a dilution point where things are no longer harmful. For some reason while they’ll believe that with other chemicals, they just don’t want to believe it about 1080.

(Health Protection Officer)

However, the number of comments about water and health that might have been expected in this study did not eventuate. Most of the participants who commented about 1080 in water did not in fact focus on risks to physical health. It seems quite possible that on one level the assurances that there is little risk may have been accepted.

Health risk was even dismissed as unimportant by one interviewee, but who still objected to 1080 going into water:

It shouldn't be going in the drink⁵² – [but] it is. I would probably just about believe them that it dilutes away ... Whether it does any harm – I'm not a scientist so I wouldn't friggin' know. I don't think anyone's died of it.

(Hunter)

The Ngāti Waewae spokesperson also made it clear that it was immaterial to him whether water was being used for human consumption:

...once they started using these baits then that's when we realised that it could get into waterways. Not only the waterways that we wanted because in one way we weren't going to use the water for irrigation anyway... So once that started and, as I said, we didn't have any problem with trapping – but the baits, yes we started having problems with.

(Ngāti Waewae spokesperson)

Yet health has been a constant focus of many of the scientific studies, media reports, and complaints made to the Public Health Unit staff. This apparent contradiction between what the research participants said, and what is publicly reported that opponents of 1080 are worried about reflected the experience of the TB Free Committee Chair:

... what we're finding is that we're not getting the people coming out with the grave concerns that we're led to believe are there... If there's the amount of people out there concerned about 1080 for starters then I would have thought we would have been getting more feedback at the Open Days and more feedback to the written material because it's not coming from the Animal Health Board primarily it's coming from my TB Committee, so fellow farmers and citizens in the communities.

One interpretation may be that it reflects the overall societal emphasis on the importance of health risk. Not only do modern governments regulate to stop people harming others, but they also act paternalistically to urge people not to behave in a way which is

⁵² Drink: slang term for a body of water and equally applied to salt or fresh water of a large enough volume to wet a person thoroughly.

detrimental for their own welfare – for example, smoking, or eating junk food (Wilkinson, 2009). As Lupton has noted, people who fail to internalise these societal norms and monitor themselves (1999, p.87) may not only be referred to as “at risk” themselves, but also be classed as a risk to the economic and social wellbeing of society by their deviant behaviour (McVarish, 2010, Wilkinson, 2009, Lowe and Lee, 2010, Beck-Gernsheim, 2000). But in the case of 1080, it is the public authorities who are seen to be acting in the deviant role by dropping a deadly poison on the land while assuring people that it is no risk to health. The protest actions that result then make good stories for the media to report, particularly when they can cast citizens in the role of victims whose health is being put at risk, and authorities are put on the spot and obliged to respond with assurances or investigations. In these circumstances:

Risk is invoked for a modern style riposte against abuse of power. The charge of causing risk is a stick to beat authority, to make lazy bureaucrats sit up, to exact restitution for victims.

(Douglas, 1992, p.25)

Another, complementary explanation for the focus on health risk may lie in the nature of the human relationship with water. After air, water is the next most essential substance for life, and throughout human history has been vested with spiritual significance as a symbol of life, purity, and renewal. To assume that beliefs about water contamination involve a risk only to physical health appears to be a limited and insufficient understanding of the role that water plays in people’s lives. A detailed study of the meaning of water in contemporary culture (Strang, 2004) uncovered deeply rooted beliefs about the holiness of water, its restorative and regenerative powers, that persist in modern society as “... a form of secular hydolatry: the sanctification of water without the burden of religious dogma, reconciling intellect and emotion, culture and nature...” (p.111).

Water plays a major role in many environmental and health risk disputes in New Zealand and elsewhere (Artists for Save our Water, 2010, Water Rights Trust, 2009). An exacerbating factor may be that people generally have to rely on authorities for a safe water supply and have little personal control over it themselves. Involuntary exposure in this way to any risk, however small, is one of the factors identified as generating

outrage among those exposed (Jensen et al., 2005, Sandman et al., 1993). In such circumstances, the dropping of poison into water, no matter how diluted or innocuous science may say it is, appears to be a highly charged issue that infringes people's sense of wellbeing on an emotional and even spiritual level and may be considered simply unacceptable:

A poison is a poison. We just don't want it in our water thank you. Bottom line.
(Mayor of Westland)

Rather than concern about physical effects, the use of health risk as a focus for protest about 1080 seemed to serve as a proxy concept for the general unease that so many of the research participants expressed about the presence of poison in their environment, lack of personal control over how it was used, and the lack of "real" knowledge about its long-term effects.

Conclusion

Contemporary theories that conceptualise modern society as a global risk society are useful in placing the reaction to risk in this study within a wider context. Many of the remarks made by the research participants resonated with ideas that have been raised by risk theorists about the potentially catastrophic dangers that technology and science may bring if not carefully watched, and the need for individual reflexivity in working out what is risky and what is safe (Beck, 1992, Beck et al., 1994). Lupton's view (1999) of risk perception as being subjective and dynamic was also evident. Rather than being divided into uniform pro- and anti blocks of expert versus lay opinion, each participant had a unique viewpoint which had developed through their experience and acquired knowledge – whether their own or those shared with the group for which they were spokespeople. Health risk seemed to be more related to much wider concerns than physical health, and to be more about the effects on the mental and emotional wellbeing of those who found introduction of a poisonous substance into their waterways unacceptable under any circumstances. Outrage was also evident in the comments relating to the urgent response to 1080 incidents in Christchurch and Wellington, at the same time that West Coasters were being assured that it was harmless. Moreover, because of the current concern in wider society about the responsibility to take care of one's own health and not

risk the health of others, health had become a suitable lever for protest about policies or actions which were disliked or resented for other underlying reasons.

Environmental and health issues have predominated in public discourse about 1080 to the exclusion of other concerns. The back and forth discussion about the risks or lack of risks to health, birds, deer, water, and so on, rather appears to obscure the more fundamental issues that drive the 1080 programme in the first place. Although risks are very much emphasised in the public debate and so much of the research undertaken has been done to assess and quantify them, a significant and under-discussed part of the dispute seemed to be about whether the whole programme was justified, or could be justified to the same degree as currently practised. Many of the comments made were not about any of the identified risks, but related much more to different views on what was appropriate and acceptable for the region, and who should make those decisions. An inevitable conclusion was that perceptions of risk from 1080 were complex and varied constructs, unique to each individual, and which drew not only on ideas about risk, but were also informed by other important related concepts. The next chapters, therefore, go on to explore two other prominent themes that arose from comments made by the research participants. The first of these concerns trust and distrust of the various local players and the wider organisations involved in the 1080 debate.

Chapter 5: Winning hearts and minds

Trust and distrust in the 1080 debate

Introduction

Trust plays a fundamental role in minimising concerns about risks and uncertainties that are outside personal knowledge and routine experience (Chrysochoidis et al., 2009, Lupton, 1999, p.78). It allows people to reduce the complexity of their lives rather than examine every interaction for its possible negative consequences (Webber and Carter, 1998). Trust has both cognitive and behavioural aspects, that is, deciding whom to trust, and then taking subsequent action based on those decisions (Webber and Carter, 1998, p.8). Trust is linked to risk, because of the risk that positive expectations may not be fulfilled, turning trust to disillusionment and distrust (Chrysochoidis et al., 2009, Earle, 2004, Webber and Carter, 1998). Social risk theorists have emphasised the important relationship between trust and risk at the interface where individuals interact with the technical and scientific expert systems that are an inescapable feature of modern society (Giddens, 1994, p.184, Lupton, 1999, 104-105, Beck, 2000, p.218). These writers draw particular attention to the past mistakes which have demonstrated that those in control of such systems cannot automatically be trusted to use their expertise wisely or to understand the limitations of their own knowledge about the potential for science and technology to cause harm.

There are numerous examples of events worldwide that could be cited as the reasons why the public has had reason to become distrustful of the ability of governments and their scientific advisors to control risk adequately and keep them informed. The BSE⁵³ crisis in Britain, for example, was worsened by attempts to keep the problem secret, thereby creating a legacy of extreme scepticism among the public about the ability of the British government to protect its citizens (Jacob and Hellstrom, 2000, Zinn, 2008, p.26). New Zealand examples include the long-running concerns among the residents of

⁵³ The transmission to humans of bovine spongiform encephalopathy from eating beef products made from cattle who that had the disease.

Paritutu⁵⁴ about exposure to 2,4,5-T that were eventually vindicated (Fowles et al., 2005) after previously being dismissed (Brinkman et al., 1986), or the contamination of the Fruitgrowers Chemical Company site at Mapua and the handling of the subsequent clean-up by the Ministry for the Environment (Bell, 2008).

Social risk theorists have drawn attention to the influence of knowledge about these past disasters on contemporary society, showing that people are sceptical, or at least cautious, about the safety of scientific and technological developments. They are more likely to make up their own minds on a case-by-case basis, rather than automatically trusting “expert” assurances (Beck, 2000, p.218, Giddens, 1994, p.184). This individual reflexivity about risk has been termed “active trust” (Giddens, 1994). Additionally, perceptions of trust are not static, but likely to be influenced by developing circumstances and acquired knowledge, all of which are incorporated into the different shades of trust or scepticism that people draw on in the way they respond to issues that affect them (Lupton, 1999, p.104-105). Psychometric studies too, though they use quantitative methods, rather than examining the way individual trust responses are constructed, have arrived at similar conclusions about contemporary caution in relation to trust of authorities responsible for risk management and have described it in the same terms as active (or critical) trust (Cook and Gronke, 2005, Poortinga and Pidgeon, 2003).

This chapter covers the theme of trust and distrust between the supporters and opponents of 1080. It looks at their attitudes to one another and to the large official organisations that control when and where 1080 is used. The first section discusses the way science was used and interpreted by the supporters and opponents of 1080. It shows how all the research participants drew on scientific reasoning, but framed, selected, interpreted, or critiqued science according to their own experience and values. The second section examines three factors that have been identified as important in the trustworthiness of institutions – the competence, honesty, and commitment to the public good of the various organisations and groups that are involved in 1080 issues in the West Coast region. The final section looks at perceptions about the trustworthiness of the communication methods the various organisations and groups use to disseminate their messages to one another and the general public.

⁵⁴ A community near New Plymouth.

Trust in scientific knowledge about 1080

As discussed in Chapter Three, the risk “window” that establishes the agenda in risk assessment is generally set by official organisations and their scientific experts (Madsen and Sandoe, 2005, p.321). In the risk assessments relating to 1080 the focus has largely been on quantifying risk of harm to individual species of birds and other native wildlife, and its effect on soil and water. It was not surprising, therefore, that almost all the participants in this study used the same sort of approach as a starting point for their comments. These ranged from general remarks about the scientific evidence for or against a particular viewpoint, to criticisms of specific details of individual studies. Several of the strong supporters of 1080 said that they had examined the scientific evidence themselves because of the personal responsibility they felt to ensure the information and advice they provided to others could be trusted:

... as one of the people that was responsible for setting conditions, it is something I did a lot of research into. I read a lot on the 1080 in water. My personal and professional opinion is that it's not a risk if it's done in the way we ask them to do it. The research that I've seen leads me to believe that that's so.

(Health Protection Officer)

I've spent hours and hours and hours going through every bit of 1080 information I can find and that's from all sides ... you have a responsibility to your fellow citizens anyway and fellow farmers because they trust you in that what you're saying is correct

(TB Free Committee Chair)

People from the citizen groups who did not support 1080 had also investigated the scientific information in a similar way to support their own position, and had come up with conclusions that were contrary to the position taken by DoC, the AHB, and other 1080 supporters. Most of those opposed to 1080 presented their case as a critique of the scientific studies, pointing out areas where they believed experts differed, aspects that had been under-investigated or not investigated at all, and cases where they believed the studies had been flawed.

I looked into it and I found the science – and I've a degree in science so I'm not a complete muffin in that area – to be very shaky and rather insignificant in detail. And certainly, I

didn't feel there'd been anywhere near enough research done to justify the broad-scale, indiscriminate use of a very dangerous toxin over a large area round where people live.

(KAKA spokesperson)

I've got a report where a guy did a research on kea in St Arnaud ... and right at the end of it he wanted to do something with the nests, so he wanted a nest recovery. He couldn't find any so he used kaka nests instead – it's just ludicrous! Should've sacked him ... they're two totally different birds. Only thing they've got in common is they look similar. And yet he used that as part of his study.

(KEA spokesperson)

Tesh (1999) and Nelkin (2004) describe how citizen groups have learnt to hire scientists so that they can contest official responses to risk on an equal footing and avoid being dismissed as lay people with insufficient knowledge. However, in the 1080 debate on the West Coast, the spokespeople for the loosely formed citizen groups, without the resources of large lobby groups, appeared entirely confident in their own ability to research the scientific findings and contest the position of large organisations. The groups sometimes combined forces to share information (KAKA, undated), but their comments were all quite specific to their own particular geographical area and each one emphasised different concerns. There is at least one document published privately by people with a scientific background⁵⁵ that is highly critical of the official evidence on the use of 1080 (Whiting-O'Keefe and Whiting-O'Keefe, 2007) and it is linked through the KAKA website, so the interviewees were probably aware of it. However, none of them mentioned it in support of their argument and nearly all the examples that they used were specific to the West Coast and did not appear in the report in question. As Lupton writes,

... it is not simply a question of lay people deciding which of two or more bodies of dissenting expert knowledge to trust when they are making judgements about risk. Rather they construct their own expert knowledges... (1999, p.110)

Neither the DoC Advisor nor the AHB Manager mentioned researching the scientific

⁵⁵ Two retired biochemists from the United States, now living in the Coromandel area, formerly on the staff of CalTech.

evidence themselves, but this did not necessarily mean they had not done so. As senior employees of their organisations it seemed very likely that they would trust the science that their organisations commissioned or carried out, and which had accrued over several decades to form the official view they represented. Both of them used the inclusive “we” throughout their (separate) interviews, identifying themselves firmly with their organisations. Neither of them mentioned any scientific uncertainty or difference of scientific opinion about the way that 1080 was currently being used.

Both supporters and opponents of 1080 clearly felt frustrated at not being able to convince the other side of the compelling nature of their case. The claims they made about one another were strikingly similar, being mostly about closed minds and wilful misunderstanding of evidence:

DOC's own scientists suggest that... the chance of non-recovery of a lot of native species – they're all listed – is 100%. Look at the report and if I was the head of DOC and I received that report from my own scientists, I would go, O my God, we can't do this! But somehow or other they spin around it and keep going. And the other thing is I think that they're just indoctrinated in the use of the poison.

(KAKA spokesperson – original emphasis)

In the same way, the Health Protection Officer, already quoted in the previous chapter, spoke about the frustration at not being able to convince the opponents of 1080 who “just did not want to believe” that 1080 in water would be diluted to a point where it was no longer harmful.

Some, though not all, of the 1080 supporters tended to fall back on the “deficit model” of expert, neutral science versus lay emotion (Barnett et al., 2007, p.922, Davies, 2008, p.415, Tesh, 1999):

It's people who have developed these groups who've got a real emotional, strong feeling about the use of 1080 and their perception of the effects it has both on public health and on the environment. So they've got very strong feelings and sometimes those strong feelings tend to overboil...

(AHB Manager)

However, other interviewees pointed out that the official organisations were just as emotionally invested in the issue :

They just don't want to listen to any other arguments. It's the only tool, it's the best tool and if it wasn't for that, all the forests would have fallen over. Well, I can be dramatic too.

(Makaawhio spokesperson)

All the interviewees had been invited to participate in the study because they had strong views on 1080. It appeared unlikely that any of them had started from a neutral standpoint, uninfluenced by prior knowledge, their own background, and interests, and had arrived at their position only after researching the scientific arguments. Rather, their views seemed to have already tended one way or the other through their own circumstances, activities and experiences, and subsequently they had searched for scientific information and selected and interpreted it in the light of their views. Although participants' interpretations ended up on different sides of the debate, no one suggested that science should be discarded as a basis for decision making about the use of 1080. Far from being disillusioned with science, the research participants in this study appeared to have exercised critical trust in science as an important tool to support the views that they developed. There was less evidence of the distinction between lay concentration on values and experts who focus on science than has been highlighted in other studies (Beecher et al., 2005, Brown, 1992, Jensen et al., 2005). Indeed, those who opposed 1080 seemed to have developed a broad knowledge of a wider range of scientific issues relating to 1080 than the DoC and AHB participants, who tended to focus much more on their individual, relatively narrow areas of expertise. This broader frame through which non-experts view risk has been contrasted with the narrower “risk window” which technical experts are more likely to apply (Madsen and Sandoe, 2005, p.321).

However, although the research participants viewed the scientific information about 1080 positively, their attitudes to its credibility were tempered by the level of trust that each of them had in the organisations that had commissioned and funded most of the studies – DoC and the AHB. Research that has attempted to tease out the different factors that influence perceptions of trustworthiness in institutions responsible for environmental risk management has found that competence, honesty, and commitment

to the public good are the most critical (Chryssochoidis et al., 2009, Peters et al., 1997, Poortinga and Pidgeon, 2003, Frewer et al., 1996). Moreover, these qualities are not only important for large government or corporate bodies but also hold true for smaller organisations such as environmental action groups (Peters et al., 1997). The next section, therefore, moves on to look at perceptions about these qualities in relation to the trustworthiness of the various organisations and groups that support and oppose 1080.

Trust in the organisations that support or oppose 1080

Perceptions of competence

The use of 1080 is controlled by legislation, regulations and detailed protocols, and the aerial operations where 1080 is used are particularly closely observed by a wide range of people to ensure all these requirements are adhered to. The research participants who worked with 1080 spoke of the intense scrutiny that the operations were under and the care they took to ensure that they were carried out with professionalism and competence:

We're now in a situation where we've got so many watch dogs and so many regulations pertaining to the application of 1080 that all the risks that have been identified by concerned parties we would have hoped to have been addressed. ... And we have everyone from ERMA, from the MoH,⁵⁶ from the Department of Conservation, from Forest and Bird, from the Regional Council all looking in on us and saying right, these are the conditions that you can do it.

(AHB Manager)

It was clear that the responsibility weighed heavily at times:

... there are nights you wake up in the middle of the night and you are reaching for your diary, just noting stuff then double checking and then re-checking and then triple checking. You're always constantly questioning and asking yourself have I got all the bases covered? Is everything in place? All the consents, all the boundaries, everyone's been notified? And you know, even at that stage you still – there's lots of things that you worry about.

(Pest control contractor)

⁵⁶ Ministry of Health

The use of geographical positioning systems (GPS) in recent years was mentioned by many of the interviewees as having brought increased accuracy to 1080 aerial operations. Both supporters and opponents acknowledged its advantages:

... from an exercise in navigation and whatever it was quite outstanding. And the pilot of the chopper I went out in he could say ... we are 70 metres away from the drop zone and I thought holy hell, how could you be so sure. But they had the technology in that machine and it was unreal.

(Makaawhio spokesperson)

However, while everyone apparently agreed that there had been improvements in accuracy, there was also a keen awareness that the operations were very finely balanced:

Not only is he [the pilot] trying to keep his aircraft in a straight line to meet our requirements of complete coverage and no gaps, he's trying to keep the thing in the air ... and to top that he's got boundaries he's not allowed to cross and you have concerns from adjoining landowners about baits ... although the GPS says the baits have been sown through here, with a 20 knot wind and falling 500 metres they could be a long way outside the drop zone. So we won't fly in 15 knots. Ten to fifteen is our optimum.

(Pest control contractor)

Those who opposed 1080, had little confidence that DoC and the AHB were able to keep within their own regulations and protocols. Factors such as the weather, the speed of the aircraft, (both of which affected how far the baits drifted before they landed), and the exact timing of the release of the baits were all cited as causing relatively frequent breaches of the agreed operational boundaries, and therefore undermining trust in the confident assurances about how precisely the 1080 was distributed:

They're not able – no one, not Animal Health Board nor DoC – to aerial topdress the area with 1080 and not infringe all their own regulations.

(FATE spokesperson)

A particular incident that had been observed seemed to confirm that things could and did go wrong out in the field:

... the auger⁵⁷ had malfunctioned. They couldn't turn it off and so it was spinning all the time and so it was flying backwards and forwards across the river dropping 1080 all over the river bank, all through the water and all the tributaries ... but they didn't stop their operation and they continued until they had used up their supply. ... Having seen that with my own eyes, I am very sceptical of the assurances we get about respecting the buffer zones and that it doesn't make it into the water catchments.

(Mayor of Westland)

Several other interviewees cited instances where protocols had been contravened, for example, ground crews scattering 1080 baits directly on the ground rather than putting them in containers, or leaving baits on walking tracks, including major tourist tracks. On occasions 1080 baits had been found intact in pools or streams, or on beaches. Some interviewees produced photographs to prove their point. These instances frequently generate complaints to public health staff⁵⁸ and sometimes receive news coverage. However, they appeared to be mentioned by participants less to demonstrate incompetence, than to imply that unrealistic claims were being made about the accuracy of the operations which then undermined confidence about other assurances that were given.

As far as perceptions of competence of the citizen groups went, their spokespeople were clearly aware of the need to be perceived as knowledgeable and accurate:

I can't say anything that's not irrefutably true. Because if I do I get absolutely machine gunned down, you know. However, DoC and the Animal Health Board can quite blithely say whatever they damn like ... with impunity.

(KAKA spokesperson)

International research has found that perceptions of competence of citizen groups is the most important factor in their credibility (Peters et al., 1997), but none of the interviewees outside the groups themselves made any comment along these lines. This may possibly reflect the fact that the spokespeople for the citizen groups were generally

⁵⁷ The auger is the part of the mechanism attached to the helicopter which spins round and ejects the 1080 baits.

⁵⁸ For example, 20 incidents in the year 2009/10 were investigated by the public health unit staff of Community & Public Health West Coast (2010).

well informed and were regarded by those who disagreed with them as not wanting to understand rather than being incompetent or ignorant.

Perceptions of openness versus secrecy

Comments about secrecy, dishonesty, lack of accountability, and hidden agendas, however, formed major themes that came up many times during interviews with the research participants, and were the subject of claims and counter claims by the supporters and opponents of 1080 about one another. The AHB in particular was perceived as being particularly secretive:

The whole Animal Health Board is very closed. ... They're not sharing their information that they have ... The only person that they are responsible to is the Minister for Agriculture, and [he] is on the Board of the company that makes 1080 baits.

(KAKA spokesperson – original emphasis)

The fact that the AHB was not subject to the Official Information Act was a particular source of frustration:

... the Animal Health Board has become a very big bureaucracy that's untouchable. It's not answerable under the Official Information Act; you can't get information from it; if you are given information it's usually verbal so if there's any queries about it, it's your fault because you've misinterpreted it, and I find that quite offensive because I'm a reasonably intelligent person and I am a farmer.

(FATE spokesperson)

Even the contractor, whose main work was with the Animal Health Board, seemed to find it difficult to get information that was relevant to his work. He explained that one way he had managed to keep better informed was through making his own workplace available for the vet to carry out the autopsies of possums with suspected TB:

... it gives us a handle, gives us an insight we don't usually get... Well, since the Animal Health Board's taken control of all of that stuff back to Wellington, it's very hard to get some information out and so at the moment, we know whether possums are infected because we take part in the autopsy process. (Pest control contractor – original emphasis)

DoC was perceived differently from the AHB - not as secretive or obstructive about giving out information, but as an organisation with a closed culture that would not admit new ideas:

I think they've been using 1080 for so long that they actually believe that they're doing the right thing. I don't think there is any real, genuine cognitive process past 1080 is good. You know, that's the end of the thought process. 1080 will save us, you know... the same thing as DDT will save us...

(KAKA spokesperson)

This closed culture and resistance to being challenged was said to extend right through the organisation from its own scientific researchers to front line workers on the ground in remote areas:

... you can't afford to upset the boss, not when the boss has shown in the past that if you don't toe the line, you'll get fired. There's no room for contentious issues with 1080 with DoC.

(KEA spokesperson)

One reason for the perception of a closed culture may be that because 1080 is so little used elsewhere, there is virtually no recent international research which might bring fresh or challenging evidence into the debate. Additionally, almost all the scientific studies that relate to 1080 or other methods of pest control are funded by the AHB or DoC and carried out by their own scientists or those from Crown Research Institutes. There was an awareness among many of the people I interviewed about the potential for bias resulting from how the research was funded:

I think a lot of the scientific research is very grey given that it is often funded by either Animal Health Board or DoC. And it would seem to me as a scientist, when I read through these reports, that there are significant concerns contained within them that seem to be glossed over. And then the scientific reports seem to be ultimately funded to the point where they seem to justify the continued use of the poison. So I have no faith in DOC.

(KAKA spokesperson)

This awareness was not limited to the opponents of 1080. Some supporters also

mentioned the need to consider who had funded the research when reviewing the scientific evidence.

However, there were also perceptions that the citizen groups were not entirely honest but were concealing their true motives behind concerns about risk:

But people aren't frank ... It's when they have hidden agendas it really drives you up the wall. People have told you things to deliberately trip you up, to try and catch you out. ... Personally I feel if we didn't kill dogs or deer we'd only have ten or twenty percent of the opposition that we have at the moment because you know most of the opposition comes from hunters, then dog owners but they hide behind that it kills everything and they hide behind the water. So they get behind these other things and start coming from these other angles because they know that the Department of Conservation isn't interested in them.

(Pest control contractor)

Almost all the research participants, no matter whether they were supporters or opponents of 1080, believed that those who disagreed with them were either hiding something, or had closed minds and just did not want to listen to the other side of the debate.

Perceptions of commitment to the public good

Comments about being uncaring about the public good were also made frequently in the interviews. All participants seemed to be genuinely concerned for the wellbeing of the region but there were many claims that others, who did not share their own views, were putting that wellbeing at risk. Supporters or opponents of 1080 (depending on the views of whoever was speaking) were said to be endangering the environment, tourism, farming, traditional leisure pursuits, business initiatives or the potential for future development of the West Coast. For the supporters of 1080 this primarily seemed to take the form of frustration that the lack of trust in them was preventing them doing their job of protecting the environment (DoC) or the rural economy (AHB), from which they were being diverted by opposition and protest:

The experience that this team has had with the West Coast ... has been challenging because we have been in the forefront of all the protest action, all the feelings about the use of 1080 and

the perceptions people have about how we deal with it. ... You know, we've got a job to do; we've got stakeholders to represent and until we can figure out a way of dealing with this in as cost effective a way we'll have to continue using it as really an important tool.

(AHB Manager)

They also felt that lobbying the uncommitted members of the general public went too far at times and crossed over into intimidation:

One of the people you've spoken to⁵⁹ is very actively involved in knocking on people's doors intimidating people to get them to oppose the drop and make it difficult because that's how they believe that they could stop it. And in a way they can hinder it because we rely on private property to operate from.

(Pest control contractor)

More seriously, there were also concerns about staff who worked with 1080 being subjected to threats and harassment which were reported to come from some of the people opposed to 1080, though they were not necessarily part of the citizen groups:

It's not a great group we're talking about that have done the harassment. It's a very tight little group and unfortunately they're a group that partake in drugs and I'm saying that out of fact – because it's a known fact – and of course when you get a group of people sitting in those circumstances they feed off one another's paranoia too.

(TB Free Committee Chair)

The citizen groups were probably not well served by extreme actions of other individuals which may have undermined perceptions about their own credibility and concern for the good of the region. However, this issue was not raised by any of the participants from these groups.

In contrast, the opponents of 1080 directed their comments about lack of commitment to the public good at the Wellington-based hierarchies of DoC and the AHB rather than the local programme managers. They believed that the Animal Health Board, in

⁵⁹ I did not tell any of the interviewees who else was a participant in the study but in the small West Coast community, everyone seemed to know who they were.

particular, had lost sight of their real mission, and was more interested in retaining the status quo than genuinely wishing to do the best they could for the region:

I think someone like [Mr X] who runs it, the Animal Health Board, being on \$370,000 a year is probably more important [than eliminating bovine TB] – that's my own personal view. I really feel that he's heading an empire that's protecting itself, because if you suddenly don't have a problem with TB, why the hell do you need an Animal Health Board?

(KEA spokesperson)

No one suggested that DoC staff were personally motivated by money. However, several interviewees believed that DoC had inherited a situation (predating its existence as a department) when the pest control industry had been faced with going out of existence because deer numbers were reduced to such low levels⁶⁰ and they needed to exaggerate the possum problem to generate public funding and keep themselves in a job:

...[they] just changed their motives to still keep doing what they were doing simply because guys have got high positions, had heaps of guys working for them, a lot of money involved, they created a niche in life and they didn't want it ended.

(Hunter)

Whether an organisation is believed to be competent, honest, and working for public good is largely reliant on the way it interacts with the public both in person and through organisational communication channels. Communications therefore, are a particularly important means of generating trust in organisations involved in environmental risk disputes (Laird, 1989).

Communications, public relations and trust

The nature of the official organisations and citizen groups involved in the 1080 debate on the West Coast and their different responsibilities, accountabilities and available resources are key factors in how they choose to communicate with the public. DoC, as a government department, is responsible to the Minister for Conservation. Its mission is

⁶⁰ Deer were a major focus of pest control programmes until commercial helicopter hunting during the late 1960s and early 1970s reduced them to very low numbers when they were no longer a threat. This predated the Department of Conservation which was established in 1988.

to manage natural and historic heritage assets for the benefit of all New Zealanders and ensure that the value of these assets is passed on to future generations.⁶¹ The Animal Health Board is an incorporated society and a registered charitable entity,⁶² legally responsible under the Biosecurity Act 1993 for managing and implementing the National Pest Management Strategy for bovine tuberculosis in New Zealand (AHB, 2009). It is accountable to its member organisations⁶³ and it also has responsibilities to the Minister of Agriculture, but is not classed as a government department. Critical differences between them which are relevant to the 1080 debate are firstly, that the AHB is not subject to the Official Information Act 1982 as DoC is, and secondly, that DoC makes the full reports of its scientific research freely available through its website, whereas the AHB provides only basic details about the research it commissions in an Annual Research Report (AHB, 2010). However, both DoC and the AHB have significant resources with which to disseminate information and promote their activities.

Very little information is available about the citizen groups formed to oppose the use of 1080. They do not have public accountabilities like DoC and the AHB, but neither do they have the same resources to draw on. The KAKA group maintains a website⁶⁴ that gives its history and outlines its objectives. The KEA and FATE groups do not have websites and their spokespeople and activities are known mainly through news media reports. Although each group is located in a particular sub-region of the West Coast, they seem well known to one another. Both the KAKA and KEA spokespeople stated that their groups had been formed by concerned citizens as a direct response to 1080 operations planned for their specific area. The groups appear to be loosely structured, and it is not clear whether they have a membership list or whether they continue to exist as entities following the particular operation for which they were formed.

Consultation with individuals and communities

Before carrying out an aerial 1080 operation, organisations that use 1080 are required to

⁶¹ See Department of Conservation website statement <http://www.doc.govt.nz/about-doc/role/mission-vision-and-statutory-mandate/mission-and-vision/>. Accessed 9.6.11.

⁶² Charitable entities are exempt from income tax on their normal operations.

⁶³ Federated Farmers Meat and Fibre, Federated Farmers Dairy, NZ Deer Farmers Association, Deer Industry NZ, Dairy NZ, Beef and Lamb NZ, and Local Government NZ (See AHB website www.ahb.org.nz).

⁶⁴ KAKA website available at: <http://www.kaka1080.co.nz/>

communicate with people who will be affected. This point of interaction and communication between individuals and the representatives of institutions is known to be critically important in informing, educating, and persuading the public to trust them (Bennett and Calman, 1999, Gough and Hooper, 2003, Pfeiffer, 2006). In the past it seemed that guidelines for communication had been vague and fairly limited in scope:

One of the other things that tended to happen in the past was that consultation was never prescribed ... it said you had to consult but it never said how you had to consult or who you had to consult or anything else, and what tended to happen in the past is that they would go out, they would talk to people who were immediately involved. If it was on your land or bordering your land they would talk to you, but what they didn't do was get involved with the community of interest.⁶⁵

(Health Protection Officer)

The Health Protection Officer had firm views about community consultation even if it was not legally required:

I pointed out to them [the AHB] then that consultation needed to change. It had to be consultation with the community of interest and if they weren't going to go down that road then I personally wasn't going to be signing off these papers ... consultation is absolutely essential and as I say you can't just pick on people directly involved because these days the communities want to know what's happening.

(Health Protection Officer)

AHB operations are more visible than DoC's; there are more of them, over a wider area, and because they target the bush-pasture margin,⁶⁶ they take place nearer to where people live and therefore seem to create more controversy than those done by DoC. Consultation in the past appeared to have been rather confrontational and possibly partly responsible for some of the strong feelings of distrust with which the organisation was viewed:

⁶⁵ The most recent guidelines on consultation (ERMA, 2009) have detailed recommendations on consultation with Māori, affected landowners and their immediate neighbours and specific interest groups but stop short of recommending consultation with the wider community.

⁶⁶ Many West Coast farms have areas of bush on the steeper parts with pasture below. Stock can graze inside the bush area and wildlife from the bush, including possums, can move freely in and out between the bush and pasture.

There were supposed consultation processes done by the Animal Health Board prior to the drop ... we all went to the public meeting and we found it wasn't a consultation at all. It was more of a decree – “this is what we'll be doing.”

(KAKA spokesperson)

Communicating through public consultation exercises has been shown in other studies to have limited success in building “widespread, socially inclusive support” (Barnett et al., 2007, p.924). It has been viewed as unrepresentative, with only confident members of the public being able to have their say, and the results of the consultation tending to be largely disregarded by the decision makers. At the time of the interviews the AHB Manager on the West Coast seemed to be making a great deal of effort to consult earlier and more widely than had been done previously, and to reverse the perception that the organisation did not care about the general public. This approach had met with some success:

He's [the Manager] talking to them about it, listening to their concerns, and he did that in Kumara. And what he did then was he actually modified the boundaries that the 1080 drop was going to go in and, you know, you have to feel for him. He's given a limited budget to do a certain task and the cheapest way is to do it with 1080. ... he went to Wellington and he talked to the Animal Health Board personally and said 'This is the problem. You have to allow me to do this.' And he got their consent to do that and so he changed – he shifted the boundary. They took out a huge amount of land area ... He's turned around the perception of TB Free on the Coast.

(Mayor of Westland)

Being in control is known to be an important factor in perceptions of risk (Sandman et al., 1993, Slovic, 1987) and it seemed likely that this change in the operational boundaries as a result of the consultation, which gave a measure of control in the decision making to the community, had been the critical factor in the improved relations reported here.

Consultation with Māori

In contrast to community consultation, consultation with Māori is legally required. Under the Resource Management Act (1991) government departments and territorial authorities must ensure that local iwi actively participate in any issues involving natural

resources and that the kaitiakitanga (guardianship) that Māori have over the natural environment is respected. To do this properly, an ongoing relationship must be built up over time and include active participation of Māori not only in making decisions, but also in the implementation and monitoring of the activities resulting from the decisions made (Jefferies et al., 2002). DoC and the two Māori rūnanga in the region appeared to have invested time into building this kind of relationship over the past decade and as result a considerable measure of trust seemed to exist between them:

...we go along and discuss operational plans, and what's coming up in the future, and what's happened in the past and how well it went and all those sort of things ... we do try hard to make sure we listen to any concerns that come out of these sort of rūnanga and address them as well as we can because they do have specific concerns and one of them is about food harvesting and another one is about medicinal plants that they might take from the forests. And so they are both genuine concerns for them about genuine issues...

(DoC Advisor)

Both rūnanga spokespeople also spoke positively about their relationship with DoC. The appointment of Māori liaison officers within DoC, for example, was mentioned as having been successful in promoting the relationship, as was the fact that rūnanga could deal directly with the Conservator for the region:

We have a Committee called Putabitanga where the head of the rūnanga can sit down with [name of the Conservator] and say we're not happy with this and not happy with that, but be able to talk about it at a governance level. 1080 has come up a lot...

(Ngāti Waewae spokesperson)

This sort of personal relationship built up at the interface between public agencies and those who have contact with them is known to be a factor that promotes and sustains trust in them (Davies, 2008, Pfeiffer, 2006, p.261, Thomas, 1998, p.178). The positive relationship between the Māori rūnanga and DoC seemed likely to be tested soon, as each of the rūnanga spokespeople said they were reviewing their stance on 1080, and were likely to be less supportive in future. They were, however, anxious not to sacrifice the reciprocal understanding with DoC they had built up:

... the skill that we've got to try and bring to bear is – if we say no [to 1080] – what we've got to do is to manage that because the dealing with 1080 is a relatively small part of our dealings with the Department of Conservation. ... But we've got a whole range of other things. We've got fisheries issues with them, we've got birds, we've got islands, we've got the sea coast, we've got protection of some of our resources and all those sort of things. But they, I think are fairly aware that we aren't sitting on our hands over this ... we have probably come a fairly quantum shift over the last four or five years.

(Makaawhio spokesperson – original emphasis)

Although this model of consultation with Māori had been successful, DoC did not appear to have considered extending it by applying it to the non-Māori public in the region. In fact, the DoC Advisor suggested that their 1080 work was not relevant or even of interest to the general public:

... most of our work is in very remote parts of the West Coast where we don't have communities, so we're not actually in people's back yards... we put our efforts into those groups that are likely to be up in a place where we are using pesticides or something that might affect them such as, you know, the game recovery industry.

(DoC Advisor)

This comment appeared to disregard the strong opinions about the conservation-managed public lands and the feelings of attachment to them that almost all the participants in the study expressed, a theme which is taken up in more detail in the next chapter.

The AHB and the Māori rūnanga did not seem to have established the same kind of positive relationship, and the AHB was not viewed well by the rūnanga. The Makaawhio spokesperson referred to the AHB as being “...a bit cowboyish” and the Ngāti Waewae spokesperson reported that he felt that his rūnanga had at times been treated as “... second rate citizens, second class people”. Reasons for the apparently poor relationship were not explored in the interviews, but may relate to the absence of the particular strengths that were mentioned in connection with DoC – the wide range of issues covered in addition to 1080, and the ongoing personal relationship with the regional head of the organisation.

The Open Days

Apart from consultation around forthcoming aerial operations, the AHB and TB Free, with some support from DoC, had initiated a series of Open Days in townships across the region. They aimed to provide a forum other than public meetings where people could get information and talk one-to-one with a scientist, contractor, or a member of the AHB or DoC staff who would answer their questions directly:

What it did do, was it gave people who really wanted to find out about 1080 an opportunity to go in there, give people their views, and listen to what we had to say without feeling threatened or intimidated or worried that, “Oh, if I say this, you know, the rest of the community’s going to get upset with me”, and that’s both sides of people who were anti and people who were sort of not sure.

(AHB Manager – original emphasis)

While these efforts were clearly well intentioned, they appeared to be based on the belief that the public just needed more information to bring them round to the view that the use of 1080 was necessary and acceptable. There is significant evidence to show that merely providing one-way information is not particularly successful in improving public relations (Bennett and Calman, 1999, Davies, 2008, p.419-420, Gough and Hooper, 2003). It is also known to be very hard to shift risk management organisations from this rather paternalistic approach which assumes that the public needs educating and there is nothing to learn from them in return. Furthermore, these same studies have found that public relations exercises of this kind have a limited influence on those who already hold strong opinions (Davies, 2008), which seemed to be confirmed by the reactions that were reported:

There’ve been one or two areas where we’ve had a poor attendance – what we’ve learnt is that we’ve had a poor attendance in that particular area because the community there are supportive of the operation so why go to an Open Day. We didn’t quite expect that type of reaction.

(AHB Manager)

Those who were strongly opposed to 1080, on the other hand, distrusted the motivation behind these events, seeing them as a cynical exercise:

Animal Health Board's having these public days ... they want to reach the widest possible audience. They're holding one in Reefton; they're holding one in Blackball. You probably don't know, they're tiny little towns ... Harihari. Now if you want to reach the highest possible number of people you don't have them in places that have got a population of a hundred. ... But they don't want to reach the biggest ... they want to say they've tried to do that.

(KEA spokesperson – original emphasis)

Davies (2008), in her study of attitudes of scientists to public consultation, found that they preferred to limit their public engagement to “non-extremists” whom they were more likely to persuade to their own views (p. 426). It appeared that the 1080 user agencies understood this instinctively, and aimed their efforts at the “hearts and minds” of those who knew little about the issues, but whom they needed to convince before they were captured by the opposite message. As one participant commented:

...it's a real toss up between the two camps and each trying to get their message out in a way that people can – the general community can understand...

(DoC Advisor)

It is hard to say to what extent the Open Days might have been effective in building trust and support for the 1080 programme with the general public of the West Coast communities. It seemed unlikely that any of the participants in this study, who were already identified as having strong views one way or the other, would have changed their views by attending.

Media communications

In environmental risk disputes both government and advocacy groups have learned to make skilful use of the media to draw attention to new issues, reframe older ones, or to transform what has hitherto been an accepted condition into something that is contested (Nelkin, 1989, Tesh, 1999). This was also the case in the “hearts and minds” battle between the supporters and opponents of 1080 in the West Coast region. Large organisations such as DoC and the AHB have considerable resources through

communication departments and media spokespeople in their national offices that support public relations and communication efforts. Small citizen groups with no paid employees or public funding largely rely on the general news media to get their message heard beyond their own fairly small circle (Koopmans, 2004). However, that means that they have to do something newsworthy to get media attention, particularly if they are remote from the main news consumers. Attitudes to the media among the research participants largely fell into the same sort of claims and counter claims about one another that have already been referred to in relation to other aspects of the debate. Both opponents and supporters believed that the media was biased against them, something which has been found elsewhere (Wahlberg and Sjoberg, 2000, p.38).

One of the strategies that the citizen groups had devised to get media attention was the distribution of stickers and posters that adapted two well known and readily recognisable promotional slogans⁶⁷ to contrast the 100% pure New Zealand logo on the one side with 1080 and a dead tui on the other (Figure 2).



Figure 2: 1080 protest sign

This did generate quite an amount of news coverage within and outside the West Coast area:

So we did those stickers, and then we got a response from Tourism New Zealand, which was a rather hairy chested letter from their lawyers saying a “cease and desist”... This is the extent

⁶⁷ The poster mixes and adapts the “100% pure” tourism promotion and the ironic Tui beer billboards with the “yeah right” statements that are well known throughout New Zealand. Note the dead tui instead of the upright tui that is pictured perching on the Tui name in the beer advertising.

we had to go to, to get any media interest in the subject. We had to create media events ... to get publicity on the other side of the 1080 debate.

(KAKA spokesperson – original emphasis)

Large billboards (Figure 3)⁶⁸ have also been used to attract the attention of residents and tourists to the West Coast. These, and many of the protest actions at the time of the aerial drops have also attracted media coverage (Anonymous, 2008c, TVNZ, 2010). At the time of the interviews for this study, stickers and posters such as those pictured below were a frequent sight on letter boxes, and in some shop windows throughout the region.



Figure 3: Protest poster used by groups opposed to 1080

While these tactics might be perceived as a David and Goliath struggle of little citizen groups battling against the officially supported giant, it is well established that bad news is more likely than good to be believed and that stories of blame and mistrust about risk management are more often reported by the media than positive news (Driedger, 2007, Slovic, 1993), so the battle for media exposure may not be as one-sided as it might seem.

In contrast, some 1080 supporters believed that the media, particularly the local media, was biased against them. A particular concern was that the adverse publicity would potentially influence more landowners to refuse access to their properties and therefore compromise the effectiveness of the 1080 operations:

⁶⁸ See also the Stop the Drop billboards (Figure 1) featured in the previous chapter.

I'm extremely disappointed with the media. On the Coast we have one media. The Grey Star, the Westport News, and the Hokitika Guardian are all owned by the same people ... And a lot of people read them, and they [the media] have no regard for accuracy, privacy, or anything. And they've blatantly disregarded requests for privacy and even lied about those. And it doesn't help when the only media organisation, or the one that most people on the Coast get, publishes untruths and doesn't give me an opportunity to correct them ... It's extremely frustrating.
(Pest control contractor)

However, other participants did not believe the media coverage had much influence, with one dismissing it as inconsequential:

They [the protesters] might have made a loud noise for themselves, put themselves on TV [but] it's better to have ... a selected group like we have where we can go ... and hit the joker at the top, because if the joker at the top doesn't get hit, all the mucking round down here at the bottom is going to go nowhere.
(Ngāti Waewae spokesperson)

It is difficult to know just how much influence media coverage would have had in creating trust or distrust in a particular viewpoint. Nelkin (1989) found that while the media were likely to be a key influence in situations where people were unfamiliar with the issues, they tended only to reinforce the existing views of those who already had an established set of opinions (p. 106). Moreover, it has also been found that people often believe others are more influenced by media reports than they are themselves (Wahlberg and Sjoberg, 2000), and that media reports are among the least trusted sources of information about risk, with all of them being perceived as more or less sensationalised (Frewer et al., 1996, p.484). Certainly none of the participants in this study mentioned the media as an influence on their own views and it seems reasonable to suppose that because of the small community and the long-running nature of the debate, most local people would already have formed some kind of opinion about the use of 1080. The influence of the media on a wider audience in relation to the use of 1080 is a major topic in its own right, and not one that was within the scope of this study.

Conclusion

The comments reported in this chapter confirmed the generalised, but cautious trust in science that has been reported in contemporary society. Almost all of the interviewees used scientific reasoning as one method of supporting their views. It was also clear that most of them examined it critically to assess its trustworthiness. Their selection and interpretation of scientific information, however, was quite clearly influenced by their own experience and values. Rather than this being a clash between expert scientific knowledge and lay values, all opinions appeared to be heavily influenced by personal constructions which underpinned the reasons that were advanced in support of particular views.

Entrenched positions of distrust on each side of the debate were noticeable, with both supporters and opponents of 1080 believing that those who did not agree with them were either dishonest, had hidden agendas, or were putting the region at risk. Some aspects of the protest action were affecting the AHB and TB Free representatives and their families personally and were compounding the levels of suspicion and distrust that the parties had about one another. Yet much of the protest action appeared to be aimed at higher-level decision makers in Wellington, and while successful in gaining some media exposure, did not seem to have a great deal of influence where it mattered most. Mechanisms for communication, particularly with the AHB, seemed to have been poor, and the maxim that trust, once lost, takes a very long time to restore was clearly evident. Efforts to build better relations on the part of the AHB had been greeted only with suspicion in some quarters. The only positive notes were where genuine two-way communication was reported – a satisfactory outcome from one particular community consultation, and more particularly in the relationship between the Māori rūnanga and DoC. Although they do not always agree, the regular meetings between DoC and the rūnanga seemed to have generated a measure of mutual respect and ability to negotiate over concerns. The lack of such a forum of constructive engagement for the non-Māori population, may potentially be one reason why protest action reported through the media seems to have become a principal means of gaining a hearing for those opposed to 1080. It appeared that the large organisations had not yet grasped the importance to the wider community of the way conservation land was managed.

All participants made it clear they were concerned for the wellbeing of region. More than

anything, their comments about trust seemed to indicate conflicting philosophies on how the place they cared about should be managed. Those who were in control were frustrated they were being diverted from giving their full attention to the job by the constant need to respond to opposition, suspicion and distrust. Equally, a feeling of frustration on the part of the opponents was evident about being shut out of decisions over places which they cared about but believed were being treated with disregard by the organisations in control. This issue of attachment to place is taken up in detail in the next chapter.

Chapter 6: Place invaders

Possoms, poison, politics and power

Introduction

It is not hard to imagine that the West Coast environment with its relative isolation and mountainous terrain is a key influence in the type of occupations and recreations that people undertake there. It enables activities which would be difficult or impossible elsewhere, but it also constrains those that are taken for granted in more urban environments.⁶⁹ Almost all the research participants in this study were long-term residents of the region and their connection was evident in their references to family ties, occupations and leisure activities that had been shaped by the place they lived in, and which in turn had shaped their own lives. Even those who had not been in the region as long spoke of how deeply they cared about it. This attachment to place emerged as one of the major themes from the interviews and a strong influence on the way the research participants viewed risk in relation to the 1080 debate.

Place attachment is generally agreed to be a positive emotional bond that develops between people and their environment and binds individuals to a place or community (Guiliani, 2003, Proshansky et al., 1983, Scannell and Gifford, 2010, Stedman, 2002, Vorkinn and Riese, 2001). Theories of place attachment had their origins in psychological and social research, but more recently they have also been applied in studies of environmental risk perception (Raymond et al., 2010, Scannell and Gifford, 2010, Stedman, 2002, Stedman, 2003, Vorkinn and Riese, 2001). Current views of place attachment in natural resource controversies acknowledge the debt to both the psychological and social aspects of the literature but add the physical nature of the place itself as a third important dimension. Several models of place attachment to natural environments have been proposed but all incorporate the same three basic components – place, person, and social context – as being necessary and interdependent (Cheng et al., 2003, Raymond et al., 2010, Scannell and Gifford, 2010, Stedman, 2002, Stedman, 2003).

⁶⁹ For example, outdoor pursuits of all kinds are on the doorstep, but on the other hand, cell phone coverage at the time of the study was limited to the main centres of Greymouth, Westport and Hokitika.

A number of New Zealand studies have looked at place attachment in relation to the South Island's West Coast. A study by Grubb (2005) looked at the way greenstone fossickers on the West Coast had built their identity around the nature of the terrain where they lived. Sampson & Goodrich (2005) studied the effect of place attachment on forestry workers when the logging of native forests was stopped and they were no longer able to work in the timber industry. Their identity as “Coasters” with the characteristics of being “hardworking, trustworthy, and somewhat anti-bureaucratic” (Scott 1995 cited in Sampson & Goodrich p. 2005 p. 136) was critical to the way they adapted to the cessation of logging by turning to other occupations instead of migrating elsewhere. That study also noted the crucial differences between Coasters and other rural communities in New Zealand – that unlike other rural New Zealanders who live in largely tamed agricultural landscapes, they lived and worked in landscapes over which they had limited control (p. 138).

When people care deeply and intensely about a place and see it as being part of their identity they are likely to take action to protect and defend that place if they feel it is under threat (Eisenhauer et al., 2000, Stedman, 2002). Issues of political power become relevant in these circumstances if the risk is being managed by those who are seen as uncaring outsiders (Bickerstaff et al., 2006, Cheng et al., 2003). Moreover, where the place is a rich natural environment such as the publicly owned conservation lands of the West Coast, the level of trust in the official agencies who control them is a key factor in whether outrage, conflict and protest action by the local inhabitants will ensue if they believe their place is being put at risk.

This chapter now goes on to examine issues of place attachment in the 1080 study. The first section looks at invasion of place and place protective responses – whether to possums or 1080; the second section examines place attachment and themes of loss; and the third covers the various “them and us” discourses that arose from the way the research participants defined themselves in contrast to outsiders who did not belong to the West Coast. The chapter conclusion shows how intimately risk, trust, and power are bound up with the nature of the physical environment of the West Coast, and how the strong place attachment of the research participants was manifested in a variety of different ways but which all arose from the same wish to protect the environment that

they cared about.

Invasion in paradise

Not only is the nature of the land in the West Coast region a key force that shapes the lives of the people who live there, it has also shaped the course of the debate around 1080. The vast tracts of native forest, home to birds and other wildlife which are exposed to 1080 along with the possum intruders; the remote and rugged nature of the terrain which influences the reliance by DoC and the AHB on aerial operations to distribute much of the 1080; and the bush-pasture margin areas found on most farms where possums and cattle come into contact are all factors that have contributed to the current situation. Also of importance is that the majority of land where 1080 is used is publicly owned land administered by DoC, a distinction which is not always clear and which was viewed differently by the research participants:

... a lot of people like to think that the DoC estate's their backyard
(Pest control contractor)

but when I referred to the “DoC estate” in another interview, the interviewee corrected me fairly forcefully:

Well, it's all the estate of New Zealand, managed by DoC on our behalf.
(FATE spokesperson)

Most of the research participants made comments that reflected their love and concern for the natural environment and the wellbeing of the wider region. Many of them talked about themselves as “Coasters”, or “Coast people” and what was in the best long-term interests of “the Coast”. Their comments recalled the same qualities of independence and attachment to their lifestyle and natural environment that were noted in the studies by Sampson (2005) and Grubb (2005). In the course of their interviews nearly all of them mentioned occupations and leisure activities in which the natural environment of the region had played an integral part. People with totally opposing views on 1080 used nearly identical phrasing to express how important the wellbeing of the region was to them:

I love living here. I'm passionate about this area. ... I think the place we live is absolutely incredibly beautiful. I think that I'm justified and right to fight for that and I'll continue to do so.

(KAKA spokesperson)

So you know we all need to get on the same page and I'm passionate about the Coast, because the Coast has always been regarded as the back end of the sticks.

(TB Free Committee Chair)

The Ngati Waewae spokesperson talked about the close relationship with the natural environment that had sustained him during his life, echoing the Maori world view that humans and nature are not separate entities but an integral part of one another (Roberts et al., 1995, Te Rūnanga o Ngāi Tahu, 2000):

... you could almost say we were brought up in the bush too because when I was younger we lived off the bush, lived off the bush and the river and the sea, so you know what Tāne Mahuta didn't give us, Tangaroa⁷⁰ gave us.

Nor did he feel that this identification with the natural environment was limited to Māori, referring to the documentary makers, the Graf Brothers,⁷¹ as:

...just like us, being brought up in the bush.

Others who did not make such direct statements clearly indicated how intimately they knew the natural environment and how important it was in their lives:

You name any valley on the West Coast from Whataroa to way up the Grey Valley right to the Southern Alps. We've flown every single bit of that in the last month...

(Hunter)

All research participants had a sense that there was a threat to the place where they lived.

⁷⁰ Tane Mahuta – god of the forest; Tangaroa – god of the sea.

⁷¹ The documentary film by the Graf Brothers *Poisoning Paradise* deals with 1080 and its effect on the environment and wildlife.

Our responsibility is the protection of the land. Because once we give up on that we might as well pack up and go home.

(Makaawhio spokesperson)

Themes of invasion, destruction, and pollution of the environment occurred frequently in the interviews for this study. However, not everyone had the same view about what constituted the threat. Cheng et al (2003) have written about the multiple layers of meaning that are contained in every physical setting and have noted that various groups will use their own meaning of place to vie for dominance in natural resource disputes. This became apparent in the comments made by the research participants. For some the threat was 1080; for others it was possums and, to a certain extent, the subsidiary threat that the only method of pest control (1080) which they believed to be effective might be lost.

The concept of possums as invaders is not a new one – possums as destroyers and devourers of forest, birds, gardens, roses, and fruit trees were mentioned by the research participants, and there are many similar examples to be found in public information from DoC and the AHB (DoC, undated-c). Those who saw possums as the primary risk to place depicted possums as cunning guerilla enemies that would never be defeated but could only be held at bay or “controlled” with the use of 1080.

... if we stopped [using 1080] today – we're 2010 – by 2012 we wouldn't cope. And maybe even less. The possums are unbelievable creatures. They manage to reproduce and survive really, really difficult circumstances. ... they're very versatile, very cunning creatures, and it won't take long before, if we stop this operation that populations will grow to a point where the ground control guys who are working purely on the accessible areas won't manage.

(AHB Manager)

The TB Free Committee Chair talked about possum invasion from the point of view of the farming families who had lost income and been driven to despair over bovine TB:

We've got farmers on the Coast here that have lost well over \$300,000 worth of stock over the years and it's horrifying ... I mean, we always say, anybody's just one test away from an

infection until we get rid of it comfortably away from around our particular region.

(TB Free Committee Chair)

But to others, the invader was 1080, not the possums and their opposition could likewise be seen to spring from place protective behaviour. They also used the language of invasion and warfare in talking about the risk to their place. Several used exactly the same “bombing” metaphor in relation to aerial 1080 operations:

... they've got to wait three years before they can bomb it again... which allows the bird life – if it's going to recover – just to get to the point of recovering, and they'll do it again.

(KEA spokesperson)

One thing that appeared to have heightened place-protective behaviour was that 1080 operations had recently been carried out closer to the more populated areas than in the past. Both supporters and opponents of 1080 mentioned that this increased proximity to people's living space had raised awareness and concern about what was going on:

The controls are at the town's back doors, so it's a visible action that's happening that suddenly has made people aware. And it's like “What are they doing? Why are they doing it? Why there? We need to know this because it's in our back yard.” ... It's a visual actuality that's happened that's created the impact we've got now with the 1080 groups... Because, as I say, in the past it was back over, you would never have seen the choppers or if it was, it was so far away you weren't worried about it.

(TB Free Committee Chair)

As well as invasion, images of the contamination and pollution associated with invasion were also used by both supporters and opponents of 1080. The threat of community-wide pollution is important in social theories of risk and one that Douglas (1992) has noted can be a useful means of persuading community members to assign blame to those who do not agree with them. “Who can resist using it who cares for the survival of the community?” she writes (p. 6). Both supporters and opponents of 1080 used similar images of purity and contamination to describe their views of invasion. The same images of pristine, clean, green bush and water and the threat of its destruction was used to express the threat of both possums and of 1080:

... we've got clean, pristine air and green, lush bush. If we lose the use of 1080 we will start to see the decline in the clean, lovely, green, lush bush because the possums eat a phenomenal amount of vegetation per night. It's huge the amount of vegetation they consume. Going through the Coast you can actually see demarcation lines where the controls go to.

(TB Free Committee Chair) .

... I felt fraudulent and irresponsible for promoting my business to the international market – 'come and see the beautiful place we live in, come and see the pure pristine environment that we've got' – and then when they arrive here, that's not the case.

(KAKA spokesperson)

This participant and several others backed up their comments by showing me photographs of the kinds of things they felt were polluting their environment – signs with “deadly poison” warnings in native bush at the start of a famous walking track, carrot baits lying among the driftwood and sand on a beach, and cereal baits lying in water.

As noted in Chapter Four, the issue of pollution had multiple layers, and while on the surface it may have been about risk to human health, at a deeper level it seemed to be more about an alien, toxic substance invading a natural place to which the opponents were deeply attached. The Health Protection Officer, who had already emphasised that he had investigated the science around 1080 and did not believe 1080 was a risk if used correctly, appeared to be somewhat uneasy about it at a more personal level:

... if you look at it dispassionately I suppose, it's not a nice idea to be throwing poisons all over the countryside.

This was an interesting, and perhaps unconscious, reversal of the usual notion of science as dispassionate and values as emotional, but seemed to capture the feeling that the issue lay beyond the realm of objective quantification of degree of risk. As Douglas (1992) has noted in relation to similar cases, although risk assessment experts view their work as being objective, the issues are, in fact, moral and political ones, which “risk language obfuscates” (p. 39).

Strongly associated with the comments on invasion and pollution were themes of loss to their place. Those who supported 1080 referred only to past losses (which 1080 was seen to have mitigated) and potential future losses that might happen if possums were allowed to proliferate as they had in the past. In contrast, those who opposed 1080 talked about the losses they were experiencing in the present because of the 1080 operations, in relation to their occupation, their leisure activities, their way of life, and, they believed, the wider good of the region.

1080 and loss

Loss of environmental access and quality

One of the most frequently mentioned and apparently unpopular was the loss of access to large areas of public land for many months during and after a 1080 operation. The areas are not physically closed but are unavailable for hunting or gathering wild foods and natural medicines from the bush while the poisonous baits and animal carcasses break down. Everyone accepted that closing off public land was done in the name of safety and no one disputed the fact that wild foods and medicines could be contaminated:

... I wouldn't go anywhere near deer, for example, that had come off any area that had been 1080'd.

(Makaawhio spokesperson)

However, as many people did not consider the 1080 drops necessary in the first place – or necessary to the same extent – they were seen as displacing traditional activities that were part of a way of life. Several spoke of the annoyance and even hardship that was caused by the restriction of leisure activities, and loss of opportunity to add variety to their diet if they could not hunt or gather wild food for months at a time. Some felt that the losses were permanent, if the environment was still felt to be polluted even after it had been officially cleared:

Every New Zealander has the right and certainly all the local people have access to all this wild land for their recreation, for their food supply in some cases, and in more cases for their Māori

medicine – and that’s becoming quite hard for people to find. It’s not that it’s not there, it’s just that they can’t use that except from an area that feels right – spiritually right ... I have a grandchild that has very bad eczema and a woman from Blenheim who is related to Coast people makes up cream for him which helps. And she can’t get it from here any more.

(FATE spokesperson)

Just as much of a loss, said several interviewees, was that even when the areas were declared safe again, the wildlife, particularly the birds and deer, were reduced to such low numbers.

The loss of the opportunity to hunt deer because of 1080 poisoning is a particularly contentious subject. Deer are not native, and were formerly considered the greatest threat to the native forest, so DoC makes no apologies for killing deer along with possums, although they no longer deliberately target them. However, many people in the West Coast enjoy deer hunting – almost all the participants in this study no matter what their views on 1080 had hunted deer at some time – and now that they have been reduced to numbers which do not present a serious environmental threat, many people feel there should be room for some deer so that recreational hunting can still be enjoyed and additional benefits to tourism derived (NZGAC, 2009). Deer hunters were longstanding opponents of 1080 well before the wider opposition that there is today. There was a feeling among several of the participants that the main opposition was still coming from hunters and that they used concerns about other risks to disguise their real concern:

They [the hunters] know that dead deer is acceptable you know, so they hide behind these other agendas to push that whole anti-1080 because at the end if 1080 gets stopped they get what they want.

(Pest control contractor)

Unsurprisingly, the hunter did mention the number of deer that were being killed, but his chief concern was the loss of a way of life for people of the region:

Well, it is partly [a concern for my living]. It’s more of a concern that what I think is one of the best New Zealand heritage really is deer hunting in New Zealand can be destroyed. Not so

much from the helicopter hunting which needs to have decent kind of restraints on it anyway because it is too effective. Ground shooters, who I've got a bit of sympathy for, are not getting a fair deal of hunting in, but at the moment the helicopters are one thing but the most insidious evil is these big drops with 1080.

Deer were mentioned very little among the other participants in the study, though several people remarked on the inhumane death that 1080 caused in deer.

Another highly publicised loss due to 1080 is that of dog deaths, most often through secondary poisoning from eating carcasses of possums or other animals that have been killed by 1080. Dog deaths have featured prominently in media stories about distraught owners losing family pets (Anonymous, 2008d) and one participant mentioned the death of a relative's dog as the incident that had initially alerted him to risks from 1080. However, it was interesting to note that concern over risk to dogs featured more prominently among supporters of 1080 than among opponents. The pest control contractor, it was clear, found dog deaths particularly distressing. He said he could remember every one that had happened "on his patch" and that in each case people had chosen to ignore the warning signs or thought that it would not matter. It could be that dog deaths were a particularly sensitive issue to the 1080 user groups because they had generated such adverse publicity. Unlike dead deer or birds, for which justifications could be made on various grounds, the poisoning of dogs – and it was usually a family pet – could only be seen in a negative light.

The skull and crossbones signage with its "deadly poison" message (Figure 4) seemed to be another outward sign of the inner loss that people were feeling. Almost everyone in the study commented at some point about the signs. Their views were diverse, and could be interpreted on several levels. At the most obvious level, as several participants pointed out, the signs were mandated for safety reasons:

... the skull and crossbones probably hits people, and that's the whole point of it – it's meant to.

(Health Protection Officer)



Figure 4: Official 1080 warning sign

On another level, the signs were widely believed to be a risk to tourism. The damage that they potentially caused to perceptions about New Zealand and the promotion of the West Coast as tourist destination was raised frequently and consistently by some of those opposed to 1080:

And you see even in the issue of signage – you [the AHB and DoC] plaster these signs all around our landscape with the skull and crossbones on them – and here our second biggest economic driver is tourism. And so I said you have to respect that we need to balance what is going on here.

(Mayor of Westland – original emphasis)

The whole issue of the signs appeared to be mired in conflicting information, with one participant suggesting that tourists would not be likely to see the signs but another stating that particular care was taken to ensure they did:

... most of them [tourists] don't stop and go into the bush in those areas. They only go in at the tourist spots and those areas are actually exempt anyhow.

(Health Protection Officer)

... we take a lot of care around state highways where they pass through places that we treat because, you know, state highways, full of byways and off-road parks where people want to go for a walk in the bush; signage is a big thing for us to make sure that good, clear signage is put

out for the public to understand.

(DoC Advisor)

This may have been a case of a misinterpretation on my part of exactly what was meant by “exempt”, but as many tourists go to the West Coast precisely to visit the national parks and famous walking tracks, it seems unlikely that they would all be off limits for 1080. Whatever the finer points of the case, the citizen groups themselves have put up large signs against 1080 (see Figure 1, Chapter 4), clearly aimed at attracting the attention of anyone in the area, including tourists and the media. As has already been noted, the protest signage was considered by some participants to be equally likely to create a detrimental effect on tourism.

Supporters of 1080 did concede that the standard signage might have a somewhat negative effect on tourism, but they viewed it as necessary all the same. However, some disliked the inflexible regulations about signage which did not allow for local knowledge and variations in conditions to be taken into account. They considered the signs often had to be kept in place long after the risk was gone and were subject to overly-cautious official standards:

I put maps on all my signs.⁷² I'm not allowed to now. DoC don't like it. It upsets their standard format. So I've got to design a sign that meets their format but yet I still want a map there to get my message across that this is the area where the 1080 is. You know, I mean, that's key to minimising the risks... We are in my view expected to put up too many signs. But there's a short stretch of road. They want me to put twenty signs on it. Six signs would do the same job but twenty signs just reinforces the message that you're damaging tourism, and there's signs and there's 1080 everywhere.

(Pest control contractor)

Feelings about signage appeared to be complex. While tourism was most often voiced as the primary concern, the signs also seemed to reflect feelings about the invasion of place and served as a focus for irritation and dislike of the 1080 programme for the reasons given, as well as reflecting an underlying irritation of everyone in the region with a “one

⁷² This was to clarify the exact area where the poison was and was in response to a request from a member of the public after a dog death.

size fits all” inflexible attitude of officialdom, which was common to a wider group of people on both sides of the debate.

Loss of economic opportunities

The risks of potential losses to dairying and tourism, two of the main economic drivers for the West Coast economy, have already been discussed in Chapter Four. There was also a belief the 1080 programme was causing losses to small local initiatives that had existed, as well as stifling new initiatives:

It's been [possum meat] a good pet food to go to Japan but now if the pet food supplier cannot state that this area is 1080 free he's not able to send possums to Japan for pet food. ... They have to be very sure where they get them from. ... 1080 has actually killed a lot of the initiative and the interaction in the bush that people have had in the past.

(FATE spokesperson)

There was a feeling that the money going into poisoning possums was literally going to a “dead end”:

... if they had poured the same amount of money into controlling and harvesting the possum fur that they have put in trying to poison possums, you know, things may be a lot different.

(Mayor of Westland)

I would convert the old dairy factory ... it's a food grade processing facility. It's just sitting there, doing nothing for fifteen years. That should be turned into a facility for processing skin, fur, and meat of possums and value-adding the products and then selling them overseas which would be a tremendous boon for this community.

(KAKA spokesperson – original emphasis)

A further loss was seen in the contracting out of 1080 operations to companies outside the region, which was presented not only as a lost opportunity for the local population, but also as an invasion of place:

We had a large area around where we live poisoned by a Taupo-based helicopter company who came in here and, you know, poisoned everything and left. Nothing in it for our community

whatsoever.

(KAKA spokesperson – original emphasis)

Another missed opportunity raised by some interviewees was the potential to get multiple benefits for the region by extending the ground laying of 1080. If combined with more trapping and shooting, this was seen as a viable means of doing away with aerial 1080, minimising the environmental impact, controlling possums adequately, and providing extra employment that would help keep young people in the district instead of them having to leave to get work elsewhere:

I saw it as an opportunity to improve the unemployment figures that were around at the time [when this speaker had first raised the issue], and I still think that it's a viable option. ... It is very naïve to think that there is nobody who would be prepared to do that because I know from personal experience that there certainly are.

(Mayor of Westland)

This view was not uniformly held, however. The DoC and AHB participants believed that it would not meet quality control requirements:

We did contract out several places for ground control, and invariably they would do bits of it reasonably, bits of it very poorly, and overall it wasn't the result we were looking for. It was far more expensive than doing it by air and we weren't getting the results that were required to sustain in places.

(DoC Advisor)

Even some of those most opposed to 1080 believed that there were simply not enough people who would be willing or capable enough to do the job:

I hear the argument run ... get all these young fellows that are unemployed and put them in the bush. ... find half a dozen unemployed people and grab them by the scruff of the collar and say, 'You're going down to the Gorge River,' and they'll say 'Where?' Say, 'well we've got a big infestation of possums down there, mate. You're going down'. It's just not practical, actually.

(Makaawhio spokesperson)

Moreover, it was noted, if ground laying were to be further extended it could also cause feelings of loss from the invasion of place:

We can't do as good a job, it's plain and simple. ... And the cost of trying to achieve it is absolutely phenomenal. And if you look at the what ifs. You go from having an untracked forest to one with plastic all the way through it, you know, plastic markers, plastic bait stations, cut tracks.

(Pest control contractor)

The issue of inaccessible country came up several times in relation to reducing or discontinuing aerial operations. Almost everyone agreed that there were some parts of the region that could not be managed by people on foot, but many felt that because aerial 1080 was so much cheaper and quicker than ground control, that the argument about inaccessibility was overused. Others questioned why there was even a need to do the inaccessible areas where there were no cattle, when the problem area was the bush-pasture margin where the possums and cattle came into contact.

Loss of feeling secure at home and in the local community

Another loss that was evident was the tension and insecurity some people felt in their local environment and even in their own homes because of protest activities directed against them in their professional roles. Most obviously affected were the representatives of the official organisations or those aligned with them, but some others also reported that they had experienced harassment in the past. The kind of discomfort experienced ranged from being challenged to justify their views at social occasions, to outright personal harassment which spilled over into their personal lives and affected their families. Most of them tended to downplay this, focusing on the impact on others rather than themselves:

It's very unpleasant and it must be very unpleasant for some of the staff here ... and that puts pressure on marriages – extremely. It puts pressures on the children within the family as well. It's a game to them [the people doing the harassment] – stalking people, and sitting up people's driveways and following people's wives to work or school or to shop with the kids. They think it's funny because they can see it's unsettling that person. (TB Free Committee Chair)

It was evident that this kind of threatening behaviour had disrupted the nature of home for those who were targeted as something familiar, known, and predictable, "... a safe extension of self that is both stable and under the resident's control" (Brown and Perkins, 1992, p. 285). Disruption to home attachment has generally been the province of psychological and social research rather than investigations of environmental place attachment. However, it was clearly relevant to the situation here because of the way people's home and family life had become embroiled in to what was fundamentally an ideological dispute over an environmental issue rather than a personal one. This type of intimidating activity was believed to be the work of a few isolated individuals rather than any of the citizen groups:

I did not want those anti-1080 groups, the formed groups, to be incriminated in that conduct because they were fully removing themselves from that. ... no, they're certainly not involved – and they certainly said last year that they don't want to do or be involved with anything that's illegal and I certainly believe them wholeheartedly with that because I know some of them well and they're not the sort of people to go that way.

(TB Free Committee Chair)

However, it seemed likely that those not as familiar with the issues might not make this distinction, and it was probably not helpful for the citizen protest groups to have these actions carried out in the name of the same cause they were advocating. In fact it seemed more likely to have created sympathy for those who had to endure it. People on both sides of the debate mentioned their horror, for example, at a dog poisoning that was widely believed to be deliberate.⁷³ As Tesh has pointed out (2000, p.111), it is not unusual for citizen groups to be embarrassed by the actions of some who are linked to their cause.

Them and us – insiders and outsiders

The discourse of invasion and loss that was brought up by participants from both sides of the debate, also gave rise to many "them and us" comments. These not only reflected the competing meanings of place, "deeply held and vigorously defended" (Cheng et al.,

⁷³ This incident was investigated by the police who concluded it was accidental. However, most people who mentioned it believed differently.

2003, p.98), but also strongly recalled the theories of Douglas (1992) and Lupton (1999) on the way risk perception very often results in constructions of “insiders” and “outsiders”, with the outsiders or “other” being viewed as a contaminating threat. As Cheng has pointed out (2003), those involved in natural resource controversies are not only grappling with the utility of the biophysical attributes of the place, but are engaged in defending the social and cultural meaning that the place has for them. In this study, some of these meanings of place related to local divisions of opinion. Just as often, however, they reflected attitudes to the remote policy makers and managers who were seen as knowing little and caring less about the local populations whom their decisions affected. Other research has found the same kind of intense concern in relation to public lands about which local inhabitants have strong feelings of attachment and identity, particularly when the lands are under the control of distant urban authorities who are not trusted (Eisenhauer et al., 2000).

The interviewees who were involved with administering and operating the 1080 programme for DoC and the AHB in the region tended to restrict their “them and us” comments to local issues. Fairly frequently they referred to the opponents of 1080 using terms like “these people”, “these groups” or “the antis”. However the comments were relatively restrained, and some of “them” at least were accepted as having real, if misguided, fears:

I must admit that a lot of the antis are genuine people. They've got, you know, genuine concerns. Because one of the problems with 1080 I suppose generally, is you've got the antis, and you've got those that are for it, and in those two groups you've got extremes and you've got this whole big group in the middle. ... And I think the most unfortunate thing about the whole game in my time is that for some reason suddenly the public are starting to take the side of the antis... and the people like myself and those that are saying, look there isn't a risk, are being ignored ... It's very hard.

(Health Protection Officer)

The attitude tended to be one of exasperation rather than anger, recalling the comments that several of the interviewees had made about people who “did not want” to see things their way:

A lot of people in the community need actually to stand up and take a good look at themselves and ask themselves why do I really oppose 1080 and be truthful to themselves and ask, 'is that position justified?'

(Pest control contractor)

The opponents of 1080 did not present this same “them and us” attitude to the current local representatives of DoC and the AHB, at least in any comments made in the interviews. The local staff appeared to be generally well liked:

The staff on the ground are critical in this. [X] has taken over as the TB Free Manager on the Coast and he has turned around the attitude of TB Free, the perception of TB Free on the Coast.

(Mayor of Westland)

As for the staff who actually did the field work, several interviewees commented that they needed the job, generally made good money, and probably did not support the 1080 programme, especially the aerial drops, but had to keep their mouths shut if they wanted to keep their jobs. Nobody seemed to bear them any ill will.

By far the majority of the “them and us” comments, however, came from those opposed to 1080 and were directed at the people in positions of power in the Wellington offices of DoC and the AHB and at their advisors and scientists rather than anyone locally. Lack of care about the wellbeing of the region and its residents was the subject of one particularly forceful comment:

There seems to me to be an incredible double standard ... We have a lot of poison spread around... on our doorstep. Now if this was to happen, in Christchurch say, or Auckland, it would be an absolute outrage ... why do we accept this on our doorstep, when people in Wellington and Christchurch will not. How can that possibly be a reasonable standard of treatment for people living in rural areas.

(KAKA spokesperson – original emphasis)

This feeling of being brushed aside because of their small voter numbers recalled the contrasting town and country “place rhetorics” in the study reported by Bickerstaff et al

(2006, p.844) where the local population saw themselves as culturally marginalised from the urban mainstream decision makers, and politically peripheral and without influence.

Contracting out the work to private companies, as was done by the Animal Health Board, was seen as another way that enabled the decision makers further afield to retain control but avoid any adverse feedback:

Who would know about the agendas of the people that make these decisions because they're always the guy in the shadows. They've got their minions out there looking bright eyed and bushy tailed talking up your rata and all this kind of thing. It's really the guys behind the scenes. Sounds like a conspiracy theory, but they are the ones that are calling the shots.

(Hunter).

“Them and us” discourses also centred on the ignorance of local conditions demonstrated by urban authorities who neither knew nor cared for the area they were controlling and yet were making decisions that affected people’s lives and identities:

You go back thirty years, the top guys had all been in the bush. Now they haven't. They can quote all the scientific names but they don't know one gully from the next.

(Hunter)

This ignorance of local conditions extended to scientists as well:

I've got another document there where some guy says – he's a scientist from Lincoln – you don't have to worry about 1080 pellets on the ground ... and in the waterways because you have to have very, very heavy rain and luckily in New Zealand we don't get that. He wants to come and live here. You know I've seen that lawn out there get six inches of water in three bloody minutes. And yet he's made a scientific study saying don't worry about that because it's not going to happen.

(KEA spokesperson – original emphasis)

One of the things that rankled the most deeply was the failure of the authorities to use local knowledge even when it was offered to them:

... When I rang the office in Greymouth and said this woman had lost her dog they said, 'Pellets have only been scattered around the islands in the river'. And I said, 'Well the area called The Islands is a recreational area and is only a group of islands when the river's in flood'. ... In spite of they're given local knowledge repeatedly. Lack of identifying where people's water is; lack of identifying where the correct draw off point for the town water supply etc. So very poor knowledge. It's never, ever, kept from drop to drop and it should be checked up on for sure, but it's never, ever located correctly.

(FATE spokesperson)

This recalls a similar complaint of a participant in the study by Bickerstaff et al (2006) that “somebody in London looked at a map” (p. 851) and based decisions on what they thought was there rather than consulting anyone with knowledge of the area.⁷⁴

Moreover, there was a feeling that this was more than just bureaucratic incompetence and oversight, but was part of a deliberate policy to exclude knowledgeable local people and bring in others who would not question what they were told:

... they're bringing up young woodsmen, young hunters, young ranger trainees underneath them and they are starting to train them to realign their friggin' thought and a guy with twenty or thirty years' experience... these young guys will look up to them, believe what they're saying and not necessarily think for themselves... An element of DoC they seem to be getting in a heap of foreigners – Germans, Canadians, whatever ...

(Hunter)

There was also a perception that some decisions had an element of malice:

This time I hope it [a planned aerial 1080 drop] doesn't go ahead at all. It's a colossal waste of money – it's an insult to the people down here and one wonders whether it's because we're getting so noisy about it that we are going to get it anyway.

(FATE spokesperson)

This feeling of being “other” and different from the main body of the population,

⁷⁴ The study of West Country farmers in the UK who had their animals slaughtered during the foot and mouth outbreak in 2001 reported several comments that were almost identical to those made by participants interviewed about 1080.

however, was also a positive way of contrasting themselves with those from elsewhere, confirming their identity, reinforcing their attachment to their own place and their longstanding knowledge about it. This feeling was common to both supporters and opponents of 1080. It is worth recalling the comment by the TB Free Committee Chair quoted earlier in this chapter:

I'm passionate about the Coast, because the Coast has always been regarded as the back end of the sticks. (my emphasis)

This seemed to imply that it was the very fact that others regarded the area poorly that reinforced her passion for it. Similarly, in the study of the forestry workers in Harihari⁷⁵ for example, the authors commented that the local population shared "... the rhetoric of being excluded from decision making and control over their own resources" by people who neither understood nor cared about the Coast. The anger and resentment about this outside control served to "... construct and reinforce both notions of identity and the distinctness of place..." (Sampson and Goodrich, 2005, p.911).

Some comments suggested that the local staff were not well supported by their national organisations. One example mentioned was the apparent lack of support shown by the AHB for their local staff over an objection that TB Free had raised with the Westland District Council on behalf of MAF⁷⁶ about the wording of the LTCCP:⁷⁷

And I said, well what is your suggested change in wording? And they had come totally unprepared for that. About a week or ten days later I got an email saying we'd like to change it to this – but of course we'd adopted the plan by then. ... I felt that the Animal Health Board had not supported their on-the-ground staff very well at all. The Animal Health Board themselves should have been prepared and should have lobbied us, should've at least have helped him with some wording if that's all that was needed.

(Mayor of Westland)

The local staff of DoC, the AHB, and TB Free did not make any direct criticisms about

⁷⁵ Harihari: a small township in the West Coast region.

⁷⁶ MAF: the Ministry of Agriculture and Forestry awards the funding to the AHB.

⁷⁷ LTCCP: Long Term Community Council Plan. The Local Government Act 2002 requires all councils to produce a plan for their district every three years.

their organisations. But there was a suggestion of under-resourcing, frustrating delays and decisions taken elsewhere that affected their ability to manage the programme as efficiently as they would have liked:

We don't know whether we've got the full funding. ... we're very hemlocked[sic] at the moment ... towards the end of last year he [the Minister] came out and confirmed that the funding would stay the same, but we don't know whether there's any criteria to that ... or stipulation that this funding is going to have to go here, and this here, and this is what you're left with for controls. So until we know what we've got left in the programme for controls we don't know what we can do and what we can fund where and so forth.

(TB Free Committee Chair)

Other comments were made by several interviewees about the long delays in the registration process for new methods of pest control, the time lag between farming conditions changing and the stock movement regulations catching up with them, and the thinly-stretched compliance officers who had to cover the entire South Island. However, while these were clearly important issues and appeared to indicate an extra source of frustration and lack of understanding on the part of urban authorities, they did not seem to be specific to the West Coast region.

“Them and us” views on local and national politics

Participants also raised “them and us” ideas in relation to using democratic political processes to resolve or improve the 1080 situation. Several interviewees viewed local body politics as having the potential to gain a greater measure of control over how 1080 was used. Not long before the interviews took place the Westland District Council had passed a resolution asserting their right to negotiate about the use of 1080 in their district:

... we had to find some middle ground between the farming sector and the community groups that are concerned about the use of 1080. Our only influence in a resource consent for the discharge of 1080 is in relation to public water supplies ... our resolution is ridgeline to ridgeline in recognised water supply catchment areas. So even though we are consulted about the use of 1080 in the water catchments we can't ban it completely but this was the first time that a

council had actually stepped up in New Zealand and actually put some barriers around the use of 1080 in water supplies. And so from that we saw it as a catalyst for change in other areas.
(Mayor of Westland)

The resolution had encouraged at least one other Council to pass a similar resolution (Wall, 2010), and the Mayor reported that there had been interest in the same approach from other Councils as well.

Some supporters of 1080 believed that those who were opposed should take up their issues through the national political process:

If you really have a problem with 1080 you should contact your MP. It's a legal process. The strategy review is with the Minister of Agriculture right now, because the current one expires in 2013. These are all opportunities for you to get involved and have your say. So do it. But don't attack me. I'm just doing a job.
(Pest control contractor)

Though it was never directly stated by any of the interviewees, protest action such as the “Stop the Drop” billboards, also seemed to indicate the end goal was to influence policy on pest control by generating pressure from voters on a wider scale than just the West Coast.

Most people, however, seemed to doubt that they could achieve much within the national parliamentary process or that public opinion could be turned against 1080 to the extent where it might create an election issue:

... really these protesters keep going round and round and round I'm afraid to say they just burn out energy for themselves... They might have made a loud noise for themselves, put themselves on TV and that... And they try to pull the general public along with them... so then are you telling me that the general public will change the government when it comes to the next [election]?
(Ngāti Waewae Spokesperson)

The present and immediate past Members of Parliament, though they had represented

different political parties, were spoken of as being well liked and genuinely concerned for the good of the region. However, just as in the British study of West Country farmers (Bickerstaff et al., p.854), where the parliamentary process was considered to work against the rural areas with their low voter numbers and fewer MPs, the participants in this study did not have much faith that their lone electorate Member of Parliament could achieve much in Wellington:

I've had some good dealings with him [the current MP] , but I've found of late what is happening is exactly what I said would happen. Once he starts questioning in one direction or the other you'll find out that government is controlling it and he will have no say in it. And he's just backed right off – he was good when he started – put his hand up, no trouble but ... I don't know whether we'll get anything out of him or not.

(KEA spokesperson)

Moreover, the concerns that the West Coast could simply be given up as not worth bothering about, shut out of the dairy industry and isolated from the rest of the country,⁷⁸ was a further indication of the feeling that the region was politically peripheral and its fate was of little interest to the rest of the country.

Conclusion

To conclude this chapter it is useful to return to Cheng's comment that place is an "integrating concept" in natural resource politics (2003, p.87). The data gathered from this study certainly support this view. The issues surrounding 1080 use are intimately bound up with the nature of the West Coast itself, the large expanses of mountainous and forested terrain, the extent of the public land managed by DoC, the sparse population, and the economic base of farming and tourism which has much to gain or lose (depending on the viewpoint) from the use of 1080. Similarly, the participants' individual identities and their viewpoints could be seen to have been shaped by the possibilities and limitations of the environment, in how they lived, worked and found their recreational activities. Political and economic control – or the lack of it – was also clearly seen to be linked to the nature of the West Coast. The physical environment,

⁷⁸ See Chapter Four.

even while it may be rich in some resources and used as a showcase for tourism, has no large population centres, and therefore little voter or consumer power. Without exception, the interviewees were strongly attached, even passionate about their region, and most⁷⁹ were acutely aware that they had little influence over decisions taken by more powerful policy makers and politicians elsewhere. While this awareness of being marginalised from the mainstream was a source of resentment, it also appeared to reinforce local identity and strengthen everyone's determination to do their best for the good of the region.

Apart from the recognition by DoC that Māori are deeply involved with the land and must be consulted over the way it is managed, place attachment does not appear to have been previously considered or discussed in conjunction with 1080 use. Non-Māori too exhibited a strong attachment to the natural environment and this appeared to be a major factor driving the intense contentiousness of the dispute, at least as much as the issues of risk that form the greater part of public discourse. The similarities between the supporters and opponents of 1080 on a local level were in some ways stronger than their differences. Many of their comments about one another amounted, in effect, to accusations that those who disagreed with them were jeopardising the wellbeing and overall viability of the region. The extent of their own ability to influence how this place they cared about should be managed appeared to be a critical factor in whether they agreed with the current regime, believed they could negotiate within the system, or had lost faith in it entirely and instead turned to protest against it.

⁷⁹ A possible exception was the DoC Advisor. While he talked about the small budget DoC had in comparison to the AHB, the West Coast Conservancy appears to have significant influence within its national organisation through the sheer size of the public lands it manages.

Chapter 7: Conclusions and recommendations

Introduction

The purpose of this study was to understand how people perceived risk relating to the use of 1080 for pest control in the West Coast region and how they explained the reasons for their views. Very early in the data-gathering process, it became clear that risk perception was complex, made up of a multi-layered combination of interdependent factors. All the participants in the study believed that there were risks of some kind – whether from possums or from 1080 – but advanced markedly divergent reasons for their views. These reasons were grounded in the participants' individual experiences, how they interacted with the place where they lived, and the impact that the use of 1080 had had on them personally. All of them, not just the opponents of 1080, put forward nuanced and complex arguments which went far deeper and wider than those that been part of the public discourse around the topic.

One of the key strengths of qualitative research is that it can develop a new understanding about a topic that has not been previously available, including to the participants themselves (Green and Thorogood, 2009, p. 29). Fascinating as each person's comments were individually, it is the analysis of them as a whole that allows the greatest insight into the 1080 controversy on the West Coast. This chapter starts by looking at the overall conclusions about risk perception that can be made as a result of this study. Next, it examines how trust and place attachment mediated risk perception and how these concepts reinforced and fed back on one another in a way that resulted in the various individual stances on 1080. Following this, suggestions are made about how the findings from this study might apply to other contemporary issues which have many of the same characteristics as the controversy over 1080. The final section presents some observations and recommendations that suggest how future relationships between pest control organisations and local communities could be improved, and notes the wider philosophical questions that have been raised by this study and which remain to be explored.

The many constructions of risk

As outlined in the theoretical background to this study, ideas of risk are prominent, even an obsession, in contemporary society (Beck, 1992, Beck, 2000, Beck et al., 1994, Lupton, 1999). The public discourse around 1080 is set in this wider climate where the importance of risk is taken for granted and the debate revolves around the magnitude and likelihood of risks of various kinds, whether from possums or from 1080. This study confirmed that this general focus on risk was also prominent among the participants. None of them queried what was meant by “risk”, why it was the subject of the study, or asked from what perspective it would be investigated. However, the analysis of their comments showed that they understood and interpreted risk in widely different ways. Their individual views ranged from total support of 1080 through to total opposition, with many views in between. Some approved of 1080 in certain circumstances but not others, and each person had a differently constructed view of what the risks were and why. The first important conclusion from this study, therefore, was how much more nuanced and individualised the participants' views about risk were than the pro- and anti-1080 blocs of opinion that have been generally presumed to exist.

A further finding from the study was that all the participants, including those who asserted that their support for 1080 was derived from scientific evidence, drew on a mix of both quantitative information and subjective, contextual experience. Nearly all of them referred to science and scientific methodology to support their arguments, using the positivist framework that has become well established in the discourse of risk assessment (Stirling, 2003). This was not surprising, given that quantitative risk assessment has been the arena in which the debate has thus far taken place. As Lupton (1999) notes, people draw into their subjective responses “pre-established knowledge” developed through their experience of the way regulatory agencies deal with risk (p. 109). However, their comments also revealed that the individual constructions of risk they put forward were influenced much less by scientific reasoning about magnitude and likelihood, than by a rich context of meaningful events and experiences unique to each individual. This suggested that while quantitative evidence had been drawn into the mix along the way, individual perceptions of risk had been constructed from multiple angles, and mediated by the wide range of life experiences and personal values that each individual brought to the issue. As is now well supported in the literature, the dichotomy that is often assumed to exist between expert scientific evidence and non-expert values is

an oversimplification. The research participants in this study amply demonstrated within the context of the 1080 debate that scientific information too draws from politically and socially constructed values (Madsen and Sandoe, 2005), and citizen activists are often not only well versed in science, but in addition often bring a broader outlook to the problems than those who are considered experts (Tesh, 2000, Madsen and Sandoe, 2005, p.321).

It could be argued that the positivist framework that has dominated the debate on 1080 to date had served both the supporters and opponents of 1080 well. The concerns raised by opponents on the West Coast and elsewhere have generated a significant amount of research that otherwise might not have taken place, adding to knowledge and prompting improvements such as better methods of manufacturing and applying the 1080 baits. These studies have been an important means of demonstrating that concerns have been taken seriously by the official organisations and some of the advances they have brought are acknowledged, even by those most opposed to 1080. The opponents of 1080 did not lack understanding of the scientific studies or need further explanations of their findings. Rather there were fundamental principles underlying the policy on 1080 use which they disagreed with. This study reached the same conclusion as that of Stirling (2003), namely that positivist science, while it may be necessary, is not sufficient to resolve the breadth, depth, and diversity of the many perspectives and frameworks from which people view controversial issues of this nature.

Risk perception mediated by trust and place attachment

Among the contextual factors that mediated perceptions of risk about 1080, two were the most prominent. The first of these was attachment to place. Common to all participants was their direct engagement and passion for their environment and their desire that “the Coast” should flourish. But their competing views about how this should be achieved – at least in relation to 1080 and possums – had resulted in an ongoing exchange of claims and counter claims between the two sides of the debate, with each one arguing that their views on management of the region would see the region protected, and blaming those with the opposite views for jeopardising its future. The moral high ground which most of the participants assumed in this respect aligned closely with Douglas’s writing on risk and blame, in which she shows how people readily turn their care about their community and their fears of what might happen to it into “a

weapon for mutual coercion” (Douglas, 1992, p.6).

Inextricably bound up with this feeling of threat to place was the second prominent factor – distrust – something which has been consistently identified as a key driver of risk perception (Cook and Gronke, 2005, Earle, 2004, Frewer et al., 1996, Peters et al., 1997, Poortinga and Pidgeon, 2003). All participants tended to believe that anyone whose stance on 1080 differed from their own had sinister motives and was advancing their interests to the detriment of the environment and people of the region. As has been seen elsewhere (Sandman et al., 1993, Slovic, 1987), one of the key reasons for distrust seemed to be associated with lack of control over how things were done. Those who had even a modicum of input into the governance of the region showed more faith in the official agencies than others who felt themselves to be completely excluded. This study also confirmed other research findings that trust, once lost, is hard to restore (Slovic, 1997). Some events that were described as being the trigger for opposing 1080 had been a long time ago, but had left an enduring legacy of distrust even when the attitudes and policies which had led to them had been modified in the interim. Distrust was also exacerbated by the confusing array of administrative, regulatory, and commercial organisations involved in the use of 1080. The public health authorities, for example, were blamed by several of the participants for failing to take actions that were not in fact within their powers, and the respective mandates of DoC and the AHB, especially when operating on public land, were also a source of confusion. If no one is entirely sure what is being done by whom, it is easy to see how it might be interpreted as incompetence or deliberate obfuscation, and further reinforce perceptions that the place is at risk.

The combination of distrust and threat to place was just as evident among those who supported the use of 1080 in their reaction to protest action over the 1080 programme – the arena where they lacked control. Although everyone agreed that the personal harassment reported by some participants was the work of a few isolated people, the resulting sense of unease and discomfort for 1080 supporters even in their own homes had clearly raised the general level of distrust towards the opposition. This distrust seemed to have extended to include the moderate protest action, with the 1080 supporters tending to believe it was insincere and selfishly motivated. Working under constant scrutiny and dealing with a stream of complaints also seemed to be viewed as a

type of low-level harassment in itself. The protests and complaints not only created difficulties for the user organisations and those who worked for them but consumed time and resources for public health unit staff as well as the police, whose presence was usually necessary for aerial 1080 operations to proceed without obstruction (Glass, 2010). This reciprocal distrust seemed to have added an additional layer of stress and anxiety to the existing concerns about the effects of 1080 – or the loss of it – on health and the environment. It is well documented that disruption to place attachment can affect people both physically and mentally (Bush et al., 2001, Tapsell and Tunstall, 2008) so that the implications of this loss of confidence in the safety of home and community – whether from 1080 poison or from protest action – may be just as significant a concern to overall community wellbeing as any physical health risks.

Place attachment and distrust bound up with risk perception were also manifested in a completely different way in the attitude that was expressed towards the Wellington-based hierarchy of DoC and the AHB. Although much of the protest action takes place locally, the quarrel that the opponents of 1080 have is primarily with the policies of the central organisations. Urban bureaucrats and politicians were felt to have no interest in or understanding of local conditions, and were viewed by some as failing to support their local representatives very well, yet held ultimate control over what happened on the West Coast. This kind of “them and us” divide between local people with strong place attachment and local knowledge vis à vis outsiders with none is recognised as reinforcing personal and community identity in a positive way (Bickerstaff et al., 2006, Sampson and Goodrich, 2009). In spite of the sharply divided opinions locally, local people had a degree of underlying solidarity in their shared views of these remote decision makers, and it may be that this offsets their mutual local distrust and prevents it escalating further. A similar attitude was seen in the local frustration about the powerlessness of small voter numbers which were insufficient to influence national policy through the democratic process. While those who opposed 1080 expressed themselves openly and forcefully about these factors, the same attitude was also discernable in a more guarded form from the 1080 supporters. They tended to mention the lack of resources, poor flow of information from Wellington, and regulatory delays which indicated that they would have certainly appreciated more interest and support from their central organisations in what was clearly a stressful job.

In spite of the reciprocal cycle of distrust that had developed, there were some signs of hope. One bright spot was the relationship between the two Māori rūnanga and DoC. This clearly illustrated that trust and respect had been built up over time through listening to one another and taking one another's concerns seriously even if they did not always agree. However, there seemed to be no understanding from either DoC or the AHB that non-Māori too had a deep interest in and attachment to public lands and how they were managed. Other positive signs were the efforts of local leaders to seek compromise solutions that balanced the interests of all parties. One of these was the formal resolution by the Westland District Council which had brought about negotiation over the use of 1080 near recognised water supplies; the other was the compromise effected by the area Manager of the AHB in response to resident concerns and which had improved relations with his organisation. Notably, these positive developments had arisen from an acknowledgement that people cared deeply about their place. This recognition opened the way for sharing some aspect of control over the way 1080 was used, which in turn built trust and reduced the perception that people and places were being put at risk.

The wider context

One of the aims of this study was to provide a basis for further examination of community perception of risk in other areas and situations. While the study itself was specific to the West Coast, the use of a theoretical framework allows the extrapolation of the findings to broader settings than the one in which the research was conducted (Willis et al., 2007). In particular it is pertinent to consider how the conclusions of this study might apply to other parts of New Zealand where there has been similar controversy over the use of 1080, such as the Coromandel, Taupo and Urewera regions (Watson, 2010a, Harper and Neems, 2009, Watson, 2010b). These areas share many of the same characteristics as the West Coast: the rugged terrain covered in native forest, national parks managed by DoC, the presence of possums as a pest, an interface between farming and forest in parts, small rural populations, and the promotion of tourism to national and international audiences. The current study suggests that the same issues of trust and place attachment are likely to underlie the concerns expressed about risk. Indeed, explicit comments about lack of trust in the AHB have been reported in both the Taupo and the Coromandel areas (Wall, 2010, Robinson, 2010).

The findings of this study also seem likely to provide insights for other situations where citizen groups oppose government programmes or economic developments on the grounds of health or environmental risk (or both). Opposition to wind farms, hydro developments and proposed irrigation schemes are all current examples (Forest and Bird, 2010, TVNZ, 2009, Anonymous, 2008b). Some of these involve a clash of environmental “goods” – renewable energy on the one hand opposed to protection of the natural environment on the other; others are openly commercial developments but present their benefits as bringing badly needed infrastructure or economic prosperity for the whole country. There are many similarities to the issues raised around 1080: hearing loss, tinnitus, sleep disturbances and stress leading to heart disease and other illnesses in relation to wind farms (Blaschke et al., 2010); contamination of ground and surface water with nitrates and other animal effluent with the resulting risk to health in the case of the irrigation developments (Water Rights Trust, 2009). There are similar claims and counter claims about risk, and similar scientific studies, which suggest the risk is small but do nothing to reduce the opposition (Bellhouse, 2004). There are the similar issues about the environmental damage, and the projected benefits versus the potential risks of what is being done. The sharp division of opinion among the local community is seen in cases such as the Hurunui Dam in Canterbury which is supported by many farmers because it will allow them to farm more intensively but opposed by other residents and recreational users of the area (Artists for Save our Water, 2010, Canterbury V5 et al., 2011). In the case of irrigation schemes and the hydro dam there is the same vociferous opposition that tampering with water in any shape or form arouses (Strang, 2004).⁸⁰

Common factors in all these cases are their settings in small rural communities where people are passionately attached to the environment and draw meaning from it for their lives. They are places where there is an imbalance between powerful political and business interests and small communities with limited resources and small voter numbers. They are also all situations where those same political and business interests tend to be promoted as equating to the best interests of the region and the nation as a whole, but which are not necessarily seen that way by some members of the local community who react with distrust, resentment, and place-protective behaviour.

⁸⁰ Unlike the 1080 debate, some of these projects have powerful lobby groups or political parties lined up in opposition to them as well as local citizens. It may be that the permanent alteration to the landscape is the deciding factor that makes them different from the 1080 issue.

The way ahead

An additional goal of this study was to produce findings that would be useful to public health authorities and other officials and assist them in communicating with groups opposed to 1080 so as to better address their concerns. This has only partly been achieved. While the study has broadened understanding and provided some new insights, it has also revealed that there is no ultimate answer about how to communicate or a final piece of scientific investigation that will bring a resolution to the conflict. The issues are complex, and extend well beyond the West Coast setting. The 1080 conflict falls into the category of a “messy problem” (Durant and Legge, 2006, Ney, 2009). Messy problems resist being resolved in traditional ways; they have no single well defined cause, and they come with a complex web of interrelated factors. They commonly generate reams of scientific facts and evidence but these prove unhelpful in determining what to do (Ney, 2009, p. 9). It would be unrealistic to presume that this study can do more than offer a few recommendations which might move the debate forward.

Firstly, the current narrow framing of research topics needs to be broadened to include a greater variety of approaches both from positivist and social science perspectives. There seems to be a significant knowledge gap in research into attitudes to pest control. What are the views of the general public of the West Coast and other communities where 1080 use is controversial? This study interviewed only twelve people, all of whom were deeply engaged in the issues, and they happened to be fairly evenly balanced between supporters and opponents of the current programme. But whether this also represents the balance of views in the wider community, and whether most individuals are engaged with the issues or indifferent to them is unknown.⁸¹ How would the general public of New Zealand view 1080 if it was being used in their own locality? To what extent are the underlying principles behind the use of 1080 for environmental and agricultural reasons understood and supported? The previous studies on public attitudes are now more than a decade out of date and the most of recent of them focused largely on biocontrol methods which are no longer being pursued (Fitzgerald et al., 2000, Wilkinson and Fitzgerald, 2006, PCE, 2011).

⁸¹ The AHB commissioned such a study in 2009 but has never made the full results public or disclosed the questions that were asked (See Chapter One).

Many areas of positivist enquiry other than risks around 1080 were highlighted by participants as under-researched or under-funded (or both): regional differences in possum infestation and damage and the effects of 1080 on wildlife, more pre-and post-monitoring around 1080 operations, more resources for compliance with stock control regulations, the prompt and thorough follow-up of all bovine TB cases with improved turnaround in DNA typing, and vigorous pursuit of research into TB testing and vaccinations for cattle and deer. Currently, the development of an alternative poison to 1080 is being pursued (PCE, 2011, p.57-62, AHB, 2010), but the findings of this study suggest that merely replacing it with a different and relatively unknown poison may arouse just as much resistance and concern. Such an approach assumes that the problem relates solely to the nature of 1080 itself, rather than acknowledging the underlying issues that cause the opposition.

A second recommendation arising from this study is for more accountability of the organisations involved in the use of 1080. The AHB was perceived as particularly lacking in transparency by many of the research participants, not just those opposed to 1080. The AHB is funded by millions of dollars of public money each year, and administers a highly controversial programme, yet is not subject to the Official Information Act 1982 (OIA).⁸² It is interesting to note that the recent report of the Parliamentary Commissioner for the Environment (2011) recommended that the AHB should be brought under the Act, as well as calling for a great deal more accountability from both DoC and the AHB. While information about what is being done is unlikely to be sufficient to resolve the controversy, if trust is to be restored in these organisations in the regions where 1080 is used, openness and availability of information is a critical first step. People need to know exactly what is being done, where, why, and be able to find out what the 1080 operations have achieved. This level of information should also reduce the time spent by publicly funded organisations (including public health units) in responding to OIA requests.

Aligned to this recommendation for more transparency is the need for some independent research money to boost credibility in scientific studies. The unique

⁸² The Official Information Act (1982) requires that government organisations and Ministers must provide information that they hold if requested unless there is a good reason not to (for example, that it would endanger the security of defence of New Zealand). See <http://www.ombudsmen.parliament.nz/imagelibrary/100034.pdf>

position of New Zealand as the main user of the world supply of 1080 means that international interest in research and publications on the topic is limited. The researchers therefore lack a body of international colleagues with whom they can exchange ideas and receive independent peer review. Furthermore, almost all the research is funded by DoC and the AHB, and it is on these organisations that the scientists depend for their careers and livelihoods. This is not to imply that their findings are unsound, but it can be seen how this closed circle is likely to undermine confidence in scientific rigour and support perceptions that research programmes are expected to reach pre-ordained conclusions. Moreover, the Animal Health Board does not make its research results readily available, providing only summaries in an annual research report.

Thirdly, a more coherent national approach to pest control seems to be needed. It was clear even among the well-informed participants in this study that there was confusion about the “labyrinth of laws, rules, and regulations” (PCE, 2011, p. 68) that govern the use of 1080. While there is a National Pest Control Agencies group whose role is to “assist with coordinating the various sectors of the industry”,⁸³ it seems to be little known and was never mentioned by any of the research participants. A single possum control agency has been suggested previously, but was rejected by DoC and the AHB over a decade ago on the grounds that their operations and their needs were “... sufficiently distinct that a single strategy was not perceived as useful” (PCE, 1998, p.4). This is a less tenable position today given the amount of controversy that 1080 causes. A single framework and strategy would clarify the responsibilities and accountabilities of those involved. It would be a further step towards providing transparency and consistency both for the organisations themselves and the public.

The strongest recommendation to come from this study, however, is that a broader range of involvement by local citizens in the affected communities is needed within the management of 1080. Community consultation is not enough. While it acknowledges that people care about their place, it risks being seen as a patronising “tick-box” process if no action is taken – whether for budgetary or policy reasons – in response to concerns raised. Additionally, the “community” does not speak with one voice and their divergent interests and values cannot be satisfied by “... bolting on inclusive deliberation at the end of a conventional reductive, specialist-led process.” (Stirling, 2003, p.62). Ideally, a

⁸³ See <http://www.npca.org.nz/> This organisation deals with other vertebrate pests as well as possums.

collaborative approach to the management of the 1080 programme in a forum such as is available to the West Coast Maori runanga is needed. Democracy relies on well balanced opposing forces that avoid too much power ending up in the hands of any one organisation or individual. Meaningful and just action on any issue depends on the continuing involvement of citizens in the making and delivery of policy (Munton, 2003, p.114). Currently the opponents of 1080 lack any voice in the management of the public lands of the region but neither do they have to grapple with the real problems of balancing the needs of all sections of the community. Bringing a wider group of public views inside the management structure would change both these factors and encourage respect and trust between those with opposing views (Munton, 2003). While it is possible that those who did become part of this process may be viewed by some as having compromised their principles, the DoC-rūnanga model would seem to speak for itself as one of the few positive aspects of the current situation. The task of a democratic society is not necessarily to pursue agreement but "... to learn to live with difference and even to enable such difference to enrich our lives" (Humphrey and Stears, 2006, p. 418). According to Ney (2009) the value-driven conflict that messy problems generate is also a crucial resource for dealing with their challenges. By adopting "... pluralist and democratic practices in policy subsystems ... [they enable] untidy (but more resilient) policy processes that yield clumsy (but more robust) solutions to messy policy problems" (Ney 2009, p. 202).

It is important to highlight the areas of the 1080 debate raised during this study that it has not been possible to address within the allocated scope and space constraints of a Masters thesis. Questions about the humaneness of pest control and the development of alternatives have been largely left aside. There are also broad philosophical questions which were not raised by participants but are implied by the findings of this study. How do we as a society address diversity of opinion? Where does legitimate protest stop and criminal action begin even if it is driven by an ideal rather than self-interest? What are the rights of local populations over their own space when the landscapes they live in happen to have national environmental or economic importance? How can rural people be included in decisions which affect their lives when their small voter numbers mean they lack the power to influence national policy through the normal democratic process? These and other questions cannot be solved with science but come down to the values and ethical frameworks that are held by wider society.

This study has shown that the contested issues around 1080 involve a great deal more than arguments about the magnitude and likelihood of risk of harm from using or not using 1080. The different perceptions of risk, trust, and attachment to place that were identified from talking to the participants fundamentally spring from what Douglas terms “the moral and political concerns which ‘risk’ language obfuscates” (p. 39). If there is one crucial message to take away from this study it is that the debate needs to be opened up to present these concerns more directly and broaden out from quantitative risk to look holistically at the fundamental trade-offs made in choices about pest control and the way they affect the whole ecosystem and the interdependence of the human and natural world.

References

- 1080 National Network New Zealand. 2008. DoC kills keas but still defends 1080 poison use. Available: <http://www.stop1080poison.com/Page3.html> Accessed 5.1.10
- Acker, J. 2008. 1080 in Kumara [letter to editor]. Greymouth Star 13 June, 4
- AHB. 2009. West Coast-Tasman Bovine TB Strategic Management Plan, Wellington: Animal Health Board. Available: <http://www.ahb.org.nz/LinkClick.aspx?fileticket=2lxlkQrHSPc%3d&tabid=210&mid=917> Accessed 12.9.2011
- AHB. 2010. Annual research report 2009/2010, Wellington: Animal Health Board. Available: <http://www.ahb.org.nz/LinkClick.aspx?fileticket=J4kdPbakCPg%3d&tabid=197&mid=951> Accessed 27.9.2011
- Anderson, A. K. 1996. 1080 environmental monitoring programme: ecological and water quality analysis. Napier: Hawkes Bay Regional Council.
- Anonymous 1952. Insecticides and rodenticides. 1952 Recommendations for use. Public Health Reports, 67, 455-458.
- Anonymous. 2007. TB devastating for Tapawera couple. Available: <http://www.ahb.org.nz/NR/ronlyres/F1AF8833-8DC2-40E7-A29B-26FFAE1E1E86/593/AHBTbActionTasman.pdf> Accessed 30.08.08
- Anonymous 2008a. 1080: why the controversy? Public Health Perspectives, 12, 5.
- Anonymous. 2008b. Artist prefers nuclear power to windfarm. New Zealand Herald May 28. Available: http://www.nzherald.co.nz/nuclear-power/news/article.cfm?c_id=500837&objectid=10512884 Accessed 24.10.11
- Anonymous. 2008c. Copyright issues end anti-1080 campaign. Available: <http://www.odt.co.nz/news/national/20610/copyright-issues-end-anti-1080-campaign> Accessed 19.11.11
- Anonymous. 2008d. Extra caution urged after dog poisoned. The Press 17 July. Available: <http://www.stuff.co.nz/the-press/news/535842/Extra-caution-urged-after-dog-poisoned> Accessed 25.10.11
- Artists for Save our Water. 2010. He awa reo rivertalk. Available: <http://artistsforsaveourwater.co.nz/2010/01/jamie-hanton-reviews-he-awa-reo-rivertalk/> Accessed 23.10.11
- Ataria, J. M. & Ogilvie, S. C. 2007. Ngā Kaihautu Tikanga Taiao report: application for the reassessment of sodium fluoroacetate (1080). Wellington: Environmental

Risk Management Authority.

- Attride-Stirling, J. 2001. Thematic networks: an analytical tool for qualitative research. *Qualitative Research*, 1, 385-405.
- Baker, M. G., Lopez, L. D., Cannon, M. C., De Lisle, G. W. & Collins, D. M. 2006. Continuing *Mycobacterium bovis* transmission from animals to humans in New Zealand. *Epidemiology & Infection*, 134, 1068-1073.
- Barnett, J., Cooper, H. & Senior, V. 2007. Belief in public efficacy, trust, and attitudes toward modern genetic science. *Risk Analysis*, 27, 921-933.
- Barnett, S. A. & Spencer, M. M. 1949. Sodium fluoracetate (1080) as a rat poison. *Journal of Hygiene*, 47, 426-430.
- Batchelor, C. L. 1978. Report to Minister of Agriculture and Fisheries on compound 1080, its properties, effectiveness, dangers, and use. Wellington: New Zealand Forest Service.
- Beasley, M., Fisher, P., O'Connor, C. E. & Eason, C. T. 2009. Sodium fluoroacetate (1080): assessment of occupational exposures and selection of a provisional biological exposure index. *New Zealand Medical Journal*, 122, 79-91.
- Beck-Gernsheim, E. 2000. Health and responsibility. From social change to technological change and vice versa. In: Adam, B., Beck, U. & van Loon, J. (eds.) *The risk society and beyond: critical issues for social theory*. Thousand Oaks, CA, Sage.
- Beck, U. 1992. *Risk society: towards a new modernity*. London: Sage.
- Beck, U. 2000. Risk society revisited: theory politics and research programmes. In: Adam, B., Beck, U. & van Loon, J. (eds.) *The risk society and beyond: critical issues for social theory*. Thousand Oaks, CA, Sage.
- Beck, U., Giddens, A. & Lash, S. (eds.) 1994. *Reflexive modernization: politics, tradition and aesthetics in the modern social order*, Cambridge: Polity Press.
- Beecher, N., Harrison, E., Goldstein, N., McDaniel, M., Field, P. & Susskind, L. 2005. Risk perception, risk communication, and stakeholder involvement for biosolids management and research. *Journal of Environmental Quality*, 34, 122-128.
- Bell, C. 2008. Remediation of the FCC Mapua site: review of the role and actions of the Ministry for the Environment New Zealand Wellington: Ministry for the Environment. Available: <http://www.mfe.govt.nz/issues/hazardous/contaminated/mapua/remediation-mapua-report/remediation-fcc-mapua-site.pdf> Accessed 16.6.11
- Bellhouse, G. 2004. Low frequency noise and infrasound from wind turbine generators: a literature review. Prepared for the Energy Efficiency and Conservation Authority, Wellington Bel Acoustic Consulting. Available: <http://www.windenergy.org.nz/documents/sound/040810->

- Bellingham, P. 2005. Natural causes likely for plight of southern rata. True Colours, September, 3.
- Bennett, M. B., Burke, J. T. & Vermeulen, F. 2005. Union Carbide, Bhopal. December 3, 1984, London: London Business School. Available: http://www.london.edu/assets/documents/facultyandresearch/Freek_Vermeulen_Union_Carbide_case.pdf Accessed 30.10.11
- Bennett, P. & Calman, P. (eds.) 1999. Risk communication and public health, Oxford: Oxford University Press.
- Bernstein, P. L. 1996. Against the gods: the remarkable story of risk. New York: John Wiley & Sons.
- Bickerstaff, K., Simmons, P. & Pidgeon, N. 2006. Situating local experience of risk: peripherality, marginality and place identity in the UK foot and mouth disease crisis. *Geoforum*, 37, 844-858.
- Blaschke, P., Signal, L. & Baines, J. Year. The illusion of integrated impact assessment under the Resource Management Act: case studies of wind farm applications in New Zealand. In: 3rd Asia and Pacific Health Impact Assessment Conference, 17-19 November, 2010 Dunedin.
- Booth, L. H., Ogilvie, S. C., Wright, G. R. & Eason, C. T. 1999. Degradation of sodium monofluoroacetate (1080) and fluorocitrate in water. *Bulletin of Environmental Contamination and Toxicology*, 62, 34-39.
- Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101.
- Brinkman, G. L., Matthews, R. E. F. & Earl, W. B. 1986. Possible health effects of manufacture of 2,4,5 T in New Plymouth. Report of Ministerial Inquiry to Minister of Health October 1986. Wellington: Ministry of Health.
- Brown, B. B. & Perkins, D. D. 1992. Disruptions in place attachment. In: Altman, I. & Low, S. A. (eds.) *Place attachment*. New York, Plenum Press.
- Brown, K. P. & Ulrich, S. C. 2005. Aerial 1080 operations to maximise biodiversity protection. Wellington: Department of Conservation.
- Brown, P. 1992. Popular epidemiology and toxic waste contamination: lay and professional ways of knowing. *Journal of Health & Social Behavior*, 33, 267-281.
- Buddle, B. M., Wedlock, D. N. & Denis, M. 2006. Progress in the development of tuberculosis vaccines for cattle and wildlife. *Veterinary Microbiology*, 112, 191-200.
- Bush, J., Moffatt, S. & Dunn, C. 2001. 'Even the birds round here cough': stigma, air pollution and health in Teesside. *Health & Place*, 7, 47-56.

- Calder, B. & Deuss, F. 1985. Effect of 1080 poisoning on bird populations in Motere, Pureora Forest Park, winter 1984. Auckland: New Zealand Forest Service.
- Campbell, G. 2010. On the economics of mining DOC land. Available: <http://gordoncampbell.scoop.co.nz/2010/03/16/gordon-campbell-the-economics-of-mining-doc-land/> Accessed 14.10.11
- Canterbury V5, Sustainable Farming Fund, Community Irrigation Fund, Hurunui District Council & Canterbury Water. 2011. Hurunui water project. Available: <http://www.hurunuiwater.co.nz/> Accessed 24.10.11
- Carroll, J. 2008a. 1080 contractor's bags slashed. The News, 23 June, 1.
- Carroll, J. 2008b. 1080 row erupts again. The News, 18 June, 3.
- Casswell, S. 2003. Evaluation research. In: Davidson , C. & Tolich, M. (eds.) Social science research in New Zealand: many paths to understanding. Auckland, Pearson Education New Zealand.
- Cheng, A. S., Kruger, L. E. & Daniels, S. E. 2003. "Place" as an integrating concept in natural resource politics: propositions for a social science research agenda. *Society and Natural Resources*, 16, 87-104.
- Chrysochoidis, G., Strada, A. & Krystallis, A. 2009. Public trust in institutions and information sources regarding risk management and communication: towards integrating extant knowledge. *Journal of Risk Research*, 12, 137-185.
- Clout, M. & Ericksen, N. 2000. Anatomy of a disastrous success: the brushtail possum as an invasive species. In: Montague, T. L. (ed.) *The brushtail possums: biology, impact and management of an introduced marsupial*. Lincoln, Manaaki Whenua Press.
- Cochrane, C. H., Norton, D. A., Miller, C. J. & Allen, R. B. 2003. Brushtail possum (*Trichosurus vulpecula*) diet in a north Westland mixed-beech (*Nothofagus*) forest. *New Zealand Journal of Ecology*, 27, 61-65.
- Community and Public Health West Coast 2010. HSNO Enforcement Agencies Intentions Report 2010/2011. Greymouth Community & Public Health
- Cook, T. E. & Gronke, P. 2005. The skeptical American: revisiting the meanings of trust in government and confidence in institutions. *Journal of Politics*, 67, 784-803.
- Cox, S. 2007. 1080 stirs strife on the Coast. The Press, May 5, 19.
- Crane, M., Norton, A., Leaman, J., Chalak, A., Bailey, A., Yoxon, M., Smith, J. & Fenlon, J. 2006. Acceptability of pesticide impacts on the environment: what do United Kingdom stakeholders and the public value? *Pest Management Science*, 62, 5-19.
- Crotty, M. 1998. The research process. *The foundations of social research: meaning and perspective in the research process*. St Leonards, Allen & Unwin.

- Davidson , C. & Tolich, M. 2003. Social science research in New Zealand: many paths to understanding. Auckland: Pearson Education New Zealand.
- Davies, S. R. 2008. Constructing communication: talking to scientists about talking to the public. *Science Communication*, 29, 413-434.
- Davis, D. H. S. 1949. Current methods of controlling rodents and fleas in the campaign against bubonic plague and murine typhus. *Journal of the Royal Sanitary Institute*, 69, 170-175.
- Department of Justice 1967. Coroner's report: Buchanan, Ian Arthur. COR 19/67/772 Wellington: Coronial Services Unit.
- Development West Coast. Undated. Regional profile. Available: <http://www.dwc.org.nz/Key-Documents/Regional-Profile/> Accessed 19.10.11
- Devine-Wright, P. 2009. Rethinking NIMBYism: the role of place attachment and place identity in explaining place-protective action. *Journal of Community & Applied Social Psychology*, 19, 426-441.
- DoC. 2011. Pesticides summary: West Coast Tai Poutini Conservancy, Wellington: Department of Conservation. Available: <http://www.doc.govt.nz/upload/documents/conservation/threats-and-impacts/animal-pests/west-coast/west-coast-pesticide-summary.pdf> Accessed 17.10.11
- DoC. undated-a. 1080 poison for pest control. Wellington: Department of Conservation. Available: <http://www.doc.govt.nz/conservation/threats-and-impacts/animal-pests/methods-of-control/1080-poison-for-pest-control/> Accessed 17.10.11
- DoC. undated-b. Oira pest control programme. Wellington: Department of Conservation. Available: <http://www.doc.govt.nz/conservation/threats-and-impacts/animal-pests/restoration-projects/otira-pest-control-programme/> Accessed 17.10.11
- DoC. undated-c. A pest of plague proportions. Wellington: Department of Conservation. Available: <http://www.doc.govt.nz/upload/documents/science-and-technical/everybodyspossum.pdf> Accessed 19.10.11
- Douglas, M. 1966. Purity and danger: analysis of concepts of pollution and taboo. London: Routledge & Kegan Paul.
- Douglas, M. 1992. Risk and blame: essays in cultural theory. London: Routledge.
- Douglas, M. & Wildavsky, A. B. 1982. Risk and culture: an essay on the selection of technical and environmental dangers. Berkeley: University of California Press.
- Driedger, S. M. 2007. Risk and the media: a comparison of print and televised news stories of a Canadian drinking water risk event. *Risk Analysis*, 27, 775-786.

- Durant, D. 2008. Accounting for expertise: Wynne and the autonomy of the lay public actor. *Public Understanding of Science*, 17, 5-20.
- Durant, R. F. & Legge, J. S. 2006. Wicked problems, public policy and administrative theory: lessons from the GM food regulatory arena. *Administration and Society*, 38, 309-334.
- Earle, T. C. 2004. Thinking aloud about trust: a protocol analysis of trust in risk management. *Risk Analysis*, 24, 169-183.
- Eason, C. T. 2002. Technical review of sodium monofluoroacetate (1080) toxicology, Wellington: Animal Health Board. Available: http://www.landcareresearch.co.nz/publications/downloads/AHB_1080_review.pdf Accessed 1.10.09
- Eason, C. T., Miller, A., Ogilvie, S. C. & Fairweather, A. 2011. An updated review of the toxicology and ecotoxicology of sodium fluoroacetate (1080) in relation to its use as a pest control tool in New Zealand. *New Zealand Journal of Ecology*, 35, 1-20.
- Eason, C. T. & Turck, P. 2002. A 90-day toxicological evaluation of compound 1080 (sodium monofluoroacetate) in Sprague-Dawley rats. *Toxicological Sciences*, 69, 439-447.
- Easton, P. & Watt, E. 2008. Pregnant women shun 1080 poison. Available: <http://www.odt.co.nz/news/national/20610/copyright-issues-end-anti-1080-campaign> Accessed 19.11.11
- Eisenhauer, B. W., Krannich, R. S. & Blahna, D. J. 2000. Attachment to special places on public lands: an analysis of activities, reason for attachments, and community connections. *Society and Natural Resources*, 13, 421-441.
- Elwood, S. A. & Martin, D. G. 2000. "Placing" interviews: location and scales of power in qualitative research. *Professional Geographer*, 52, 649-657.
- ERMA. 2007a. Environmental Risk Management Authority Decision: Application for the reassessment of a hazardous substance under Section 63 of the Hazardous Substances and New Organisms Act 1996: name of substance(s): sodium fluoracetate (1080) and substances containing 1080. Application number: HRE05002, Wellington: Environmental Risk Management Agency. Available: [http://www.ermanz.govt.nz/news-events/1080/Decision%20\(2007.08.13\)%20FINAL.pdf](http://www.ermanz.govt.nz/news-events/1080/Decision%20(2007.08.13)%20FINAL.pdf) Accessed 2.05.09
- ERMA. 2007b. The reassessment of 1080: an informal guide to the August 2007 decision of the Environmental Risk Management Authority, Wellington: Environmental Risk Management Authority. Available: <http://www.epa.govt.nz/Publications/ERMA-1080-Reassessment.pdf> Accessed 26.10.11
- ERMA. 2009. Communications guideline for aerial 1080 operations, Wellington:

- Environmental Risk Management Authority. Available:
<http://www.epa.govt.nz/Publications/ERMA-1080-Guidelines.pdf> Accessed 25.10.11
- European Commission. 2009. Flash Eurobarometer on water: summary. Available:
http://ec.europa.eu/public_opinion/flash/fl_261_sum_en.pdf Accessed 3.05.09
- European Commission. 2010. Science and technology report June 2010. Special Eurobarometer 340 Wave 73.1 Brussels: European Commission. Available:
http://ec.europa.eu/public_opinion/archives/ebs/ebs_340_en.pdf Accessed 16.10.11
- Fanning, J. 1994. Effects of an aerial 1080 operation on kokako (*Callaeas cinerea wilsoni*) in the Hunua Ranges 1994. Auckland: Auckland Regional Council Parks Service.
- Federated Farmers. 2009. Why the Hurunui water project is a 'dam' good idea. Available:
<http://www.fedfarm.org.nz/n1553,56.html> Accessed 14.10.11
- Fitzgerald, G., N., F. & R., W. 2005. Social acceptability of stoats and stoat control methods: a survey of the New Zealand Public. *Science for Conservation* 253. Wellington: Department of Conservation.
- Fitzgerald, G., Saunders, L. & Wilkinson, R. 1994. Doing good, doing harm: public perceptions and issues in the biological control of possums and rabbits. Report prepared for the MAF Policy and Landcare Research Christchurch NZ Institute for Social Research and Development.
- Fitzgerald, G., Saunders, L. & Wilkinson, R. 1995. Public perceptions and issues in the present and future management of possums, Wellington: Ministry of Agriculture and Forestry. Available: <http://www.maf.govt.nz/mafnet/rural-nz/research-and-development/pest-control/public-perceptions-of-possum-management/> Accessed 16.07.09
- Fitzgerald, G., Wilkinson, R. & Saunders, L. 2000. Public perceptions and issues in possum control. In: Montague, T. L. (ed.) *The brushtail possum: biology, impact and management of an introduced marsupial*. Lincoln, Manaaki Whenua Press.
- Forest and Bird. 2009. Protecting native forests with 1080. Available:
<http://www.forestandbird.org.nz/saving-our-environment/threats-and-impacts-protecting-native-forests-1080> Accessed 25.05.09
- Forest and Bird. 2010. Forest and Bird damns the Mokihinui decision. Available:
<http://www.forestandbird.org.nz/what-we-do/publications/media-releases/forest-bird-damns-mokihinui-decision> Accessed 24.10.11
- Foronda, N. M. 2007. Health risk assessment and health risk management with special reference to sodium monofluoroacetate (1080) for possum control in New Zealand. (Ph.D Thesis). Dunedin, University of Otago.
- Fowles, J., Gallagher, L., Baker, V., Phillips, D., Marriott, F., Stevenson, C. & Noonan, M. 2005. A study of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) exposures in

- Paritutu, New Zealand: a report to the New Zealand Ministry of Health, Wellington Institute for Environmental and Scientific Research. Available: <http://www.moh.govt.nz/moh.nsf/indexmh/dioxins-paritutu#1> Accessed 24.10.11
- Frewer, L. J., Howard, C., Hedderley, D. & Shepherd, R. 1996. What determines trust in information about food-related risks? Underlying psychological constructs. *Risk Analysis*, 16, 473-485.
- Fried, M. 2000. Continuities and discontinuities of place. *Journal of Environmental Psychology*, 20, 193-205.
- Gaskell, G., Allum, N., Wagner, W., Kronberger, N., Torgersen, H., Hampel, J. & Bardes, J. 2004. GM foods and the misperception of risk perception. *Risk Analysis*, 24, 185-193.
- Giddens, A. 1990. *The consequences of modernity*. Stanford, CA: Stanford University Press.
- Giddens, A. 1994. Replies and critiques: risk, trust, reflexivity. In: Beck, U., Giddens, A. & Lash, S. (eds.) *Reflexive modernization: politics, tradition and aesthetics in the modern social order*. Cambridge, Polity Press.
- Glass, A. 2010. Police arrest anti-1080 protesters. *The Press* 16 June. Christchurch Available: <http://www.stuff.co.nz/the-press/news/3815966/Police-arrest-anti-1080-protesters> Accessed 19.11.11
- Gough, J. & Hooper, G. 2003. *Communicating about risk issues*, Christchurch: University of Canterbury Centre for Advanced Engineering. Available: http://www.europe.canterbury.ac.nz/conferences/tech2004/tpp/Gough%20and%20Hooper_paper.pdf Accessed 31.07.09
- Gray, H. E. 1948. The newer insecticides and rodenticides in relation to improved pest control. *Canadian Journal of Public Health*, 39, 458-463.
- Green, J. & Thorogood, N. 2009. *Qualitative methods for health research*. Thousand Oaks, CA: Sage.
- Green, W. 2004. *The use of 1080 for pest control: a discussion document*. Wellington: Animal Health Board and Department of Conservation, Wellington: Animal Health Board. Available: <http://www.doc.govt.nz/upload/documents/conservation/threats-and-impacts/animal-pests/use-of-1080-04.pdf> Accessed 28.04.09
- Green, W. 2007. 1080 or not 1080 is that the question? The Sanderson Memorial Address to the Annual General Meeting of the NZ Royal Forest and Bird Protection Society, Wellington, 23 June 2007, Wellington NZ Royal Forest and Bird Protection Society. Available: <http://www.forestandbird.org.nz/files/file/Sanderson%20Memorial%20Address%201080%20or%20not%201080%20-%20Wren%20Gren.pdf> Accessed 5.1.2010

- Grubb, F. 2005. Jade and belonging: making a social landscape of belonging on the West Coast. *Sites*, 2, 186-211.
- Guba, E. G. & Lincoln, Y. S. 1994. Competing paradigms in qualitative research. In: Denzin, N. K. & Lincoln, Y. S. (eds.) *Handbook of qualitative research*. Thousand Oaks, CA, Sage.
- Guest, G., Bunce, A. & Johnson, L. 2006. How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18, 59-82.
- Guiliani, M. V. 2003. Theory of attachment and place attachment. In: Bonnes, M., Lee, T. & Bonaiuto, M. (eds.) *Psychological theories for environmental issues*. Aldershot, Ashgate.
- Halpenny, E. A. 2010. Pro-environmental behaviours and park visitors. The effect of place attachment. *Journal of Environmental Psychology*, 30, 409-421.
- Hansen, E. C. 2006. *Successful qualitative health research: a practical introduction*. Crows Nest, NSW: Allen & Unwin.
- Harper, P. & Neems, J. 2009. Protesters stop Coromandel 1080 drop. *Waikato Times* 19 September. Available: <http://www.stuff.co.nz/waikato-times/news/2881440/Protesters-stop-Coromandel-1080-drop> Accessed 27.9.2011
- Healy, J. W. 1978. What is hazardous? What is safe? *Environmental Health Perspectives*, 27, 317-321.
- Horn, C. & Kilvington, M. 2002. *Maori and 1080*, Lincoln: Landcare Research. Available: <http://www.landcareresearch.co.nz/research/sustainablesoc/social/1080.asp> Accessed 31.07.09
- House of Lords. 2000. *Science and society. Select Committee on Science and Technology 3rd Report*, London: House of Lords. Available: <http://www.publications.parliament.uk/pa/ld199900/ldselect/ldsctech/38/3802.htm> Accessed 14.10.11
- Humphrey, M. & Stears, M. 2006. Animal rights protest and the challenge to deliberative democracy. *Economy and Society*, 35, 400-422.
- Huser, B. 1990. *Animal pest control: toxicity and environmental fate of 1080*. Wellington: Department of Conservation.
- Hutcheson, J. 1996. *Characterisation of insect communities of tawa forest in the Onaia ecological area using malaise trapped beetles, and indications of influences including 1080 operations on these communities*. (M.Phil Thesis) Hamilton, University of Waikato.
- Hutching, G. 2009. *Possums in New Zealand: Te Ara: the Encyclopedia of New*

- Zealand, updated 1-Mar-09
Available: <http://www.TeAra.govt.nz/en/possums/1> Accessed 19.10.11
- Ipsos MORI Social Research Institute. 2011. Public attitudes to science 2011, London: Department for Business Innovation and Skills. Available: <http://www.ipsos-mori.com/Assets/Docs/Polls/sri-pas-2011-main-report.pdf> Accessed 16.10.11
- Jacob, M. & Hellstrom, T. 2000. Policy understanding of science, public trust, and the BSE-CJD crisis. *Journal of Hazardous Materials*, 78, 303-317.
- Jefferies, R., Warren, T., Berke, P., Chapman, S., Crawford, J., Ericksen, N. & Mason, G. 2002. Iwi interests and the RMA: an evaluation of the quality of first generation council plans. Maori Working Paper No. 1, Hamilton: University of Waikato
Available:
<http://researchcommons.waikato.ac.nz/bitstream/10289/901/1/MaoriPaper1.pdf> Accessed 17.6.11
- Jensen, K. K., Lassen, J., Robinson, P. & Sandoe, P. 2005. Lay and expert perceptions of zoonotic risks: understanding conflicting perspectives in the light of moral theory. *International Journal of Food Microbiology*, 99, 245-255.
- KAKA. 2008. 1080: age of consent? KAKA Press Release 17 June. Available: http://www.kaka1080.co.nz/kaka_press_releases.html Accessed 19.10.11
- KAKA. undated. KEA joins KAKA in West Coast 1080 war. Available: http://www.kaka1080.co.nz/news_releases.html Accessed 16.6.2011
- Keey, R. B. 2000. Management of engineering risk. Christchurch: University of Canterbury Centre for Advanced Engineering and Institution of Professional Engineers.
- Koopmans, R. 2004. Movements and media: selection processes and evolutionary dynamics in the public sphere. *Theory and Society*, 33, 367-391.
- Krewski, D., Lemyre, L., Turner, M. C., Lee, J. E. C., Dallaire, C., Bouchard, L., Brand, K. & Mercier, P. 2006. Public perception of population health risks in Canada: Health hazards and sources of information. *Human and Ecological Risk Assessment*, 12, 626-644.
- Krewski, D., Lemyre, L., Turner, M. C., Lee, J. E. C., Dallaire, C., Bouchard, L., Brand, K. & Mercier, P. 2008. Public perception of population health risks in Canada: risk perception beliefs. *Health Risk & Society*, 10, 167-179.
- Laird, F. N. 1989. The decline of deference: the political context of risk communication. *Risk Analysis*, 9, 543-550.
- Lash, H. 2008. Coast needs 1080 use. Available: http://kaka1080.co.nz/news_releases.html Accessed 19.11.11
- Lloyd, B. D. 1994. Evaluating the potential hazard of aerial 1080 poison to short-tailed bat populations. Wellington: Department of Conservation.

- Lowe, P. K. & Lee, E. J. 2010. Advocating alcohol abstinence to pregnant women: some observations about British policy. *Health, Risk and Society*, 12, 301-311.
- Lupton, D. 1999. *Risk*. London: Routledge.
- Lyng, S. 2008. Edgework, risk and uncertainty. In: Zinn, J. O. (ed.) *Social theories of risk and uncertainty: an introduction*. Malden, MA, Blackwell.
- Madsen, K. H. & Sandoe, P. 2005. Ethical reflections on herbicide-resistant crops. *Pest Management Science*, 61, 318-325.
- McVarish, J. 2010. The effect of 'risk thinking' on the contemporary construction of teenage motherhood. *Health, Risk and Society*, 12, 313-322.
- Milligan, M. J. 1998. Interactional past and potential: the social construction of place attachment. *Symbolic Interaction*, 21, 1-33.
- Mills, L. 2007. Protest targets tourist train. *Greymouth Star* 25 June, 1.
- Morgan, D. R. 2004. Maximising the effectiveness of aerial 1080 control of possums (*Trichosurus vulpecula*). (Ph.D Thesis). Lincoln, Lincoln University.
- Munton, R. 2003. Deliberative democracy and environmental decision making. In: Berkhout, F., Leach, M. & Scoones, I. (eds.) *Negotiating environmental change: new perspectives from social science*. Cheltenham, Edward Elgar Publishing.
- Murray, P. 2008. It's not all dairy cows. *Christchurch Press* Friday 22 August.
- Nelkin, D. 1979. *Controversy: politics of technical decisions*. Beverley Hills, CA: Sage.
- Nelkin, D. 1989. Communicating technological risk – the social construction of risk perception. *Annual Review of Public Health*, 10, 95-113.
- Nelkin, D. & Marsden, E. 2004. The StarLink controversy: the competing frames of risk disputes. *International Journal of Biotechnology*, 6, 20-42.
- New Zealand Deerstalkers Association. 2006. Oral submission: Reassessment of sodium fluoroacetate (1080) and substances containing 1080 (a vertebrate toxin). Available: http://www.deerstalkers.org.nz/Site/Submissions/Poison_Submissions/Oral_Submission.aspx Accessed 5.1.10
- Ney, S. 2009. *Resolving messy problems: handling conflict in environmental, transport, health and ageing policy*. London: Earthscan.
- NZGAC. 2009. *Options for establishing a Game Animal Council: a discussion paper*, Christchurch: Game Animal Council Establishment Committee. Available: <http://www.nzgac.org.nz/> Accessed 30.9.2011
- O'Connor, C. E., Beasley, M. & Fisher, P. 2003. Monitoring workers involved in aerial

- cereal bait distribution against a biological exposure index (BEI) for 1080. Wellington: Department of Conservation.
- O'Hagan, B. J. 2004. Fluoroacetate poisoning in seven domestic dogs. *Australian Veterinary Journal*, 82, 756-758.
- O'Malley, P. 2008. Governmentality and risk. In: Zinn, J. O. (ed.) *Social theories of risk and uncertainty: an introduction*. Oxford, Blackwell.
- Ogilvie, S. C., Miller, A., Ataria, J. M., Waiwai, J. & Doherty, J. 2009. Uptake of 1080 by watercress and puha – culturally important plants used for food: final report, Lincoln: Lincoln University. Available: http://researcharchive.lincoln.ac.nz/dspace/bitstream/10182/1389/1/wmr_49.pdf Accessed 5.5.2011
- Ogilvie, S. C., Ataria, J. M., Waiwai, J., Doherty, J. E., Lambert, M., Lambert, N. & King, D. 2006. Uptake and persistence of the vertebrate pesticide, sodium monofluoroacetate (Compound 1080), in plants of cultural importance. *Ecotoxicology*, 15, 1-7.
- Ogilvie, S. C., Booth, L. H. & Eason, C. T. 1998. Uptake and persistence of sodium monofluoroacetate (1080) in plants. *Bulletin of Environmental Contamination and Toxicology*, 60, 745-749.
- Ogilvie, S. C., Hetzel, F. & Eason, C. T. 1996. Effect of temperature on the biodegradation of sodium monofluoroacetate (1080) in water and in *Elodea canadensis*. *Bulletin of Environmental Contamination and Toxicology*, 56, 942-947.
- Para, D. 1999. A Maori perspective of pest control, from within DOC. Manaaki Whenua Conference, April 1999 Available: <http://www.landcareresearch.co.nz/news/conferences/manaakiwhenua/papers/para.asp> Accessed 31.07.09
- Payton, I. 2000. Damage to native forests. In: Montague, T. L. (ed.) *The brushtail possum: biology, impact and management of an introduced marsupial*. Lincoln, Manaaki Whenua Press.
- PCE 1998. Possum management in New Zealand: critical issues in 1998. PCE Progress Report No. 1. Wellington: Parliamentary Commissioner for the Environment.
- PCE 2011. Evaluating the use of 1080: predators, poisons, and silent forests. Wellington: Parliamentary Commissioner for the Environment.
- Perfect, A. J. & Bell, B. D. 2005. Assessment of the impact of 1080 on the native frogs *Leiopelma archeyi* and *L. hochstetteri*. DOC Research & Development Series 209. Wellington: Department of Conservation.
- Peters, R. G., Covello, V. T. & McCallum, D. B. 1997. The determinants of trust and credibility in environmental risk communication: an empirical study. *Risk Analysis*, 17, 43-54.

- Pfeiffer, D. U. 2006. Communicating risk and uncertainty in relation to development and implementation of disease control policies. *Veterinary Microbiology*, 112, 259-264.
- Pierce, R. J. & Montgomery, P. J. 1992. Fate of birds and selected invertebrates during a 1080 operation. Wellington: Department of Conservation.
- Poortinga, W. & Pidgeon, N. F. 2003. Exploring the dimensionality of trust in risk regulation. *Risk Analysis*, 23, 961-972.
- Pope, C. & Mays, N. 2000. Qualitative research in health care. Malden, MA: Blackwell/BMJ Books.
- Powesland, R., Knegtman, J. & Marshall, I. 1998. Evaluating the impacts of 1080 possum control on North Island robins, North Island tomtits and moreporks at Pureora: preliminary results. Wellington: Department of Conservation.
- Powesland, R. G., Knegtman, J. W. & Marshall, I. S. J. Year. Costs and benefits of aerial 1080 possum control operations using carrot baits to North Island robins (*Petroica australis longipes*), Pureora Forest Park. In: Scientific Meeting on Ecological Consequences of Poisons used for Mammalian Pest Control, Jul 09-10 1998 Christchurch, New Zealand. 149-159.
- Proshansky, H. M., Fabian, A. K. & Kaminoff, R. 1983. Place identity: physical world socialisation of the self. *Journal of Environmental Psychology*, 3, 57-83.
- Pyle, E. & Gough, J. D. 1991. Environmental risk assessment for New Zealand: a guide for decision makers. Information Paper No. 29. Lincoln: Lincoln University Centre for Resource Management.
- Raymond, C. M., Brown, G. & Weber, D. 2010. The measurement of place attachment: personal, community, and environmental connections. *Journal of Environmental Psychology*, 30, 422-434.
- Rice, P. L. & Ezzy, D. 1999. Qualitative research methods: a health focus. Oxford: Oxford University Press.
- Roberts, M. G., Norman, W., Minhinnick, N., Wihongi, D. & Kirkwood, C. 1995. Kaitiakitanga: Maori perspectives on conservation. *Pacific Conservation Biology*, 2, 7-20.
- Robinson, R. 2010. 1080 critics target AHB 'gravity train': opinion piece by Reihana Robinson, an organic farmer on the Coromandel peninsula. *Greymouth Star* 3 February.
- Rollero, C. & De Piccoli, N. 2010. Does place attachment affect social well-being? *European Review of Applied Psychology – Revue européenne de psychologie appliquée*, 60, 233-238.
- Rose, A. B., Pekelharing, C. J. & Platt, K. H. 1992. Magnitude of canopy dieback and implications for conservation of southern rata - kamahi (*Metrosideros umbellata* -

- Weinmannia racemosa) forests, central Westland, New Zealand. *New Zealand Journal of Ecology*, 16, 23-32.
- Ross, J. 1997. The role of non toxic cereal prefeed and postfeed (dyed & undyed) in the development and maintenance of 1080 cereal bait shyness in captive possums, Lincoln: Lincoln University. Available: http://researcharchive.lincoln.ac.nz/dspace/bitstream/10182/717/1/wmr_18.pdf Accessed 2.11.11
- Rubin, H. J. & Rubin, I. S. 2005. *Qualitative interviewing: the art of hearing data*. Thousand Oaks, CA: Sage.
- Sadleir, R. 2000. Evidence of possums as predators of native animals. In: Montague, T. L. (ed.) *The brushtail possums: biology, impact and management of an introduced marsupial*. Lincoln, Manaaki Whenua Press.
- Sampson, K. A. & Goodrich, C. G. 2005. "We're Coasters, why should we move?" Community identity, place attachment and forestry closure in rural New Zealand Sites, 2, 124-149.
- Sampson, K. A. & Goodrich, C. G. 2009. Making place: identity construction and community formation through "sense of place" in Westland, New Zealand. *Society & Natural Resources*, 22, 901-915.
- Sandman, P. M. 1989. Hazard versus outrage in the public perception of risk. In: Covello, V. T., McCallum, D. B. & Pavlova, M. T. (eds.) *Effective risk communication: the role and responsibility of government and nongovernment organisations*. New York, Plenum.
- Sandman, P. M., Miller, P. M., Johnson, B. B. & Weinstein, N. D. 1993. Agency communication, community outrage and perception of risk: three simulation experiments. *Risk Analysis*, 13, 585-598.
- Save Our Wild Rivers. Undated. Hundreds protest Hurunui dam project. Available: <http://saveourwildrivers.org.nz/news/hundreds-protest-hurunui-dam-project> Accessed 14.10.11
- Scannell, L. & Gifford, R. 2010. Defining place attachment: a tripartite organizing framework. *Journal of Environmental Psychology*, 30, 1-10.
- Sheppard, R. & Urquhart, L. 1991. Attitudes to pests and pest control methods: results from a sample survey of the New Zealand population in February 1991. Lincoln: Lincoln University Agribusiness and Economics Research Unit
- Skjong, R. 2005. The etymology of risk. Oslo: Det Norske Veritas (DNV). Available: <http://research.dnv.com/skj/papers/etymology-of-risk.pdf> Accessed 16.10.11
- Slovic, P. 1987. Perception of risk. *Science*, 236, 280-285.
- Slovic, P. 1993. Perceived risk, trust, and democracy. *Risk Analysis*, 13, 675-682.

- Slovic, P. 1997. Public perception of risk. *Journal of Environmental Health*, 59, 22-23, 54.
- Spurr, E. B. 1989. Bird populations before and after 1080 poisoning of possums in Westland National Park. Christchurch: Forest Research Institute.
- Staples, E. L. J. 1976. Comparison of arsenic trioxide and 1080 for rabbit control. Wellington: Animal Health Division Ministry of Agriculture and Fisheries.
- Stedman, R. C. 2002. Toward a social psychology of place: predicting behavior from place-based cognitions, attitude, and identity. *Environment and Behavior*, 34, 561-581.
- Stedman, R. C. 2003. Is it really just a social construction? The contribution of the physical environment to sense of place. *Society and Natural Resources*, 16, 671-685.
- Stirling, A. 2003. Risk, uncertainty and precaution: some instrumental implications from the social sciences. In: Berkhout, F., Leach, M. & Scoones, I. (eds.) *Negotiating environmental change: new perspectives from social science*. Cheltenham, Edward Elgar Publishing.
- Strang, V. 2004. *The meaning of water*. New York: Berg.
- Suren, A. M. & Lambert, P. 2006. Do toxic baits containing sodium fluoroacetate (1080) affect fish and invertebrate communities when they fall into streams? *New Zealand Journal of Marine and Freshwater Research*, 40, 531-546.
- Tapsell, S. M. & Tunstall, S. M. 2008. "I wish I'd never heard of Banbury": the relationship between 'place' and the health impacts from flooding. *Health and Place*, 14, 133-154.
- Taylor, T. 2008. Kumara 1080 drop [letter to editor]. *Greymouth Star* 18 June, 4.
- TB Free New Zealand. 2009a. TBfree New Zealand – doing the job for the New Zealand economy. Available: <http://tbfree.ahb.org.nz/LinkClick.aspx?fileticket=JgzYp3RbEqQ%3D&tabid=319> Accessed 17.08.09
- TB Free New Zealand. 2009b. West Coast survey confirms desire for information. Available: <http://tbfree.ahb.org.nz/LinkClick.aspx?fileticket=Rg2NlKrCgh0%3D&tabid=319> Accessed 31.07.09
- Te Rūnanga o Ngāi Tahu. 2000. *Ngāi Tahu 2025*, Christchurch: Te Rūnanga o Ngāi Tahu. Available: http://www.ngaitahu.iwi.nz/Publications/Governance/NgaiTahu_2025.pdf Accessed 27.5.11
- Tesh, S. N. 1999. Citizen experts in environmental risk. *Policy Sciences*, 32, 39-58.

- Tesh, S. N. 2000. *Uncertain hazards: environmental activists and scientific proof*. Ithica, NY: Cornell University Press.
- Thomas, C. W. 1998. Maintaining and restoring public trust in government agencies and their employees. *Administration and Society*, 30, 166-193.
- Thomas, M. D. 1991. Assessment of possum kill and bait spread of an aerial 1080 control operation, Waipoua Forest Sanctuary, Northland. Christchurch: Forest Research Institute.
- Thomas, M. D. & Hickling, G. J. 1989. Coverage of aerially sown 1080 bait for possum control at Slopdown, Southland. Christchurch: Forest Research Institute.
- Toxnet. 2003. *Integrated Risk Information System: Sodium fluoroacetate*. Bethesda, MD: US National Library of Medicine
- Trentelman, C. K. 2009. Place attachment and community attachment: a primer grounded in the lived experience of a community sociologist. *Society & Natural Resources*, 22, 191-210.
- Troup, C. 2009. Birds of open country - kea and people. In: *Te Ara - the Encyclopedia of New Zealand*, updated 1-Mar-09. Available: <http://www.TeAra.govt.nz/en/birds-of-open-country/3> Accessed 25.10.11
- Tulloch, J. & Lupton, D. 2003. *Risk and everyday life*. London: Sage.
- TVNZ. 2009. Hundreds protest Hurunui dam project. Available: <http://tvnz.co.nz/national-news/hundreds-protest-hurunui-dam-project-3079784> Accessed 24.10.11
- TVNZ. 2010. 1080 to stop bovine TB divides West Coast farmers. Available: <http://tvnz.co.nz/national-news/1080-drop-stop-bovine-tb-divides-farmers-3396527/video> Accessed 15.6.11
- Veltman, C. J. & Westbrooke, I. M. 2011. Forest bird mortality and baiting practices in New Zealand aerial 1080 operations from 1986 to 2009. *New Zealand Journal of Ecology*, 35, 21-29.
- Vorkinn, M. & Riese, H. 2001. Environmental concern in a local context: the significance of place attachment. *Environment and Behavior*, 33, 249-263.
- Wahlberg, A. A. F. & Sjoberg, L. 2000. Risk perception and the media. *Journal of Risk Research*, 3, 31-50.
- Wall, T. 2010. The mayor who declared war. *Sunday Star Times* 27 June. Available: <http://www.stuff.co.nz/sunday-star-times/features/3855784/The-mayor-who-declared-war> Accessed 19.11.11
- Warburton, B. 1996. Potential effectiveness of aerially sown 1080 baits for controlling low density possum populations. Wellington: Department of Conservation.

- Warburton, B., Cowan, P. & Shepherd, J. 2009. How many possums are now in New Zealand following control and how many would there be without it?, Lincoln: Landcare Research. Available: <http://www.envirolink.govt.nz/PageFiles/159/720-NLRC104%20Possum%20numbers%20inNZ.pdf> Accessed 21.9.2011
- Warburton, B. & Poutu, N. 2008. Effectiveness of chain-springs on leghold traps for reducing injuries to captured brushtail possums (*Trichosurus vulpecula*). *New Zealand Journal of Zoology*, 35, 147-150.
- Warburton, B. & Yockney, I. 2009. Comparison of two luring methods for trapping brushtail possums in non-forest habitats of New Zealand. *New Zealand Journal of Zoology*, 36, 401-405.
- Warren, A. 1984. Effects of 1080 poisoning on bird populations in Tihoi, Pureora State Forest Park, winter 1983. Auckland: New Zealand Forest Service.
- Water Rights Trust. 2009. Our path to disaster, Christchurch: Water Rights Trust. Available: <http://www.waterrightstrust.org.nz/pathway-to-disaster/> Accessed 24.10.11
- Watson, M. 2010a. 1080 bomb hoax a 'terrorist act'. *Dominion Post* 19 June. Available: <http://www.stuff.co.nz/national/3830385/1080-bomb-hoax-a-terrorist-act> Accessed 27.9.2011
- Watson, M. 2010b. Spikes planted on Urewera track. *Dominion Post* 30 August 2010. Available: <http://www.stuff.co.nz/national/4073449/Spikes-planted-on-Urewera-track> Accessed 27.9.2011
- Weaver, S. 2006. Chronic toxicity of 1080 and its implications for conservation management: a New Zealand case study. *Journal of Agricultural and Environmental Ethics* 19, 367-389.
- Webber, L. & Carter, A. 1998. On constructing trust: temporality, self-disclosure, and perspective-taking. *International Journal of Sociology and Social Policy*, 18, 7-26.
- West Coast Regional Council. undated. About our region. Available: http://www.wcrc.govt.nz/about_us/our_region/ Accessed 26.10.11
- West, P., Igoe, J. & Brockington, D. 2006. Parks and peoples: the social impact of protected areas. *Annual Review of Anthropology*, 35, 251-277.
- Whiting-O'Keefe, P. M. & Whiting-O'Keefe, Q. E. 2007. Aerial monofluoroacetate in New Zealand's forests: an appraisal of the scientific evidence, Port Charles, Coromandel: Whiting O'Keefe. Available: <http://www.thegrafsboys.org/files/Pat-Quinn-Erma-Submission.pdf> Accessed 26.8.10
- Wildavsky, A. & Drake, K. 1990. Theories of risk perception: who fears what and why. *Daedalus*, 119, 41-60.

- Wilkinson, R. & Fitzgerald, G. 1999. Public perception of pests in New Zealand: essential information for moving forward. Paper presented to Manaaki Whenua Conference, Te Papa, Wellington, April 1999.
- Wilkinson, R. & Fitzgerald, G. 2006. Public attitudes to possum fertility control and genetic engineering in New Zealand. Landcare Research Science Series No. 29. Lincoln: Manaaki Whenua Press.
- Wilkinson, T. M. 2009. Making people be healthy. *Journal of Primary Health Care*, 1, 244-246.
- Willems, H. 2002. 1080 conspiracy: the truth and nothing but the truth. Karamea: KAKA 1080 group. Available: http://www.kaka1080.co.nz/1080_conspiracy.html Accessed 5.1.10
- Willis, K., Daly, J., Kealy, M., Small, R., Koutroulis, G., Green, J., Gibbs, L. & Thomas, S. 2007. The essential role of social theory in qualitative public health research. *Australian & New Zealand Journal of Public Health*, 31, 438-443.
- Wodzicki, K. & Wright, S. 1984. Introduced birds and mammals in New Zealand and their effect on the environment. *Tuatara*, 27, 78-104.
- Woldoff, R. A. 2002. The effects of local stressors on neighbourhood attachment. *Social Forces*, 81, 87-116.
- Wynne, B. 1996. May the sheep safely graze? A reflexive view of the expert-lay knowledge divide. In: Lash, S., Szerszinski, B. & Wynne, B. (eds.) *Environment and modernity: towards a new ecology*. London, Sage.
- Wynne, B. 2008. Elephants in the rooms where publics encounter "science"?: a response to Darrin Durant, "Accounting for expertise: Wynne and the autonomy of the lay public". *Public Understanding of Science*, 17, 21-33.
- Zinn, J. O. (ed.) 2008. *Social theories of risk and uncertainty: an introduction*, Malden, MA: Blackwell