

# **Public perceptions of New Zealand's state of the environment – how 'clean' and how 'green'?**

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## **Abstract**

New Zealander's perceptions of the state of the New Zealand environment were examined in a second Lincoln University national survey, conducted in March 2002. We report the public's perceptions of environmental quality in New Zealand, and comment on the claim that New Zealand has a 'clean green' image. The paper reports the public's perceptions of the causes of environmental damage, and comments on the items which might be tackled to support a 'clean green' image for international trade.

**JEL: Q0, Q1.**

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## **1. INTRODUCTION**

New Zealand has developed a number of strategies, and committed significant resources toward environmental goals, most recently beginning in 1995 following release of the Environment 2010 Strategy (MfE 1995). The goals of that strategy included: development of a sustainable land management strategy, ensuring that water was safe for swimming and for drinking, maintenance or improvement of air quality, maintain areas of indigenous forest, prepare a national biodiversity strategy, develop national and regional pest management strategies (OECD, 1996). The present government is preparing a sustainable development strategy.

New Zealand is often described as 'clean and green', and international marketing highlights the environment as a key feature of New Zealand. Reality may not match the slogans or advertising straplines, and considerable effort is being invested in developing state of the environment reporting, and resource accounting to ensure that New Zealand can better document its environmental performance (Department of statistics 2002). Earlier efforts to document the state of the New Zealand environment include Department of Statistics (1993), MfE (1997) and OECD (1996). Those documents focus on primarily biophysical indicators. There are however, few New Zealand publications documenting New Zealanders' perceptions of the environment.

The first State of the Environment Reporting (SER) exercise based on a survey of New Zealanders' perceptions of the environment in 2000 was reported by Hughey et al. (2001) using a survey based on the Pressure-State-Response model. OECD (1996) and MfE (1997) explain this model, which is used internationally as the basis for environmental reporting. The Hughey et al. (2001) survey was designed to be undertaken biennially and this paper, providing an overview of some key resource areas in relation to the 'clean green' perception of New Zealand, is drawn primarily from the findings of the 2002 survey, with some reference to the 2000 survey as appropriate. The survey asks respondents directly if they believe New Zealand is 'clean and green'. We report responses to that and several other questions. We focus on water, air and 'biodiversity' to provide a representation of public perception of the state of the environment. An additional focus is on an analysis of responses according to the ethnic background of respondents, i.e., Maori, NZ European or 'other'.

The main aims of the ongoing research programme are to measure, analyse and monitor changes in New Zealanders' perceptions, attitudes and preferences towards a range of environmental issues, ultimately contributing to improved state of the environment reporting. A component of each survey is a set of questions focusing on a topical issue, natural hazards in 2000, and the marine environment and recreational fishing in 2002.

## **2. SURVEY METHOD**

A postal questionnaire based on the Pressure-State-Response (PSR) model was developed to gather information on New Zealanders' perceptions of the environment and environmental management. The postal questionnaire was used to gather this information.

## 2.1. The questionnaire

Questionnaire items were presented in an A5-size booklet with questions on facing pages. Each questionnaire had fourteen pages of questions. A letter of introduction stating the purpose of the questionnaire, introducing the topics in the questionnaire and inviting voluntary participation was included. The questionnaire contained a total of 135 questions, seven of which were specifically linked to freshwater issues, six to air, and fourteen to biodiversity issues. 'Biodiversity' was subdivided into 'native land and freshwater plants and animals' and 'native bush and forests.' In this paper we focus on the former of those two categories. Other questions, including those reporting demographics, are also relevant and are referred to as appropriate.

The water, air and biodiversity -related questions in the 2002 survey were the same as those asked in 2000. The PSR framework guided the development of survey questions. Three sets of questions assessed perceptions of the state of water, air, biodiversity (and six other environment components) 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 did not feel they were sufficiently informed to respond. Perceived pressures were assessed by one set of questions. Further questions supplemented the PSR framework. These included measurement of the main perceived causes of damage to the environment. Nine questions sought demographic information, with the region of residence being determined by respondent's address.

The first question concerned knowledge about environmental issues and with whether New Zealand is 'clean and green'.

### **The state of air/fresh water/biodiversity**

Three questions measured the state of water/air/biodiversity. The first question was: *Please indicate what you think the state of each of the following is.* Followed by (*inter alia*): *The quality or condition of New Zealand's air, fresh water, etc.* A five-point scale was provided for measurement, anchored by *very good* and *very bad*.

The second question regarding the state of water/air, etc., asked: *We would like your opinion on the availability or amount of some of our natural resources.* Water was one of nine natural resources evaluated. The set was presented with five-point scales anchored by *very high* and *very low*.

The third measurement was of perceptions of change in the state of 13 environmental aspects over the last five years. These were taken 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.* Questions took the form: *Compared to five years ago the quality of air/fresh waters/, etc is?* These aspects were presented with a five-point measurement scale anchored by *much better* and *much worse*.

### **Pressures on the environment**

The PSR framework includes pressures on the environment. Perceived causes of adverse environmental effects were measured by presenting a table containing ten aspects of the New Zealand environment (including air, fresh water, and

'biodiversity') with fifteen potential causes. Respondents were instructed to select up to three causes. This approach was designed to assist respondents by removing the necessity to select the single most important item from the fifteen presented.

### **Adequacy of environmental management – the response**

A set of questions designed to measure current management of different resources was then presented. Thirteen items were presented in the form: *Currently in New Zealand air, fresh water, etc., are?* These items were each presented with a five-point response scale anchored by *very well managed* and *extremely poorly managed*.

Another set of management questions was designed to establish whether management had improved or had become worse over the previous five years. The question asked: *Compared to 5 years ago, management of New Zealand's air, etc., is?* These items were presented with five-point response scales anchored by *much better* and *much worse*.

### **Allocation of government funds**

The 2002 survey differed from the 2000 survey in terms of how respondents were asked to consider expenditure preferences. The latter mixed the major overall areas of government expenditure with some specific conservation and environment expenditure items. While these results were interesting, it was decided to improve the question in 2002 by separating the general areas of government expenditure from specific areas in environment and conservation. Despite these changes an effort is made to compare findings between surveys, although these comparisons need to be made with care.

To enable comparison between preferences for the allocation of government spending on conservation and the environment within the existing budget, respondents were asked whether they considered more or less should be spent on eleven items. The question began by stating: *Now we would like to know how you would **reallocate the Government's expenditure on Conservation and the Environment**. Total spending on Conservation and the Environment would not change. Please tick one box for each spending category to show how you would change the allocation of government spending if **total spending is the same as now**.* Measurement was then taken on five-point scales anchored by *we should spend far more* and *we should spend far less*.

### **Demographic information**

Information was sought regarding gender, age, country of birth, ethnicity, education, current situation, paid employment, the industry the person worked or had last worked in, and personal income. These were measured in some cases using categories from the 2001 New Zealand Census. Demographic information and the categories for their measurement are provided in Appendix 1, with comparisons between the 2000 and 2002 data sets. In addition, numbering of each survey allowed derivation of respondents' residential locations, which were subsequently categorised into three regions (southern, central and northern), and into two categories (either within the five major urban centres, or elsewhere).

Some preliminary work has been carried out to determine the representativeness of survey respondents compared to the New Zealand population. Both gender ( $\chi^2=4.86$ ; DoF=1;  $p=0.028$ ) and age ( $\chi^2=13.46$ ; DoF=5;  $p=0.019$ ) were significantly different to

comparative population data. Disproportionately more females and slightly older age groups responded (Table 1).

Table 1: Demographic data for the survey sample and the comparative NZ population.

Demographic	Group	Survey sample	New Zealand
Gender	Male	44%	48%
	Female	56%	52%
Age Band	20-29	15%	19%
	30-39	19%	22%
	40-49	20%	20%
	50-59	19%	16%
	60-69	13%	11%
	70+	14%	12%

## 2.2. Distribution

Two thousand questionnaires were distributed to randomly selected individuals 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 9 March 2002. In addition, a follow-up postcard on 28 March 2002 and a second questionnaire posting to non-respondents was made on 18 April 2002 to those who had not returned their questionnaire.

## 2.3. Response

The survey received an effective response rate of 45% (N= 836) (2000 survey response rate of 48 per cent; N = 894). Both surveys had maximum margins of error of 3% at the 95% confidence interval.

## 2.4. Methods of analysis

Due to the large number of relationships tested, in general only summarised results for significant relationships ( $p < 0.1$ ) are reported. Description of the components of the model is undertaken with means and standard deviations for interval or ratio data, and frequency of occurrence for categorical data measured on either nominal or ordinal scales. Where measured, 'don't know' responses are also provided.

Descriptive data for each of the resource-related questions are provided in Section 3, along with a comparison of 2002 survey results with those from 2000. Relationships between parts of the PSR framework and ethnicity were explored and are presented here as well. Chi square tests were used to test for changes in responses. Data conglomeration was necessary in some areas because there were too few valid responses in some cells to enable appropriate testing to be undertaken.

# 3. RESULTS

Results are presented in two main ways. First, descriptive statistics are provided in relation to each of the questions and where possible these are plotted against 2000 findings. Second, for most questions there is an analysis of responses against

ethnicity. Because sample sizes are too small in some cells we have clumped responses in this analysis for most questions.

### 3.1. "Clean and green"

Table 2 summarises responses to the question concerning New Zealand's 'clean and green' environment. Clearly, most respondents either agreed or strongly agreed with the statement. In terms of ethnicity (Figure 1) there is a significant difference ( $\chi^2=14.82$ ; DoF=4;  $p=0.005$ ) between the views of Maori (only 45.7% of whom strongly agree or agree NZ is regarded as clean and green), NZ European (with 66.9%) and others (with 77.3%). This trend is reversed in terms of the proportions that disagree or strongly disagree versus those who agree or strongly agree. Notably very few respondents expressed a 'don't know'.

Table 2: Is New Zealand's environment clean and green?

New Zealand's environment is regarded as "clean and green". Do you ...	N	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know	Mean (1-5)	Std. Dev.
		(1)	(2)	(3)	(4)	(5)			
		%							
	816	9.2	57.0	17.6	13.7	2.0	0.5	2.4	0.9

### 3.2. State of the environment

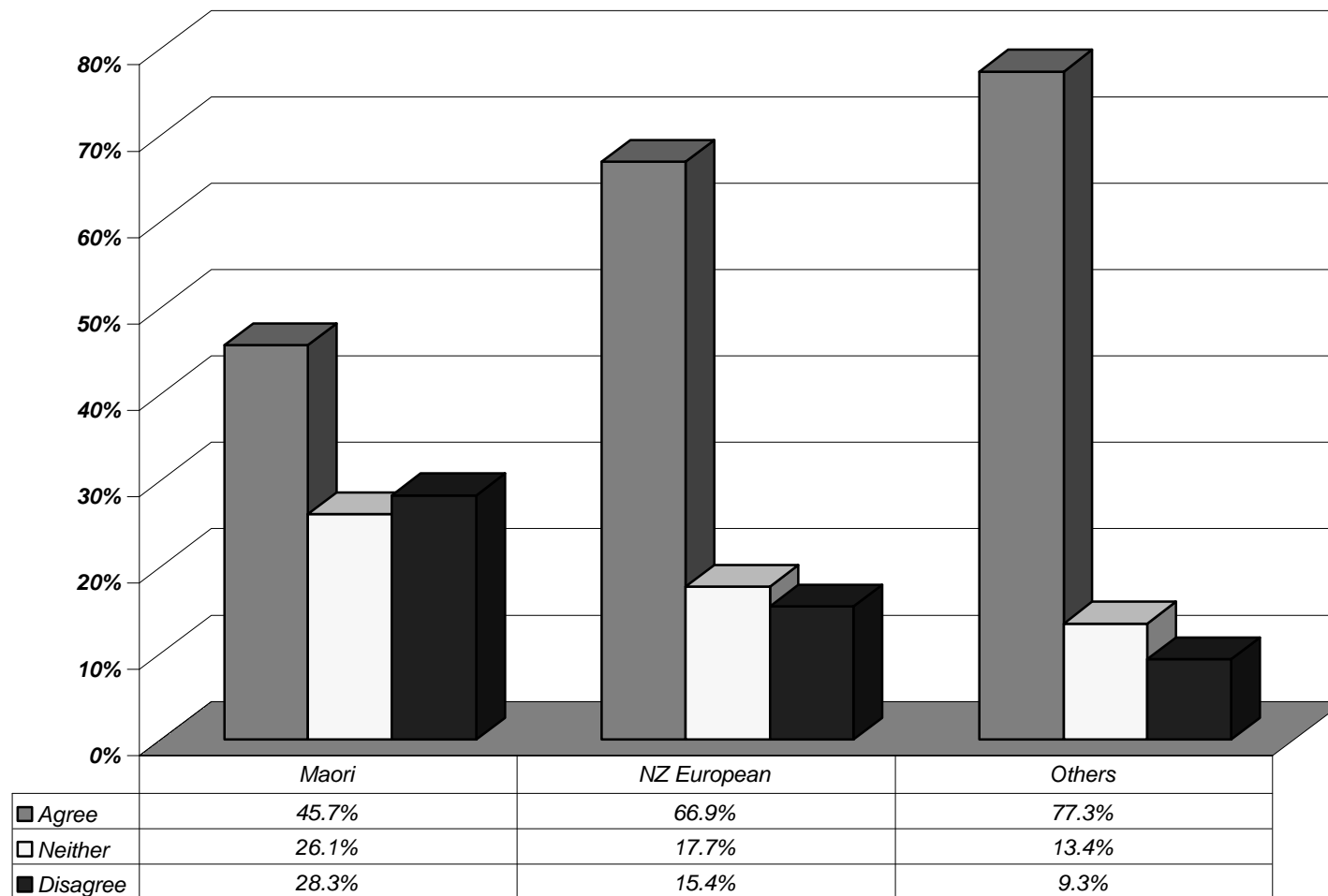
#### a) Quality of water/air/biodiversity in New Zealand

Table 3 shows that perceptions of the state of New Zealand's water/air/biodiversity are that it is generally *good to adequate* and the results from 2002 are not significantly different to those obtained in 2000. Ethnic differences are apparent, and highly significant ( $p<0.01$ ) for all three resources (see Appendix 2 for detailed data). In all cases more Maori respondents consider the state of the environment worse than do Europeans or others, the latter always giving it the highest ratings.

Table 3: Perceived quality or condition of natural resources in New Zealand.

Quality of ...	N	Very good	Good	Adequate	Bad	Very bad	Don't know	Mean (1-5)	Std. Dev.
		(1)	(2)	(3)	(4)	(5)			
		%							
Air									
2002	795	15.8	43.5	29.6	8.8	1.5	1.5	2.4	0.9
2000	866	20.0	47.0	23.6	7.2	1.3	1.3	2.2	0.9
Fresh waters									
2002	803	12.1	34.2	36.5	11.1	2.4	3.7	2.6	0.9
2000	875	11.7	35.3	35.1	12.2	1.9	3.8	2.6	0.9
Biodiversity									
2002	803	12.1	34.2	36.5	11.1	2.4	3.7	2.4	0.9
2000	870	12.6	42.8	29.9	10.1	1.8	2.8	2.4	0.9

**Figure 1: New Zealand's environment is "clean and green" versus ethnicity**



## b) Change in the state of the environment

As shown in Table 4 respondents generally considered that either no change in air or water quality or a change to the worse had occurred over the last five years. Less than 20% of either group of respondents considered improvements had occurred, with nearly 40% of respondents reporting a worsening of air quality and 30% a worsening of water quality. There is a significant difference between the 2002 and 2000 surveys ( $p=0.071$ ), with 2002 respondents rating changes slightly more positively. There were no significant differences between the perceptions of the three ethnic groups ( $p>0.10$ ).

Table 4: Change in state of environment over last five years.

Change in quality over last five years for ...	N	Much better (1)	Better (2)	No change (3)	Worse (4)	Much worse (5)	Don't know	Mean (1-5)	Std. Dev.
		%							
Air									
2002	805	0.9	11.2	44.5	34.5	3.3	5.6	3.3	0.8
2000	846	3.5	10.2	47.1	32.7	2.7	3.8	3.2	0.8
Fresh waters									
2002	805	1.7	16.3	44.5	25.8	3.0	8.7	3.1	0.8
2000	843	2.3	12.5	42.7	30.1	4.4	8.1	3.2	0.8
Biodiversity									
2002	807	1.9	22.2	38.7	23.4	2.0	11.9	3.0	0.8
2000	853	2.6	17.2	42.2	25.3	2.1	10.6	3.1	0.8

## 3.3. Management of the environment

### a) Current management

Perceptions of quality of management of particular environments are reported in Table 5. Between 60-70% of respondents considered each of the three resources to be adequately or better managed. While there were no significant differences between surveys for water or biodiversity ( $p>0.10$ ), more people in 2002 considered management of air was worse than did so in 2000 ( $\chi^2=14.149$ ; DoF=5;  $p=0.015$ ).



Table 5: Perceptions of current management of resources.

Perceived quality of management of ...	N	Very well managed (1)	Well managed (2)	Adequately managed (3)	Poorly managed (4)	Very poorly managed (5)	Don't know	Mean (1-5)	Std. Dev
Air									
2002	805	1.6	15.2	45.7	26.6	4.6	6.3	3.2	0.8
2000	851	2.8	20.1	45.7	22.9	2.9	5.5	3.0	0.8
Fresh Water									
2002	807	2.4	20.4	45.5	18.1	3.2	10.4	3.0	0.8
2000	846	3.3	20.1	45.3	17.6	3.2	10.5	3.0	0.8
Biodiversity									
2002	805	2.2	24.6	47.3	14.8	1.4	9.7	2.9	0.8
2000	849	3.3	22.5	46.8	17.1	1.6	8.7	2.9	0.8

**b) Management of air/water/biodiversity compared to five years ago**

Perceived changes in quality of management of over the previous five years are reported in Table 6. Most people thought that management was the same as or better than five years ago with no significant differences for water or biodiversity between the 2002 and 2000 surveys ( $p > 0.10$ ). However, for air, there has been an increase in the amount of adverse perception of management between the two surveys ( $\chi^2 = 11.661$ ; DoF=5;  $p = 0.040$ ).

Table 6: Quality of management of resources compared to five years ago.

Perceived change in management compared to 5 years ago for ...	N	Much better (1)	Better (2)	The same (3)	Worse (4)	Much worse (5)	Don't know (N)	Mean (1-5)	Std. Dev
Air									
2002	806	1.1	16.7	47.6	23.0	2.4	9.2	3.1	0.8
2000	843	3.0	16.5	51.1	18.7	2.3	8.4	3.0	0.8
Fresh Water									
2002	805	2.1	19.4	48.3	15.9	1.9	12.4	3.0	0.8
2000	837	2.9	17.6	49.5	13.9	3.5	12.8	3.0	0.8
Biodiversity									
2002	798	2.8	26.7	45.4	11.0	1.1	13.0	2.8	0.8
2000	843	3.6	29.7	42.9	12.3	1.8	9.7	2.8	0.8

### 3.4. Main causes of damage to the environment

Respondents' judgements of the main causes of damage to the environment are reported in Table 7. Respondents were instructed to select what they considered to be the main causes of damage from a list of fifteen items. Respondents could select up to three items.

An example serves to illustrate how Table 7 should be interpreted. The top left cell in column two indicates that 87.9% of respondents indicated that motor vehicles are one of the three main causes of damage to air. In terms of water there is a significant change between 2000 and 2002 ( $\chi^2=48.107$ ; DoF=14;  $p=0.000$ ; see Figure 2). In 2002 the most frequently cited main causes of damage were sewage and stormwater, followed by farming and by industrial activities. This can be contrasted with 2000 when sewage and stormwater, followed by hazardous chemicals and industrial activities were those most cited by respondents. The biggest change between 2000 and 2002 has been the increase in respondents choosing farming as one of the main causes of damage to freshwater. Significance of differences in proportions of respondents citing each cause in the two surveys is measured using the Z statistic. Significant changes occurred in 'farming' ( $p(Z)=0.000$  for all three resources), forestry ( $p(Z)<0.10$  for all three resources) and hazardous chemicals ( $p(Z)<0.10$  for all three resources). Both farming and forestry increased significantly as causes of damage for all three resources examined whereas hazardous chemicals declined. Urban development as a factor in 'biodiversity' loss declined between 2000 and 2002.

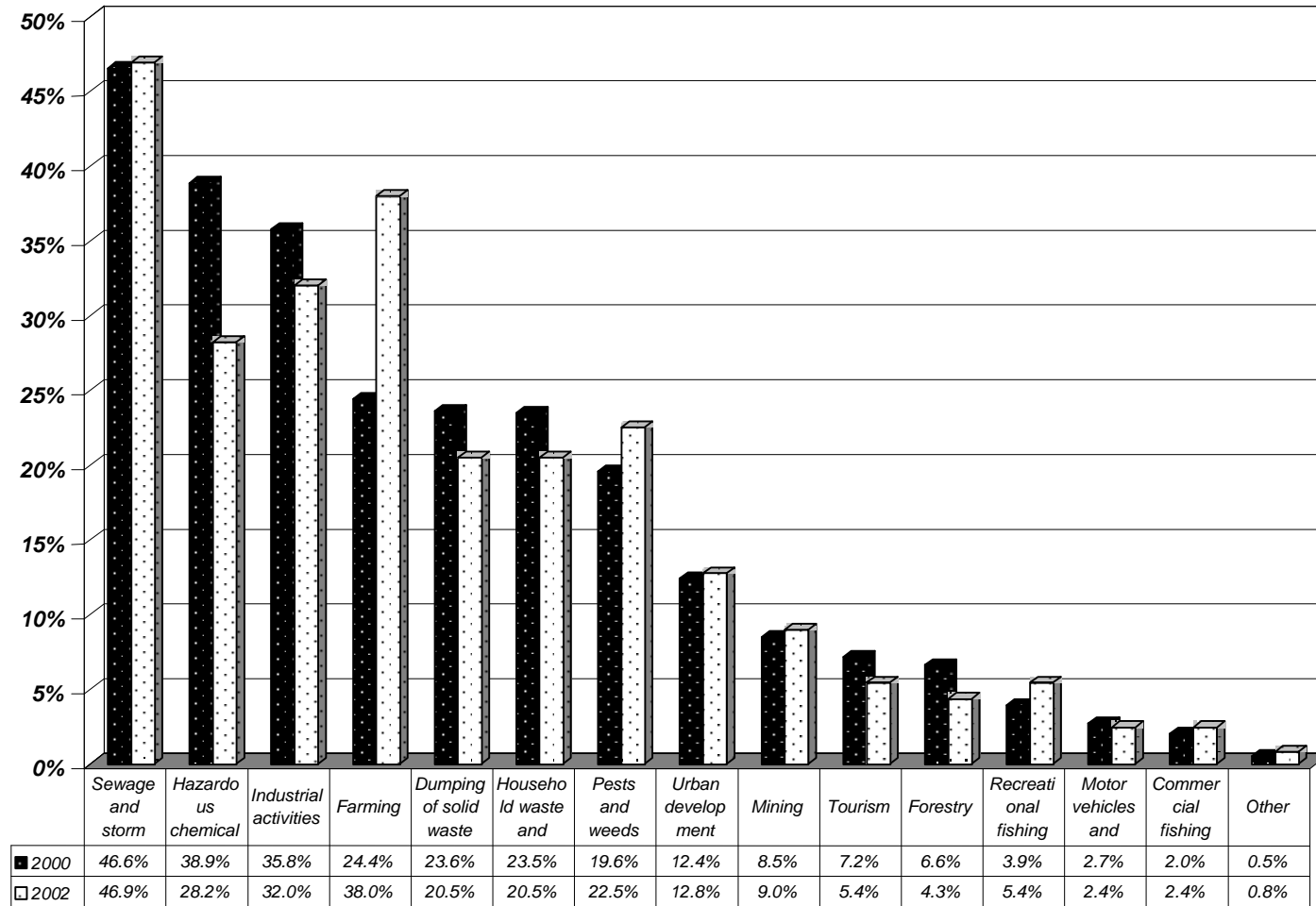
'Cause' responses have also been analysed by ethnicity. No significant differences occurred for 'biodiversity' ( $\chi^2=24.674$ ; DoF=18;  $p=0.134$ ) but did so for air ( $\chi^2=21.726$ ; DoF=12;  $p=0.040$ ; see Figure 3) and fresh water ( $\chi^2=26.662$ ; DoF=14;  $p=0.021$ ; see Figure 4). For air the ethnic pattern was very mixed. Over 90% of respondents from all groups considered motor vehicles and transport were the main cause, whereas only 16.7% of Maori compared for 32.1% of NZ European respondents thought household waste and emissions were one of the three main causes. The pattern was also mixed in terms of freshwater. The highest NZ European response was recorded for farming while for Maori and 'others' it was sewage and storm water.

Table 7: Main causes of damage to resources.

Resource:	Air			Fresh water			Biodiversity		
	2002	2000	Z score; 2 tailed probability	2002	2000	Z score; 2 tailed probability	2002	2000	Z score; 2 tailed probability
<b>Main causes of damage to fresh water:</b>	% of all survey respondents who gave this response			% of all survey respondents who gave this response			% of all survey respondents who gave this response		
Motor vehicles and transport	87.9	85.3	-1.574; p=0.116	2.4	2.7	0.312; p=0.755	4.9	4.0	-0.882; p=0.378
Household waste and emissions	28.5	28.7	0.128; p=0.898	20.5	23.5	1.390; p=0.164	8.7	10.3	1.106; p=0.269
Industrial activities	67.9	67.3	-0.269; p=0.788	32.0	35.8	1.520; p=0.128	17.9	21.0	1.623; p=0.105
Pests and weeds	3.5	4.0	0.611; p=0.541	22.5	19.6	-1.395; P=0.163	48.9	46.9	-0.855; p=0.392
Farming	5.6	2.2	-3.610; <b>p=0.000</b>	38.0	24.4	-5.688; <b>p=0.000</b>	27.9	18.9	-4.418; <b>p=0.000</b>
Forestry	1.2	0.4	-1.712; <b>p=0.087</b>	4.3	6.6	1.921; <b>p=0.055</b>	12.8	15.5	1.642; <b>p=0.101</b>
Urban development	12.4	13.3	0.541; p=0.589	12.8	12.4	-0.196; p=0.844	18.4	21.8	1.762; <b>p=0.078</b>
Mining	1.1	1.5	0.704; p=0.481	9.0	8.5	-0.309; p=0.758	10.8	9.7	-0.708; p=0.479
Sewage and storm water	5.1	5.1	0.002; p=0.999	46.9	46.6	-0.150; p=0.881	20.8	22.5	0.843; p=0.399
Tourism	0.7	0.6	0.157; p=0.875	5.4	7.2	1.367; p=0.172	7.7	6.0	-1.328; p=0.184
Commercial fishing	0.2	0.6	1.062; p=0.288	2.4	2.0	-0.544; p=0.587	1.6	2.1	0.884; p=0.377
Recreational fishing	0.0	0.1	1.001; p=0.317	5.4	3.9	-1.380; p=0.168	0.6	1.0	0.956; p=0.339
Dumping of solid waste	7.4	8.6	0.917; p=0.359	20.5	23.6	1.452; p=0.147	18.9	19.5	0.298; p=0.766
Hazardous chemicals	23.8	27.6	1.822; <b>p=0.068</b>	28.2	38.9	4.362; <b>p=0.000</b>	17.0	21.9	2.602; <b>p=0.009</b>
Other	1.3	0.6	-1.622; p=0.105	0.8	0.5	-0.643; p=0.520	0.7	1.0	0.652; p=0.515
<b>Number of survey respondents</b>	<b>836</b>	<b>894</b>		<b>836</b>	<b>894</b>		<b>836</b>	<b>894</b>	
<b>Number of people answering this question</b>	<b>760</b>	<b>819</b>		<b>737</b>	<b>741</b>		<b>707</b>	<b>769</b>	

Note: Percentages add to more than 100 because respondents could nominate up to 3 causes.

Figure 2: Perceived causes of damage to fresh waters



**Figure 3: Main causes of damage to air versus ethnicity**

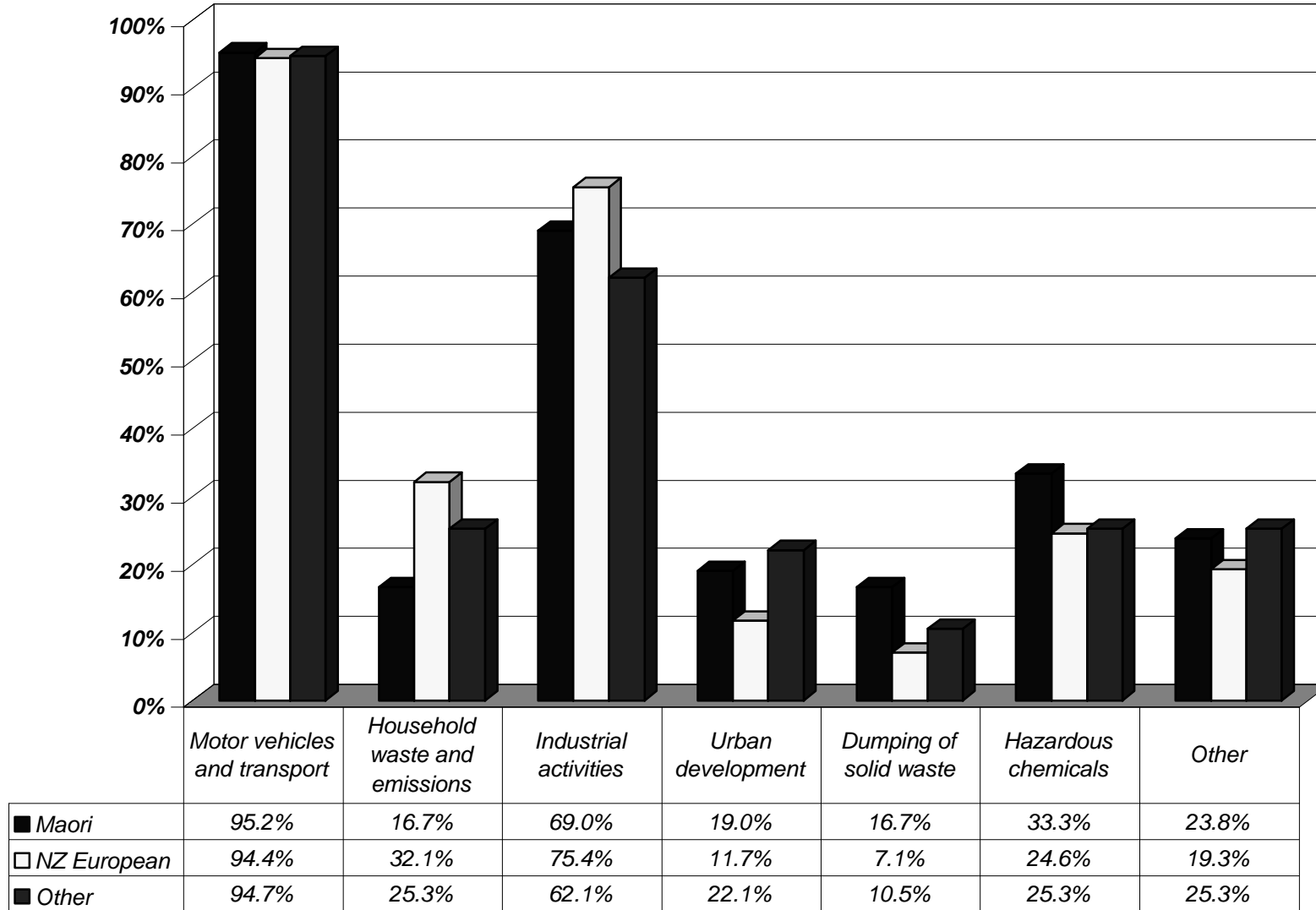
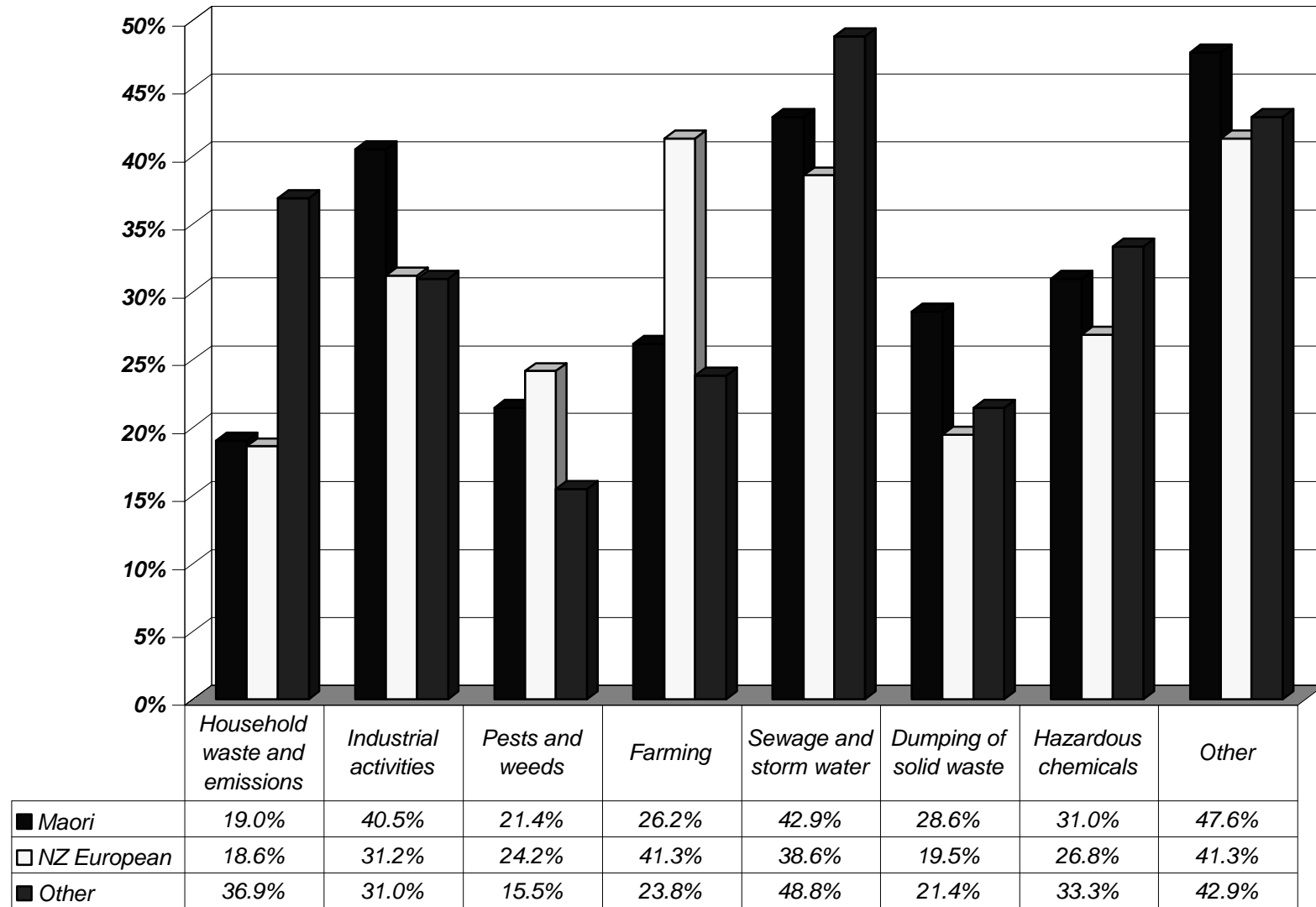


Figure 4: Main causes of damage to fresh water versus ethnicity



### 3.5. Allocation of government spending

Respondents were asked to reallocate the existing budget amongst a selected set of items. Total budget spending remained fixed. We provide data on preferences for spending on water as one example (Table 8). In 2002 people wanted more expenditure on water, whereas in 2000 they either wanted no change or more expenditure on water. There is a highly significant difference between the two surveys ( $p=0.0022$ ). This response is not surprising given the earlier result that people judged the quality of water has declined in the past two years.

Table 8: Preferences for allocation of government spending.

Preferences for spending on fresh water...	N	Spend far more (1)	Spend more (2)	No change (3)	Spend less (4)	Spend far less (5)	Mean (1-5)	Std. Dev
		%						
<b>2002</b>	770	13.3	45.6	38.7	2.1	0.3	2.3	0.7
<b>2000</b>	860	11.6	39.3	47.9	0.8	0.3	2.4	0.7

### 3.6. Major environmental issues

Respondents were asked to identify the most important environmental issue facing New Zealand today (Table 9). Pollution of a variety of sorts is the main issue identified in the survey.

Table 9: Most important environmental issues facing New Zealand.

Environmental Issue	% of valid responses
Air quality/pollution	17.3
Waste disposal and industrial pollution	11.8
Introduced pests, weeds and diseases	10.9
Water quality/pollution	10.8
Urban environment, population pressure and tourism	6.5
Climate change and ozone layer	6.3
Sustainable management of resources	6.3
Pollution (unspecified)	6.2
Wildlife and natural environment	5.9
Protecting environment/keeping New Zealand clean, green	5.6
Environmental education	3.8
Other	8.6
Total	100.0

## 4. DISCUSSION

A Pressure-State-Response model (as used for state of the environment reporting) approach guided data collection and subsequent analysis. We have focused in this paper on 'clean and green', and three components of the environment, water, air, and 'biodiversity'. Some key points identified in this selective research include the following:

- Respondents think New Zealand is clean and green, and this is in keeping with the reputation of New Zealand held abroad (Thornton et al. 2001)
- While respondents were happy with the state of water, air and native biodiversity, they are not so happy about trends in the state of air and, for water at least, would like more expenditure on the problems.
- It is notable that farming is increasingly considered a major cause of problems to water (which is consistent with recent media reports, e.g., NZ Environment, 2002: 1).
- It is notable that in virtually all situations there is a major divergence of views along ethnic lines - Maori consider states to be worse and getting worse than do NZ Europeans and others for all three resources examined here.
- Respondents judge that most of the main environmental issues New Zealand are clumped around pollution matters and not around biodiversity management, or GE for example. This finding is also consistent with the 2000 Massey University environmental survey (Gendall et al. 2001).

Most respondents agreed with the statement that New Zealand is 'clean and green'. However, it is clear that neither Maori nor NZ European are as convinced about this view as is the 'other' ethnic group. One possible explanation for this result is the 'other' ethnic group may contain a high proportion of relatively recent immigrants to New Zealand who judge that New Zealand is 'clean and green' compared to the environment in their source country. Further research is needed to determine if that is a valid explanation for the difference in views.

Our examination of air, water and biodiversity has identified some issues and anomalies. 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, water and biodiversity. 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), who consider 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.

Relative to many other countries it is probably true that the state of the New Zealand environment is adequate to good. Population density at 14 per km<sup>2</sup> is the fourth lowest in the OECD (OECD, 1999) and the pressures on the environment are much higher in more densely populated nations. A recent international study rated New Zealand, nineteenth for its environmental sustainability (World Economic Forum, 2002). These aggregate measures disguise areas where New Zealand environment performance is noteworthy and we comment on some of these below.



## *Air*

There is increasing concern amongst scientists about the health effects of air pollution in New Zealand, e.g., Fisher et al. (2002) regarding increased mortality from vehicle emissions in the greater Auckland region, and Hales et al. (2000) who linked increases in air-borne particulates to increased mortality and to an increase in respiratory hospital admissions in Christchurch. Despite these growing concerns, MfE (1997: 6.10) found that New Zealand has generally clean air, e.g., MfE (1997: 6.24) reported that "as with suspended particulate matter, smoke levels around the country have also shown some improvements over the last 10 to 20 years". 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), smog levels still regularly exceed World Health Organisation limits every winter.

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. This view is consistent with the World Economic Forum (2002) finding that ranks New Zealand first of 142 nations in terms of air quality. The majority of survey respondents, nevertheless, believed air quality had declined in the last 5 years - this perception is at odds with 'clean and green' image.

## *Water*

An OECD review of New Zealand's environmental performance judged that ... 'thanks to a very low intensity of water use and low overall levels of pollutant discharges from point sources, New Zealand's rivers, lakes and groundwater *generally present very high water quality*' (OECD, 1996: 181). In general respondents to our survey rated water quality as adequate to good but they also judged that water quality is deteriorating. Farming was judged by 38% of respondents to be a major cause of damage to water. This result may at least partly be the result of a 'dirty dairying' campaign by Fish and Game Councils (see for example New Zealand Environment 2002: 18). If the perception is that farming is a major source of damage then this may have trade implications for trade in dairy products where New Zealand trades on its 'clean and green' image.

## *Biodiversity*

Conservation of native plants and animals is one of New Zealand's main environmental issues (DoC and MfE 2000). This policy view is supported by findings from the World Economic Forum (2002), that reported New Zealand's biodiversity performance as worst of 142 nations. There is a diverse flora and fauna in New Zealand, with about 1000 threatened or endangered plant and animal species (DoC and MfE 2000), some of which (e.g., kakapo and kiwi) are national icons. From the survey it is clear that New Zealanders believe the condition of native land and freshwater plants and animals (biodiversity) to be adequate to good, although there is a perceived decline in this position over the last five years. Given New Zealand's 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. As with air then, New Zealanders' perceptions are at odds with scientific evidence.

### *Ethnicity and responses*

Crosstab analysis indicates that responses to many questions vary significantly with ethnicity of respondents. Maori judge that water quality, and management of water is lower than do New Zealand Europeans and 'other ethnicity' respondents. Maori recognition of the land as resources as taonga, and their concerns for guardianship (kaitiakitanga) might have adverse effects on New Zealand's environmental reputation. 'Other ethnicity' people includes, Pacific Island people, and Asians. There is some evidence that Asian people have differing attitudes toward environmental management than do New Zealand Europeans and Maori (MfE, 1997: 2.9).

### *Major environmental issues*

The identification of pollution as the most commonly cited environmental issue in New Zealand is surprising given the generally high air and water quality in New Zealand. Recent publicity attached to air quality in Christchurch, and Auckland, and water quality issues associated with dairy farming, and disposal of urban wastes, illustrates that low human population density is no longer sufficient to maintain high air and water quality (see also Gendall et al. 2001).

### *Concluding remarks in relation to the 'clean green' image and trade*

Gendall et al. (2001) undertook a detailed examination of New Zealanders' understanding of the 'clean green' image and found that 42% believe the image is a myth. We have taken a different approach in this study and have examined individual resource areas to gain an understanding of areas in which New Zealanders' consider the major changes and issues with respect to the environment exist. Some of these results are disturbing, both from an environmental management and, potentially, from a trade perspective. While most people (over 85%) think the state of the environment is adequate or better, between 25-30% believe that the state of the three resources addressed here is getting worse. Perhaps of greatest concern is the perceived contribution of farming as the most reported cause of damage to fresh waters, and that New Zealanders perceive both farming and forestry are increasingly important causes of damage to air, fresh water and biodiversity.

Kiwis' perceptions of and pride in their environment are likely to be communicated to current and potential visitors and trade partners. Consequently, for New Zealand to maintain its international reputation of a 'clean green' environment it would appear important that New Zealanders retain the same view. The critical importance of perceptions of New Zealand's 'clean green' environment to overseas purchasers of our products has already been shown (Thornton et al., 2001). Our data indicate perceptions of a worsening environment and a growing level of interest in the impact of farming on natural resources. If these trends continue then, in time there could be spillover effects on international trade. Given that both tourism and farming obtain premiums based on the 'clean green' image, then politicians and policy makers should consider undertaking policy actions to enhance environmental management in order to maintain perceptions of environmental quality. The fact that respondents want more spent on water is, perhaps, a signal that the New Zealand public thinks so too.

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## Appendix 1: Demographic information

Information was sought regarding gender, age, country of birth, ethnicity, education, current situation, paid employment, the industry the person worked or had last worked in, and personal income. These were measured in some cases using categories from the 2001 New Zealand Census. Demographic information and the categories for their measurement are provided in Appendix 1, with comparisons between the 2000 and 2002 data sets. In addition, numbering of each survey allowed derivation of respondents' residential locations, which were subsequently categorised into three regions (southern, central and northern), and into two categories (either within the five major urban centres, or elsewhere).

Some preliminary work has been carried out to determine the representativeness of survey respondents compared to the New Zealand population. Both gender ( $\chi^2=4.86$ ; DoF=1;  $p=0.028$ ) and age ( $\chi^2=13.46$ ; DoF=5;  $p=0.019$ ) were significantly different to comparative population data. Disproportionately more females and slightly older age groups responded (Table 1).

Table A: Summary of comparative demographic data between the survey sample and the comparative NZ population.

Demographic	Group	Survey sample	New Zealand
Gender	Male	44%	48%
	Female	56%	52%
Age Band	20-29	15%	19%
	30-39	19%	22%
	40-49	20%	20%
	50-59	19%	16%
	60-69	13%	11%
	70+	14%	12%

Age is the only demographic for which there is a significant difference between the 2000 and 2002 respondents (Table B). The average age of respondents in 2002 is 2 years older than in 2000, and relatively more respondents 40 years and older participated in 2002 compared with 2000.

Table B. Comparison of demographic data between the 2000 and 2002 perceptions surveys.

Demographic	Chi squared	Degrees of freedom	Probability of chi squared
Regions	4.45	2	0.11
Gender	1.33	1	0.25
Age band	24.03	6	0.001
Education	6.90	6	0.33
Current situation re employment	5.84	6	0.44
Paid employment	3.33	2	0.19
Income	1.26	7	0.99

## Appendix 2: Ethnic perceptions of resource quality in New Zealand

Table C: Analysis of ethnic differences in perceptions of resource quality.

	Environmental quality ratings	Maori (N)	NZ European (N)	Others (N)	Chi squared; Degrees of Freedom; probability of chi squared
Air	Very good-good	18	378	64	$\chi^2=27.528$ ; DoF=4; p=0.002
	Adequate	11	197	20	
	Bad-very bad	14	57	10	
	Total	43	632	94	
Fresh waters	Very good-good				$\chi^2=25.74$ ; DoF=4; p=0.000
	Adequate				
	Bad-very bad				
	Total				
Biodiversity	Very good-good	19	353	67	$\chi^2=27.693$ ; DoF=4; p=0.000
	Adequate	12	205	22	
	Bad-very bad	14	68	4	
	Total	45	626	93	