Application of the Pressure-State-Response framework to perceptions reporting of the State of the New Zealand Environment

Running title: **Perceptions of the New Zealand Environment**

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ABSTRACT

The Pressure-State-Response framework for environmental reporting was used as a basis to develop a long-term study of people's perceptions of the state of the New Zealand environment. A postal survey of 2000 people, randomly drawn from the New Zealand electoral roll was used to gather data – an effective response rate of 48% was achieved. A range of different resource sectors was examined. We report on New Zealand's air, native animals and plants, and marine fisheries, as well as New Zealand compared to other developed countries. Respondents generally considered that in terms of pressures, states and responses, New Zealand was performing better than other developed countries and that for the resources examined here overall performance was in the adequate to good range, except for marine fisheries. The survey appears to be a useful tool for linking perceptions data into State of the Environment reporting. It also helps identify policy issues where perceptions do not match other scientific evidence or management initiatives. Such findings can be important for the successful implementation of policy measures.

Keywords:

Survey, perceptions, state of the environment, Pressure-State-Response framework, resources, New Zealand

Introduction

State of the Environment Reporting (SER) is the way many governments typically report on trends in (mostly) biophysical environmental parameters (UNEP, 2002). 'The State of New Zealand's Environment' was reported on by the Ministry for the Environment (MfE) (1997) and, in an international context, by the Organisation for Economic Cooperation and Development (OECD) (1996). Both reports use Pressure-State-Response (P-S-R) as the framework for reporting. The P-S-R framework (OECD, 1996; 1999), or variations thereof, is based on the notion of causality. It is used worldwide as a reporting tool to describe human activities that exert pressures on the environment, changing the quality and quantity (the state) of natural resources. Human management responses to the changes include any form of organised behaviour that seeks to reduce, prevent or ameliorate undesirable changes.

The OECD uses the P-S-R framework to provide the basis for a classification into indicators (of environmental pressures, environmental conditions and societal responses) using a number of environmental issues which reflect major environmental concerns in OECD countries, including New Zealand (OECD, 1999). New Zealand's first State of the Environment Report (MfE, 1997) was based on this framework but was subsequently criticised by Hughey *et al*. (1998) who, *inter alia*, considered socio-environmental matters were inadequately addressed. Effective State of the Environment Reporting (SER) requires that sets of indicators are consistently monitored and reported, and that there is a relationship between indicators and management, to the point where environmental indicators are viewed as 'signposts for sustainability'. Since producing New Zealand's first SER report, the MfE has been

leading a process to develop a core set of indicators for SER – the Environmental Performance Indicators (EPI) programme (MfE, 2001a).

New Zealanders do appear to value their environment and indeed have ethical concerns with regard to their interaction with it. This is evident by the many submissions received in public consultation procedures on environmental management, for example, the formulation of an Oceans Policy (PCE, 2002). However, until relatively recently, nowhere in the SER development process has any major attempt been made to capture New Zealanders' perceptions of the state of their environment. Marion Hobbs, Minister for the Environment, intimated that more effort needs to be put into understanding the social aspects of environmental management, including people's understanding thereof (Hobbs, 2000). During May to July 2001, the MfE (2001b) sought, via a submission response form process, public views on the state of the environment (and priorities for environmental sustainability) through its 'Rio+10 community programme'. While informative in terms of gathering public views on key issues, the process was not designed to test perceptions around the structure of SER or the P-S-R framework.

While environmental and conservation-type surveys have been undertaken over the last decade (e.g., Heylen Research Centre, 1993; Petersen *et al*., 1997; Massey University, 2001) there have been few ongoing surveys of perceptions of the environment. The regional council Environment Waikato (Research Solutions, 1998; Key Research & Marketing Ltd & Eclectic Energy, 2001), has undertaken telephone 'environmental awareness, attitudes and actions' surveys, in 1998 and 2000.

New Zealand's Parliamentary Commissioner for the Environment recently commented upon the New Zealand public's environmental values and ethics and perceptions gained via public surveys (PCE 2002). Areas of concern common to the surveys he reviewed (MfE, 2001b; Massey University, 2001; Hughey *et al*., 2001 and Key Research & Marketing Ltd & Eclectic Energy, 2001) include water quality, air quality and waste/hazardous materials. There were a few differences noted. For example, Hughey *et al*. (2001) and Massey University (2001) responses to perceptions of New Zealand's 'clean and green' image contrasted (PCE, 2002: 46). The former reported the image as a reality while the latter saw it as a myth.

Relying on trends among biophysical indicators alone for SER may be problematic. People's perceptions of the states of environmental parameters are also important because there is frequently dissonance between technical and perceptual measures of risk. For example, debate over the location of cell phone towers in New Zealand demonstrates this problem – technical experts reassure people that the levels of electromagnetic radiation from towers are safe, but near neighbours often have a vastly different view and consider that radiation levels are unsafe. Monitoring the technical (biophysical) indicator in this circumstance is important, but so too is the need to monitor changing public perceptions. The size of any variation can then be used to inform policy makers about the need for education programmes and advise them about improved policy response. This approach is sometimes referred to as multi-way risk communication (Gerrard, 1995).

A review of New Zealand public surveys about environmental matters shows that a few surveys (e.g., the annual Christchurch City Council survey of ratepayers

(National Research Bureau, 2000)) are establishing a long-term record of matters concerning some environmental services, such as roading and parks. The 1993 International Social Survey Programme (ISSP) survey on 'New Zealanders' Attitudes to the Environment' (Gendall *et al*., 1993) was used to examine the link between environmental attitudes and behaviour (Hini *et al*., 1995) and was recently repeated (Massey University, 2001). However, the ISSP surveys focus on behaviour with limited information on public perceptions of the environment, its management and trends. Environment Waikato is establishing a long-term profile of environmental perceptions, but only for its region.

Irrespective of the above initiatives there are no long running surveys, either in New Zealand or internationally, that have used the P-S-R framework to focus on detailed public perceptions of the state of the environment. In response to this gap in SER, Hughey *et al*. (2001) commenced a long-term project to determine people's views about the State of New Zealand's Environment. The project aims to examine and monitor perceptions over time using biennial surveying of a sample of the New Zealand population. This paper draws on selected data from the initial survey[1] and outlines how the P-S-R framework was applied, the methods that were used, identifies some of the key findings and explores the validity and policy implications of this research.

[1] To date, two surveys have been undertaken, in 2000 and 2002. Analysis of the 2002 survey is currently being completed. This paper reports results only from the 2000 survey.

Methods

Survey instrument

A postal questionnaire based on the P-S-R framework was developed to gather information on New Zealanders' perceptions of the environment and environmental management. The postal survey format was selected because the large number of questions was unsuitable for a telephone survey and in-person interviews were impractical because of budget limitations.

Survey administration

Pre-testing involved initial appraisal by MfE staff. Subsequently, twenty-six individuals selected from the target population completed the questionnaire and were interviewed to obtain interpretations of question tasks and responses. Interview responses prompted some minor adjustments to the questionnaire prior to its distribution.

Two thousand questionnaires were mailed to households randomly drawn from the New Zealand electoral roll. The questionnaire and the letter of introduction were posted with a freepost return envelope. The questionnaires were posted on 3 February 2000. In addition, a second posting was made on 9 March 2000 to those who had not returned their questionnaire.

The survey received an 'effective' response rate of 48 percent (N = 894), given that questionnaires returned because the respondents' addresses were no longer known were removed from the sample. The sample had a margin of error at the 95% confidence level of three per cent or less.

The survey responses were not representative of the population at large. Survey respondents were overly representative of people aged over 40; with an income over NZ$30 000; in employment; and with a tertiary qualification.

The questionnaire

Following the P-S-R framework, one set of questions measured the main perceived causes of damage to the environment. Three sets of questions assessed perceptions of the state of the environment and three sets of questions assessed perceptions of the response by management. For all of these measures a ‘don’t know’ option was provided for respondents who may not have felt sufficiently informed to respond.

Pressures on the environment

Pressures (perceived causes of adverse environmental effects) were measured by presenting a table containing ten resource areas (e.g., air, soils, marine fisheries) with fifteen potential causes of adverse effects. Respondents were instructed to select up to three main causes of adverse effects for each resource. This approach was designed to

assist respondents by removing the necessity to select the single most important item from the fifteen presented.

The state of the environment

The perceived state of the environment was measured in terms of quality, availability, and change over the previous five years. In the first set of questions respondents were invited to indicate the 'quality or condition' of eleven aspects of the environment on five-point scales anchored by *very good* and *very bad*.

The second set of state questions asked for: *your opinion on the availability or amount of* nine natural resources. The set was presented with five-point scales provided for measurement anchored by *very high* and *very low*.

The third set of state measurements was of perceptions of change in the state of thirteen environmental aspects over the last five years. These were sought with the invitation: *Now that you have told us what you think about the state of New Zealand's environment, we would like you to tell us how you think the environment has changed over the last 5 years*. These aspects were presented with a five-point measurement scale anchored by *much better* and *much worse*.

Response - Adequacy of environmental management

Judgement of the adequacy of environmental management was sought by introducing five aspects of management with: *Now we would like you to tell us what you think of*

the following items, followed by *Management of New Zealand's….* Five aspects were presented, each with a five-point scale anchored by *very good* and *very bad*.

A set of questions designed to measure perceived quality of current management of aspects of the environment was then presented. Thirteen items were measured on a five-point scale anchored by *very well managed* and *extremely poorly managed.*

A further set of management questions was designed to establish whether quality of management had changed over the previous five years for the same set of items as the previous question set. Each item was presented with a five-point scale provided for measurement anchored by *much better* and *much worse*.

Methods of data analysis

Whereas Hughey *et al.* (2001) used a wide variety of statistical tests to analyse the survey data, in this paper we rely on mean and percentage response rates and on Cronbach's Alpha correlations. Cronbach's Alpha coefficient is a calculated value (ranging between 0 and 1) based on the average correlation of items within a test if the response categories are standardised (Coakes and Steed, 1997). Values above 0.5 are considered acceptable as evidence of a relationship (Nunnally, 1967), while values above 0.7 are more definitive (Peterson, 1994). Such values are used in this paper to also demonstrate the validity of the P-S-R relationship.

Results

While our survey addressed a wide range of environmental components, this paper reports on only four: ‘air’, 'native animals and plants', 'marine fisheries' and ‘New Zealand compared to other developed countries’. ‘Air’ and ‘native animals and plants’ (biodiversity) have been chosen because the recent World Economic Forum (2002) Environmental Sustainability Index rankings placed New Zealand best of 142 nations for air quality, and worst for biodiversity. ‘Marine fisheries’ have been chosen because management of New Zealand marine fish stocks is frequently acclaimed as being amongst the most innovative in the world (e.g., Falloon, 1993 and Annala, 1996; but see also Wallace, 2002, for an alternative view). Finally, 'New Zealand compared to other developed countries' provides an international context.

Pressures on the environment

Respondents’ judgements of the main causes of damage to the environment are reported in Table 1. Note that respondents were asked to identify up to three main causes of damage to any of these resources.

An example serves to illustrate how Table 1 should be interpreted. The top cell under air shows that 85% of respondents indicated that motor vehicles were one of the three main causes of damage to air. Industrial activities (67%) were also seen to be a main cause of damage to air, followed by households (29%) and hazardous chemicals (28%).

In comparison, the most recent study for Environment Waikato (Key Research & Marketing Ltd, & Eclectic Energy, 2001: 64) revealed that vehicle emissions (47%),

industrial emissions (38%) and sprays/chemicals (17%) were the three main activities 'perceived to be damaging air quality'. Domestic fires (6%) were ranked as fourth highest damaging activity. In this survey, respondents were encouraged to name *all* causes of resource damage.

Pests and weeds (47%) were most widely considered to be important causes of damage to native plants and animals, followed by a group of problems that included sewage and stormwater, hazardous chemicals, urban development, solid waste dumping, and farming (range 19-23%).

For marine fisheries, commercial fishing (60%) was most widely considered to be an important cause of damage, followed by sewage and stormwater (32%), and hazardous chemicals (22%).

TABLE 1 GOES HERE

State of the environment

Table 2 shows the quality of New Zealand environments was generally perceived to be adequate to good (between 71% and 75%). The state of the natural environment in New Zealand compared to other developed countries received a higher mean rating: *good* to *very good*.

TABLE 2 GOES HERE

Change in the state of the environment over time

Most respondents considered that NZ's environment had either not changed or had worsened over the last five years (Table 3), with the state of marine fisheries most frequently perceived to have become ‘worse’ or ‘much worse’ (47%). Most respondents, however, believed that New Zealand's natural environment had improved relative to natural environments in other developed countries.

The above findings can be contrasted to the Waikato study, where respondents were asked ‘what is the change in the overall state of the environment?’ (Key Research & Marketing Ltd, & Eclectic Energy, 2001: 40). The regional level of negative response was lower in the Waikato than nationally with 16% (2000) and 12% (1998) perceiving that the overall state of their local environment had worsened.

TABLE 3 GOES HERE

Management Responses

Current management of the environment

Perceptions of quality of management are reported in Table 4. For native land and freshwater plants and animals, current management is considered to be adequately managed to well managed (76%). However, both air quality and marine fisheries are judged to be adequately managed to poorly managed (73% and 75% respectively).

This latter finding contrasts with the view that New Zealand's environment is well to very well managed compared to other developed nations.

TABLE 4 GOES HERE

Management of the environment compared to five years ago

Respondents' perceptions of changes in quality of management over the previous five years are reported in Table 5. Management quality was perceived to have improved relative to other developed countries. About half the respondents considered management of each resource had remained at the same level, although about 29% of respondents thought fisheries management had worsened. Nearly as many (24%) thought that marine fisheries management had improved.

TABLE 5 GOES HERE

Allocation of government spending

Respondents were asked to reallocate the existing government budget amongst a selected set of environmental and non-environmental items (Table 6). Total budget spending remained fixed.

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In non-environmental areas respondents wanted *more spending* on education, roads/transport, crime prevention, health and superannuation, *less spending* on defence, and either *no change* or *less spending* on income support. In terms of the natural environment, the majority want *more spending* on pests and weeds, endangered species and air quality. Most respondents considered there should be *no change* in expenditure for marine fisheries.

Overall findings

Respondents generally considered that in terms of pressures, states and responses, New Zealand was performing better than other developed countries and that for the resources examined here overall performance was in the adequate to good range, except for marine fisheries.

Consistency of responses

There is a high degree of consistency in responses between questions on native plants and animals (Cronbach's Alpha = 0.66), marine fisheries (Cronbach's Alpha = 0.76) and for New Zealand compared to other developed countries (Cronbach's Alpha = 0.83). For air there is a moderate level of consistency (Cronbach's Alpha = 0.51). Interpretation of Cronbach's Alpha indicates, for example, that where the state of an environmental aspect was evaluated to be poor, its availability was usually perceived to be low and its condition was judged to have changed for the worse in the last five years. In addition, these perceptions were commonly aligned to perceptions that current management is poor, and to the view that more money should be spent on the

particular aspect of the environment. This high degree of consistency is important to overall reliability of the survey and to the veracity of the following discussion.

Discussion

The discussion covers three main areas that are important in evaluating the validity of the survey and its potential worth in policy circles:

- How respondents' perceptions of the environment compare to scientific research and analysis for air quality, native land and freshwater plants and animals, marine fisheries and how New Zealand compares to the rest of the developed world;
- How perceptions surveying is complementary to SER initiatives and use of the P-S-R framework; and
- Implications of the survey for future policy making.

The relationship between perceptions and biophysical scientific measures

A decision system, based around the P-S-R framework, is used to help frame the following discussion. It is postulated that respondents, in general, will support more expenditure on a resource issue if:

(a) the state of the resource is not as good as desired or its state over time is declining;

(b) respondents consider there is a management action that can successfully address the problem or issue; and

(c) respondents perceive managers are capable of implementing these actions.

Alternatively, it is postulated that respondents, in general, will not support more expenditure on a resource issue if:

(a) the state of the resource is considered to be satisfactory; or

(b) nothing can be done to address the problem or issue; or

(c) management is considered to be inadequate.

Air

There is increasing concern amongst scientists about the health effects of air pollution in New Zealand. Fisher *et al*. (2002) reported that most of the increased mortality resulting from vehicle emissions (64% of the total) occurs in the greater Auckland region, an urban conurbation experiencing increasing difficulties with traffic congestion. Christchurch City has a particulate pollution problem associated with emissions mainly from solid fuel combustion for home heating (MfE, 1997: 6.16). Hales *et al*. (2000) linked increases in air-borne particulates to increased mortality and to an increase in respiratory hospital admissions. Despite these growing concerns, MfE (1997: 6.10) found that New Zealand has generally clean air. However, in cities such as Christchurch, for example, while "wintertime levels of smoke have decreased - significantly in the case of Christchurch - especially over the last decade" (MfE, 1997: 6.24), Christchurch smog levels still regularly exceed World Health Organisation limits every winter.

Notwithstanding the differences in questions between surveys, the order of causes of damage to air identified in this survey match closely those recorded by Environment Waikato (Key Research & Marketing Ltd, & Eclectic Energy, 2001: 64). In the

Waikato region, motor vehicle and industrial emissions are also ranked in first and second place. However, sprays/chemicals (in third position) are elevated above domestic fire emissions, perhaps because of the intensive agriculture in the region. Whereas the Waikato survey encouraged respondents to name *all* causes of damage, in this survey respondents were asked to identify only the three main causes of damage.

From the survey it is clear that New Zealanders generally believe that air quality is good and management of air is deemed to be adequate. The majority of respondents, nevertheless, believed air quality had declined in the last 5 years and this is matched by a demand for more expenditure on air quality management. Interestingly, 85% of respondents stated motor vehicles to be the chief cause of damage to air quality. Improving the quality of emissions from motor vehicles is technically a relatively simple task and one that would likely gain political support. However, although motor vehicle emissions are a major cause of concern in the Auckland region and many other areas, studies carried out in Christchurch and more southern population centres in New Zealand show that solid fuel home heating fires are the primary cause of localised deterioration of air quality (Gurnsey, 2002). Under these circumstances, where perception of the cause of the problem is different to the findings from scientific analysis, intervention in air quality is going to be politically difficult. Politicians cannot win in these situations, a position exemplified in Christchurch where the local regional council has been attempting for the last decade or so, often over differing ideological approaches to tackling the problem with the public and the local city authority, to introduce policy measures that will clean up the city's winter smog problem, almost always without success. This may be about to change as the

regional council is implementing a dual regulatory and educational programme, backed with financial incentives, to reduce winter smog (Gurnsey, 2002).

Native land and freshwater plants and animals

Conservation of New Zealand's native plants and animals is one of the country's main environmental issues (DoC and MfE, 2000), a view supported by the World Economic Forum (2002) finding that New Zealand's biodiversity performance is ranked worst of 142 nations. New Zealand has diverse flora and fauna, with over 2000 threatened or endangered plant and animal species (Hitchmough, 2002), some of which (e.g., kakapo and kiwi) are national symbols and attract high levels of media interest. From the survey it is clear that New Zealanders believe the condition of native land and freshwater plants and animals to be adequate to good, although there is a perceived decline in this position over the last five years. Management is deemed to be good and improving. Extra expenditure is supported for endangered species and pests and weeds. Given New Zealand's poor international ranking and the high number of endangered species it is difficult to understand why New Zealanders think the condition of native land and freshwater plants and animals is adequate to good.

Marine fisheries

In reviewing the state of New Zealand's marine fisheries the first state of the environment report noted that 'only 7 of 74 assessed fish stocks are considered to be below the maximum sustained yield level' (MfE, 1997: 9.104). New Zealand fisheries management is often seen as leading the world (e.g., Annala, 1996; Food and Agriculture Organisation of the UN, 1995), although some are not so positive in their analyses (see Wallace, 2002). Survey respondents viewed the state of the resource as adequate

to good, but declining over time. This view is backed up somewhat by recent scientific evidence (Turner *et al*., 1999) suggesting commercial fishing practices in New Zealand and Australia, which remove large marine organisms has a subsequent effect on fish species. Survey respondents considered management to be adequate to poor and to be getting worse. This is despite conclusions such as that from the Food and Agriculture Organisation of the UN (1995), which stated that 'on the whole the problems of fisheries in the South Pacific differ from those elsewhere since management of the fisheries is relatively advanced'. The fact that over 60% of respondents did not think any extra expenditure should go into marine fisheries seems somewhat at odds with some of the above findings about the deteriorating state of the resource, but is consistent with the view that management is adequate to poor and getting worse.

New Zealand's natural environment compared to other developed countries

Most people think that compared to other developed countries the natural environment in New Zealand is good to very good. Furthermore, over 60% think the condition of the New Zealand environment has improved relative to other developed countries. There are highly significant ($p < 0.001$) correlations between all responses to the core questions in this area. For example, those people who think the quality or condition of New Zealand's natural environment compared to other developed countries is good to very good also think the state of New Zealand's environment and its current management are good, and management compared to 5 years ago has also improved.

Findings from this survey reinforce the view that New Zealanders believe they live in a cleaner and greener environment than is found in other developed countries. This view concurs with the conclusions from the World Economic Forum (2002) report, which ranked New Zealand highly in terms of relative environmental sustainability.

Overall findings on the relationships between perceptions and scientific analysis

Evaluations of the survey findings against biophysical conclusions are equivocal. Respondents' views of the state of air, marine fisheries and New Zealand compared to the rest of the developed world align generally with scientific SER data. However, this is not the case for native land and freshwater plants and animals where perceptions are at odds with biophysical scientific reports.

Perceptions surveying, the P-S-R framework and SER

This study has systematically identified perceptions of the state of the environment using the Pressure-State-Response framework. Adapting this framework to a public survey has not been without difficulties. One difficulty was how to ask questions that made sense from a communication point of view and that would also contribute to the usefulness of the study. The concepts 'state' and 'pressure' are difficult to articulate within survey questions. Nevertheless, it has been possible to translate the framework into straightforward questions for postal surveys. As a consequence, the results of the survey are interpreted using the P-S-R framework and, along with the large sample size, the high response rate, and small margin of error, provide the most accurate representation yet of New Zealanders' perceptions of the environment. Indeed, New Zealand's Ministry for the Environment is planning to use findings from the 2002 survey to complement biophysical reporting information from its Environmental Performance Indicators programme (M. McLeod, MfE, pers. comm.).

A general finding from this work is that, on average, New Zealanders consider the state of their environment to be adequate to good. This response is consistent across the resources of: air, native plants and animals, and marine fisheries. While the state of the environment overall is thought of very highly, there seems to be a sizeable minority view (between 30-40% of respondents), that the state of the environment has deteriorated over the past few years. This common perception of resource deterioration contrasts somewhat with perceptions about management of those same resources. The vast majority of survey respondents think management has remained the same or improved over recent times, except for marine fisheries.

Relative to many other countries it is probably true that the state of the New Zealand environment is adequate to good (World Economic Forum, 2002). However, relative to even a few decades ago the picture is much more complex. For example:

- the quantity and quality of fresh waters in many rural South Island streams and rivers has declined, although it might have improved in the North Island (B. Johnson, Fish and Game New Zealand, pers. comm.);
- while threatened and endangered species management has improved, the numbers of species considered threatened has increased and habitat loss continues (DoC and MfE, 2000; Hitchmough, 2002);
- air quality has declined in some areas (MfE, 1997);
- the quality of water discharged into the coastal marine environment has probably improved (MfE, 1997).

Overall judgements about the state of the New Zealand environment and trends in the state are not easy to make. Respondents to the survey appear to be aware of some of

these divergent trends and gave differing ratings to the states of different parts of the environment, their management and changes in management quality.

Implications for policy making

Where there is evidence of divergence between scientific measures of the state of the environment, and New Zealander's perceptions of its state, provision of more information to the public about the scientific state of the environment is needed to achieve desired policy outcomes. For example, there has been a long running campaign by environmental non-governmental organisations (NGOs) and the Department of Conservation to establish many more marine reserves in New Zealand, yet the programme has been extremely slow to achieve results, with large-scale opposition to many proposals. This opposition is not surprising given the findings from this survey, for instance, most people think the state of marine fisheries is adequate to good. In that case there is little reason to support marine reserve establishment. Policy makers, in these sorts of circumstances, need to develop strategies that address such assumptions. An *integrated* environmental management approach, whereby the nature of environmental management problem is carefully defined, existing policy deficiencies are determined, and the views of all stakeholders are taken into consideration, may be the best strategy in such situations. Programmes that aim to disseminate biophysical scientific research findings need also to be carefully designed and must include consideration of the key points where public perceptions differ from research findings.

While almost all respondents wanted greatly increased government expenditure in the areas of health, education and law enforcement, there was discrimination between the environmental areas tested. Whereas there was much support for additional expenditure in the areas of endangered species and pest and weed control, over 60% of respondents thought expenditure on marine fisheries was adequate. The greatest remaining threat to endangered species in New Zealand is from pests and weeds (DoC and MfE, 2000). The P-S-R survey shows that New Zealanders are clearly aware of the threat and support increased expenditure for their control, another point that both policy makers and politicians could find of value. Knowledge of the degrees of public awareness and support for action removes major objections that policy makers and politicians may raise to avoid taking action to deal with these matters. Differences in opinion between the public, scientists, policy makers and politicians signal the need to identify the reasons for people holding different views, and to work on bridging gaps in perceptions to allow action to be taken in cases of critical environmental concern.

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Table 1: Causes of damage to air, native animals and plants, and marine fisheries in New Zealand (Note that figures in columns add up to more than 100% because respondents were allowed to select up to three causes.)

Potential causes of environmental damage	Air (% of respondents indicating up to 3 causes of damage)	Native plants and animals (% of respondents indicating up to 3 causes of damage)	Marine fisheries (% of respondents indicating up to 3 causes of damage)
Motor vehicles	85.3	4.0	0.9
Households	28.7	10.3	5.1
Industrial activities	67.3	21	14.0
Pests and weeds	4.0	46.9	3.7
Farming	2.2	18.9	1.6
Forestry	0.4	15.5	0.6
Urban development	13.3	21.8	2.3
Mining	1.5	9.7	1.1
Sewage and storm water	5.1	22.5	32.0
Tourism	0.8	6.0	5.0
Commercial fishing	0.6	2.1	59.7
Recreational fishing	0.1	1.0	15.4
Dumping of solid waste	8.6	19.5	14.9
Hazardous chemicals	27.6	21.9	22.1
Other	0.6	1.0	1.8

Table 2. Perceived state of New Zealand's environment (% of responses)

Perceived quality of ...	Likert scale					Mean score
	Very good (1)	Good (2)	Adequate (3)	Bad (4)	Very bad (5)	(1-5)
Air	20.2	47.5	23.8	7.2	1.3	2.22
Native land and freshwater plants and animals	13.0	44.0	30.7	10.4	1.9	2.44
Marine fisheries	7.1	34.5	37.6	17.6	3.1	2.75
New Zealand's natural environment compared to other developed countries	37.0	45.3	15.7	1.7	0.2	1.83

Table 3. The perceived state of the environment compared to five years ago (% of responses)

Perceived change over the last five years of ...	Likert scale					Mean score
	Much better (1)	Better (2)	No change (3)	Worse (4)	Much worse (5)	(1-5)
Air quality	3.7	10.6	49.0	33.9	2.8	3.22
Native land and fresh water plants and animals	2.9	19.3	47.2	28.3	2.4	3.08
Marine fisheries	2.1	13.8	37.5	41.8	4.7	3.33
New Zealand's natural environment compared to other developed countries	15.2	50.9	27.4	5.8	0.7	2.26

Table 4. Perceptions of current management of the environment (% of responses)

Perceived quality of management of ...	Likert scale					Mean score
	Very well managed	Well managed	Adequately managed	Poorly managed	Very poorly managed	
	(1)	(2)	(3)	(4)	(5)	(1-5)
Air quality	3.0	21.3	48.4	24.3	3.1	3.03
Native land and freshwater plants and animals	3.6	24.6	51.2	18.7	1.8	2.90
Marine fisheries	2.9	17.0	42.9	31.6	5.6	3.20
New Zealand's natural environment compared to other developed countries	13.3	45.5	35.5	5.0	0.8	2.35

Table 5. Quality of management compared to five years ago (% of responses)

Perceived change in management compared to 5 years ago of ...	Likert scale					Mean score
	Much better (1)	Better (2)	The same (3)	Worse (4)	Much worse (5)	(1-5)
Air quality	3.2	18.0	55.8	20.5	2.5	3.01
Native plants and animals	3.9	32.9	47.6	13.7	2.0	2.77
Marine fisheries	3.4	20.8	46.7	24.8	4.2	3.06
New Zealand's natural environment compared to other developed countries	15.8	42.5	35.8	4.7	1.3	2.33

Table 6. Preferences for allocation of government spending (%)

	Likert scale					
Ordered preferences for spending on ...	Spend far more (1)	Spend more (2)	No change (3)	Spend less (4)	Spend far less (5)	Mean score (1-5)
Health	43.1	41.2	14.6	0.8	0.3	1.74
Education	35.5	48.9	14.6	0.8	0.2	1.81
Crime prevention	36.2	45.5	17.3	0.9	0.1	1.83
Pest and weed control	11.1	47.7	38.9	2.0	0.4	2.33
Endangered species	17.5	38.0	39.7	3.8	0.9	2.33
Air quality	15.3	36.6	46.0	2.0	0.1	2.35
Roads and transport	14.3	39.2	42.9	2.8	0.9	2.37
Superannuation	14.1	33.5	45.5	5.6	1.3	2.46
Native forests and bush	8.6	36.8	50.2	4.1	0.3	2.51
Marine fisheries	4.7	29.1	61.0	4.3	0.9	2.68
Civil defence	4.4	23.1	64.7	6.3	1.6	2.78
Income support	6.8	15.8	44.0	24.1	9.2	3.13
Defence	6.1	22.1	37.5	21.3	13.1	3.13