



**Science and the
General Public
in 2005**



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Recommendation Prepared For:

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Table of Contents

Executive Summary	3
Needs Assessment	6
Research Design	7
The Report	9
Interest in and Benefits arising from Science	10
Interest in Science and Science Learning.....	17
Relationships between Science and the Economy	21
Sociological Aspects of Science	27
Information and Trust in Relation to a Specific Science Issue	29
Whether Receive Sufficient Information about Science.....	33
Appendix I: Questionnaire	34

Executive Summary

Introduction In 2002, MoRST commissioned research into public attitudes towards science and technology, and looked at ways in which the public conceptualise science. This 2005 survey was undertaken to inform several aspects of MoRST's policy work, in particular the impact of attitudes about science on the potential supply of future scientists needed for New Zealand's ongoing research programmes.

Methodology This quantitative survey was undertaken via CATI (Computer Assisted Telephone Interviewing) on 4 to 23 April 2005.

General Attitudes to Science A majority of New Zealanders are interested in at least some aspects of science and technology. Familiarity and accessibility (to personal experience and daily lives) are instrumental factors in stimulating interest, with interest highest in areas relating to new medical techniques, saving endangered species, new forms of energy for transport and improving the quality of our agriculture and horticulture.

This means it is important to place science in a real life context, to engage public interest and stimulate debate.

Science and Learning People have a broad appreciation of the role of science in society, and the importance of scientific advance and discovery for New Zealand's and the world's future.

Over eight in ten consider that science *is an important subject for students to study at school*, and that it *is a worthwhile career to pursue*. Those who agree that science is a worthwhile career to pursue mentioned two themes: the opportunity to make a contribution to the world in a discipline that is constantly moving ahead and changing, and/or the value of a subject that broadens horizons, and offers the potential for a satisfying and rewarding career.

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Executive Summary, Continued

Disagreement that science is a worthwhile career to pursue generally relates to perceptions of limited job availability and comparatively low-income levels.

Risk and the Regulation of Scientific Research

People clearly appreciate the contribution science makes to New Zealand, in both economic and environmental terms, and perceptions of the contribution science makes have increased since 2002, particularly in terms of environmental preservation.

Given the high level of acknowledgement of the role of science, it is not surprising that two in three people support the government funding basic scientific research regardless of the economic benefit. Agreement has also strengthened on this dimension since 2002.

It is encouraging to note that perceptions of science being out of control have diminished significantly since the 2002 survey. There is still a significant level of desire for government control over scientists, and accountability of scientists to the public, although the level of agreement about the need for this has declined significantly since 2002.

The Right Science for New Zealand's Future?

People show a high level of respect for the quality of science work conducted by New Zealand scientists, and there is a wide belief that they do world class work. Two in three people agree that New Zealand scientists are doing the science research that New Zealand needs for the future.

Agreement is based on the perception that:

- New Zealand scientists are focusing on research relating to New Zealand specific issues, arising out of our physical isolation and our economic and environmental needs.
 - New Zealand scientists have a history of successful scientific discoveries. There is a hope that their work will keep New Zealand science to the forefront internationally, and that it may have wider benefit for the whole world. Medical research was mentioned as a specific example of our success.
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Executive Summary, Continued

- However, there is some feeling that New Zealand scientists are limited by a lack of resource and a concern that scientific talents are being lost to overseas countries.

The small proportion who disagree that New Zealand scientists are doing the research that New Zealand needs for the future are not convinced that New Zealand scientists have their priorities correct, or are heading in the right direction.

Preferred Information Sources

Most people are discriminating of the sources they trust to access information about a science matter, such as environmental pollution. The majority would expect to access information from a professional scientific source. Television has reasonable credibility, either in documentary or current affairs guise.

Media sources such as newspapers, the Internet and radio talk back are not considered trustworthy sources. Politicians are the least trusted source of information about science issues.

Whether People Receive Enough Information about Science

While about half of those surveyed feel they receive about the right amount of information about science these days, over forty percent feel they receive too little. This indicates opportunity for more communication about science issues in a way that connects with its impact on people's daily lives.

Needs Assessment

Background In 2002 the Ministry of Research, Science and Technology (MoRST) undertook a benchmark study of public knowledge and attitudes toward science and technology, and looked at ways in which the public conceptualise science.

In 2005, MoRST has commissioned further research to inform several aspects of their ongoing policy work. In particular MoRST is interested in the impact of attitudes and beliefs about science on the potential supply of future scientists needed for New Zealand's ongoing research programmes.

There are three components to the research:

1. A repeat of the 2002 quantitative study, with some modifications in line with updated objectives (undertaken by ACNielsen)
2. Production of a background paper that discusses the subject choices students make for their senior secondary school years and when in transition to tertiary education (to be undertaken by NZCER)
3. Conversations with final year school students, who could potentially study science at university, to ascertain the factors that have impacted on their decisions about their courses of tertiary study (to be undertaken by NZCER).

This report presents the findings of the 2005 quantitative study.

Research Objectives

The research assesses:

- Interest in science research areas, and perceived areas of benefit
 - Interest in science learning and perceptions of science as a career
 - Relationship between science and economic success
 - Sociological aspects of science
 - Source trustworthiness in relation to science issues
-

Research Design

Method The telephone survey was conducted using ACNielsen's Auckland-based CATI (Computer Assisted Telephone Interviewing) facility. Fieldwork was conducted from 4-23 April 2005 during evenings and weekends.

Sample The total sample was 800 people. It was a fully national sample that was representative of New Zealand's main urban, secondary urban and rural urban populations. To be eligible, people had to be 18 years and over.

Where there was more than one eligible person per household, the 'next birthday' method was used to randomise respondent selection. Telecom's Electronic White Pages provided the sample frame.

Response Rates Response rates for telephone surveys vary according to the survey topic and its intrinsic interest level, and according to the questionnaire length. This questionnaire was relatively long for a telephone survey (average interview length was 17 minutes). The response rate achieved was an average one for a survey of this length.

Four call-backs were made to each household selected for interview, to help boost response rates.

- The response rate (based on interviews achieved versus number refused) was 19 percent.
 - The response rate (based on total eligible numbers, including refused, no answer, engaged, people unavailable during survey period, language barriers etc.) was 13 percent.
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Research Design, Continued

Questionnaire The 2005 questionnaire was based on the 2002 benchmark questionnaire. This was developed principally by the New Zealand Council for Educational Research (NZCER), drawing on other international studies such as the UK Wellcome Trust's 2000 Study of Science and the Public, and the findings of literature reviews, etc.

Major changes to the 2005 questionnaire were as follows:

- Removal of references to technology to give the questionnaire a tighter **science** focus.
- Addition of questions relating to value of science as a career
- Modification of questions about Information and Trust
- Pre-coding of open ended questions, based on responses in the 2002 survey. Additional responses that did not fit the pre-codes were coded at the data analysis stage
- Deletion of some open ended questions

Margins of Error

Margins of error for key sub sample and sample sizes at the 95% confidence level are as follows.

Sample size	Margin of error
800 (total sample)	+/- 3.5%
383 (men)	+/- 5.0%
417 (women)	+/- 4.8%
163 (have formal science training)	+/- 7.7%
637 (no formal science training)	+/-3.9%

The Report

Notes to Report

- The report comments on differences between subgroups. While some of these are not statistically significant, they do highlight emerging differences and trends.
 - Responses to some open-ended questions total more than 100%. Respondents could provide more than one reason for their answer.
 - ‘*’ appearing in a table indicates a percentage of less than 0.5%.
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Interest in and Benefits arising from Science

Introduction To provide a context for consideration of the topic, respondents first rated their level of interest in a range of topical scientific and technological areas, and then rated the level of benefit they consider each has or is likely to offer to humanity.

These questions sought to correlate people's interest in the various areas with the perceptions of the benefits that science research could bring.

Note: while the broad areas assessed were the same in both years, in 2005, the wording of some statements was honed, to increase their relevance. References to technology were removed.

Interest in Different Science Areas

As the following chart shows, three broad groupings emerged, with greatest interest shown in areas that directly affect people's personal lives, or that are easy to relate to and understand. The groupings were the same as those observed in 2002, although there were increases and declines apparent for some individual topics.

- First tier (70 percent interest or higher): New medical techniques and treatments; saving endangered species; New forms of energy for transport; Improving quality of our agriculture and horticulture
- Second tier (51 to 65 percent interested): Genetic testing for human health issues; Understanding earthquakes and their effects on people; Research into climate change; Computing and the Internet;
- Third tier (less than 30 percent expressing interest); Space research and astronomy; Cloning

As in 2002, people have the greatest level of interest in *new medical techniques and treatments* (82 percent interest), the area of science that directly affects them, and the area they consider has the greatest benefit for their lives (91 percent beneficial).

People claim a relatively high level of interest in *saving endangered species* (74 percent interest), which may reflect the high level of media attention in New Zealand to saving species of native bird and sea-life, such as kiwis, kakapo, dolphins, etc. However claimed interest in this area has shown some decline compared with 2002.

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Interest in and Benefits Arising from Science, Continued

An increased level of interest is apparent for transport related research, in particular *new forms of energy for transport* (75 percent interest in 2005 compared with 56 percent in 2002). While this may reflect recent petrol price increases and media attention about the declining petroleum based energy reserves worldwide, there has been a question wording change, which may also account for this. In 2002, people were asked about their interest in '*new methods of transport*' whereas there was greater emphasis on *energy forms* in 2005.

Interest in *improving the quality of our agriculture and horticulture* remains strong (at 70 percent). (Note: a wording change: in 2002, people were asked about *improving the quality of our agriculture and horticultural products*.)

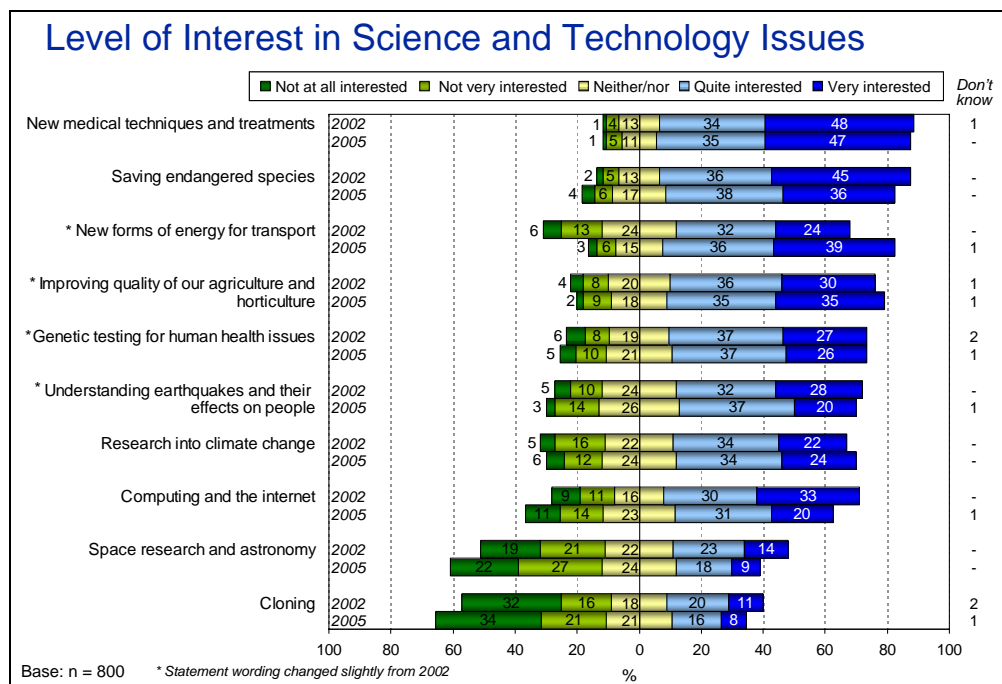
A second tier of scientific and technology topics emerged, with between half and two-thirds of the sample claiming interest in each. This group contained a mix of physical sciences, electronic technologies, and engineering sciences. It included *genetic testing for human health issues* (63 percent), *understanding earthquakes and their effect on people* (57 percent), and *research into climate change* (58 percent), *computing and the Internet* (51 percent). Compared with 2002, the claimed interest levels in computing and the Internet have decreased by 12 percentage points, which may reflect the fact that they have increasingly become a mainstream part of people's everyday work and home lives.

Two areas, that are remote from people's daily lives, and for which fewer societal benefits are perceived from research, have shown declines in stated interest: *space research and astronomy* (27 percent) and *cloning* (24 percent). At the time of the 2002 survey, there was publicity surrounding the cloning of Daisy the cow. But there has been less mainstream media comment about cloning during 2005.

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Interest in and Benefits Arising from Science, Continued

The chart below compares responses for 2002 and 2005.



Subgroup differences

Some general trends in interest levels emerged, along with trends specific to the area of science.

- Generally, people with formal training in science claimed greater interest in the topics than did those with no formal science training.
- Interest in science topics such as *new forms of energy for transport* was reasonably consistent across all demographics. However there appears to be a positive relationship between interest level in this field and respondent education level (70% among people who received only primary/secondary school education, 76% among those with a technical qualification, and 81% among those with a university education). Mirroring this relationship, there is also a positive relationship between the level of interest in this topic with the level of personal income.

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Interest in and Benefits Arising from Science, Continued

- Some areas appealed differently to men and women. Men showed greater interest in high technology areas such as *space research and astronomy* (33 percent interest among men vs. 22 percent interest among women), *new forms of energy for transport* (85 percent interest among men vs. 68 percent interest among women).
- Women showed greater interest than men in topics like *saving endangered species* (79 percent and 68 percent interest respectively), *genetic testing for human issues* (67 percent and 58 percent interest respectively) and *cloning* (28 percent and 20 percent interest respectively).
- While *computing and the Internet* continue to be appealing to people under 34 years old, interest in *space research and astronomy* has faded among this younger age group.
- Interest increased with age for science topics like *genetic testing for human issues*, and *new medical techniques, improving the quality of agriculture and horticulture, understanding earthquakes and research into climate change*. These age related differences are likely to reflect the impact of life experiences on interests.
- Some ethnic differences were apparent, although these should be read with caution in view of the small Pacific peoples and Asian sub samples.
- Asian patterns of response were different on some dimensions, with greater than average levels of interest in *computing and the Internet*, and lower than average interest in *saving endangered species* and *climate change*. These differences may indicate values based differences, but they are more likely to reflect age related differences, as the Asian sub sample had an age profile that was younger than that for the total sample.

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Interest in and Benefits Arising from Science, Continued

Benefits Associated with Science

When asked how beneficial they feel each of the developments has been or is likely to be to humanity, broad groupings of perceived benefit again emerged, that were similar to those observed for interest levels.

While the perceived benefits of most areas are relatively stable, perceived benefit has changed in some other areas since 2002.

Three areas stand out, as being of major benefit to humanity, with high levels of 'very beneficial' ratings:

- *New medical techniques and treatments* continues to be rated the most beneficial research area of all (with 91% considering it so).
- More than four in five people rated *improving the quality of agriculture and horticulture* (83% beneficial),
- In line with the positive change in interest level in *new forms of energy for transport*, the perceived benefit has increased significantly, with 83% considering this a beneficial area of development.

Although still regarded as beneficial by between a half and two thirds of those surveyed, the perceived levels of benefit have decreased for:

- *saving endangered species* (from 80% to 67% beneficial)
- *genetic testing for human health issues* (from 73% to 67% beneficial)
- *research into climate change* (from 68% to 65% beneficial)
- *computing and the Internet* (from 65% to 52%)

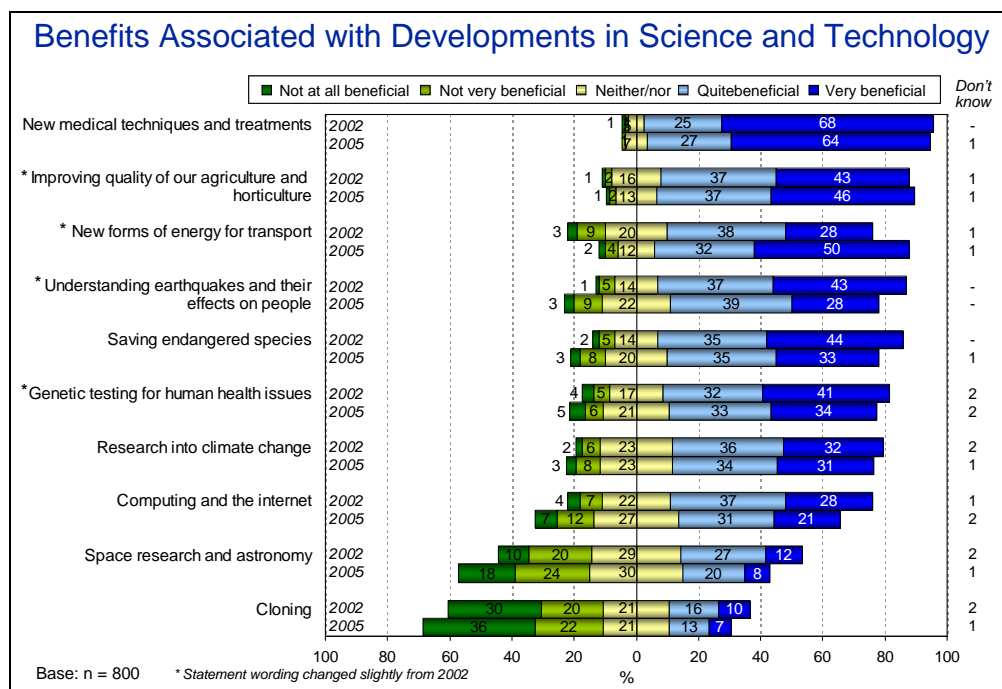
The two least accessible and/or acceptable areas of science also show a significant drop in perceived benefit levels; neither is perceived to be particularly beneficial.

- In 2005, only 28% consider *space research and astronomy* offers benefits (28% beneficial down from 39% beneficial in 2002).
- Negative opinion about the benefits of *cloning* now strongly outweighs favourable opinion (58% not beneficial versus 20% beneficial).

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Interest in and Benefits Arising from Science, Continued

The chart below compares responses about the perceived benefits associated with developments in science for 2002 and 2005.



Subgroup differences

Patterns of response were generally similar to those outlined for levels of interest in science areas.

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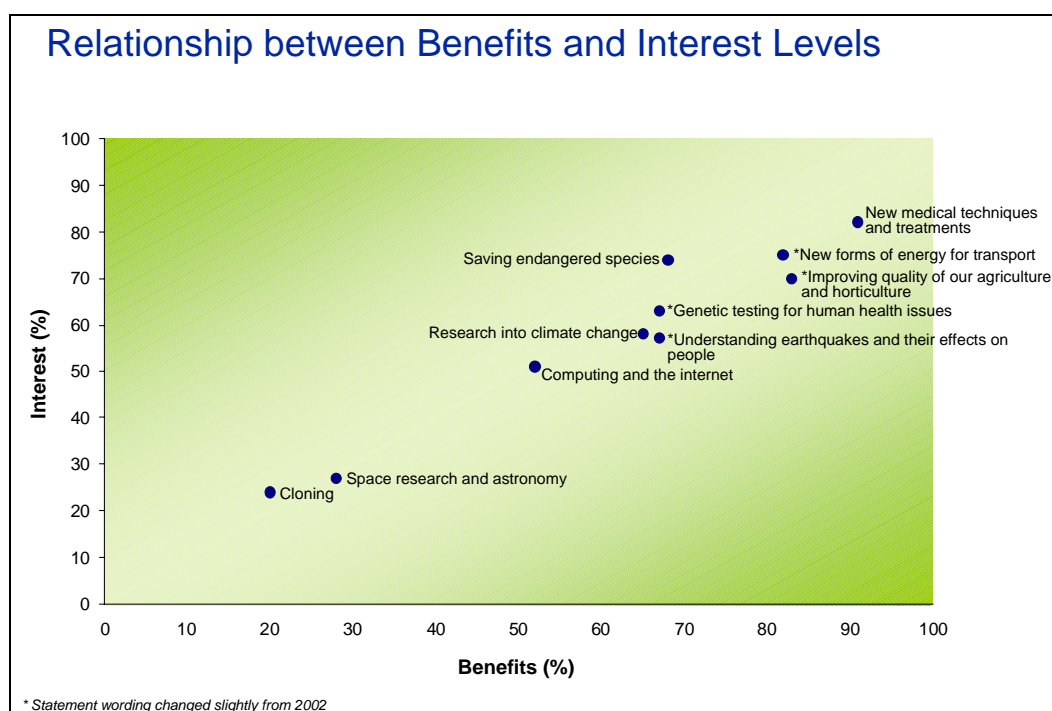
Interest in and Benefits Arising from Science, Continued

Relationship between Interest and Benefits

The following chart plots the relationship between declared interest in and perceived benefits associated with the areas of science and technology.

It indicates that interest in an area of scientific research is strongly related to the perceived benefits of that research.

Patterns of response observed in 2005 were similar to those observed in 2002.



Interest in Science and Science Learning

Introduction Questions in this section assessed people's personal interest in science learning, and perceptions of science as a career.

Interest in Science Learning Overall science and science learning are valued, both in career terms and as a part of people's daily lives.

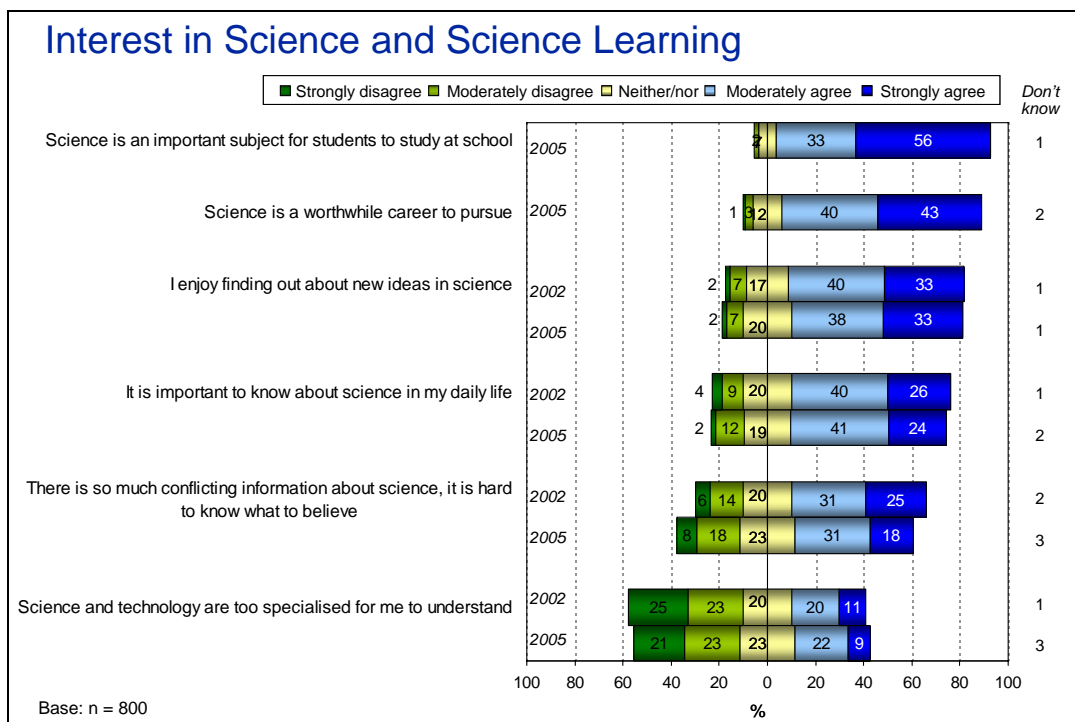
- 89 percent consider *science is an important subject for students to study at school*, and 83 percent say *science is a worthwhile career to pursue*
- 65 percent acknowledge the importance of knowing about science in their daily lives and 71 percent say they enjoy finding out about new ideas in science

People tend to disagree that *science and technology are too specialised for them to understand* (44 percent disagree that this is so, while 31 percent agree). There is, however, reasonable agreement (49 percent agreement) that *there is so much conflicting information about science that it is hard to know what to believe*.

As the following chart shows, results are stable, compared with 2002.

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Interest in Science and Science Learning, Continued



Subgroup Differences

Some demographic differences were apparent in the views expressed:

- The importance of teaching science to school students is widely appreciated across all demographics, with nearly all of those who have received formal science training acknowledging its importance.
- There is a wide agreement about the worthiness of pursuing science as a career. People of 65 years of age or older, and/or those who have received formal training in science tend to hold this view more strongly than the other people.
- The importance of knowing about science in their daily lives is also widely appreciated. But those with formal science training attach greater importance to it than others (87 percent versus 59 percent).
- Enjoyment in finding out about new science ideas is greater than average among those with formal science training, those with tertiary education (a wider subset than those with formal science training), and, related to this, those in professional roles. Enjoyment was lower among retired people.

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Interest in Science and Science Learning, Continued

- Those who tend to find science and technology too specialised to understand and those who find it hard to know what to believe, tend to be those with no tertiary training, and those with no formal science training. In demographic terms they are more likely than average to be older people (over 65 years), women, people employed in sales/clerk type roles and Maori.

Reasons for Views about Science as a Worthwhile Career

Overall, the vast majority of those (83 percent) surveyed consider *science is worthwhile career to pursue*, while only a small minority (4 percent) disagree. 12 percent have a neutral view. Those who agreed or disagreed with the statement were asked the reasons for their agreement or disagreement.

Those who **agree** that science is a worthwhile career to pursue mentioned two themes: the opportunity to make a contribution to the world in a discipline that is constantly moving ahead and changing, and/or the value of a subject that broadens horizons, and offers the potential for a satisfying and rewarding career. Specific reasons given for considering science is a worthwhile career were as follows:

- May make a contribution to the world. People acknowledge the need to continue to make new discoveries and progress
- It will broaden their horizon, increase awareness of the world
- Science is the future. Working in science equips them for day to day life in the future
- A career in science is satisfying and rewarding, and one that offers good opportunities

Among those who **disagree** that science is a worthwhile career to pursue, the main reasons generally related to perceptions of limited job availability and comparatively low income levels. However, for some, it was more that other career options are considered as or more beneficial.

The following table lists the reasons given by those who agree or disagree with the statement. (note: the attitudes of those with a neutral attitude are not shown).

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Interest in Science and Science Learning, Continued

Reasons for agreeing or disagreeing that 'Science is a worthwhile career to pursue'

	Total Answering Question	Agree With Statement	Disagree With Statement
Base	695	666	29
	%	%	%
They may make contribution to the world	27	28	-
It broadens people's horizons, increases awareness of the world.....	23	24	-
It is the future	18	19	-
Need to make new discoveries and progress..	18	18	-
Equips people for day to day life in the future:	15	15	-
It is satisfying and rewarding	12	12	3
Good opportunity	10	11	-
Science technology is central to everything....	9	10	-
It is my own background.....	6	6	10
Should be encouraged more	5	6	-
It offers a secure future	5	5	-
A career with good income prospects	4	4	-
Wide variety of fields available	3	4	-
Good for those who are scientifically minded.....	3	3	17
It is international, can go anywhere	*	*	-
Not many jobs in science	1	1	10
It won't provide as good a living as other careers	3	3	10
Science jobs are poorly paid/won't pay much	1	1	14
Not interested myself; other areas equally important	2	1	31
There is a lack of funding in science.....	1	*	3
All other reasons	2	2	3
Don't know	6	5	21

Note: The table is interpreted as follows: In total 27% who answered the question believe that people who pursue science as a career may make a contribution to the world. 28% of those 666 people who agreed with the statement that science is a worthwhile career to pursue believe that people who pursue science as a career may make a contribution to the world, while none of the 29 who disagreed with the statement, gave this response in support of their view.

Relationships between Science and the Economy

Introduction

Questions in this section assess perceptions of the role that science plays in the economy. They also discuss attitudes towards the need for control over science. Results are compared with those observed in the 2002 study.

Note: in 2002, questions asked about ‘science and technology’. In 2005, the focus was on ‘science’.

Science and the Economy

People clearly recognise the contribution science makes to New Zealand, in both economic and environmental terms. In each instance, more than three in four agree that science is important and has a role to play in *preserving our New Zealand environment* (89 percent agreement), to *enhance our international competitiveness* (79 percent). Agreement with both statements has increased in 2005.

Given the perceived importance of science, it is not surprising that two thirds (67 percent) support the *government funding scientific research regardless of the economic benefit*. Agreement has also strengthened on this dimension since 2002 (up ten percentage points from 57 percent).

People showed a high level of respect for *the quality of science work conducted by New Zealand scientists* (76% agree that New Zealand scientists are doing world class work). There is general agreement about the appropriateness of research being undertaken for New Zealand’s future (63 percent agree that *New Zealand scientists are doing the science research New Zealand needs in the future*).

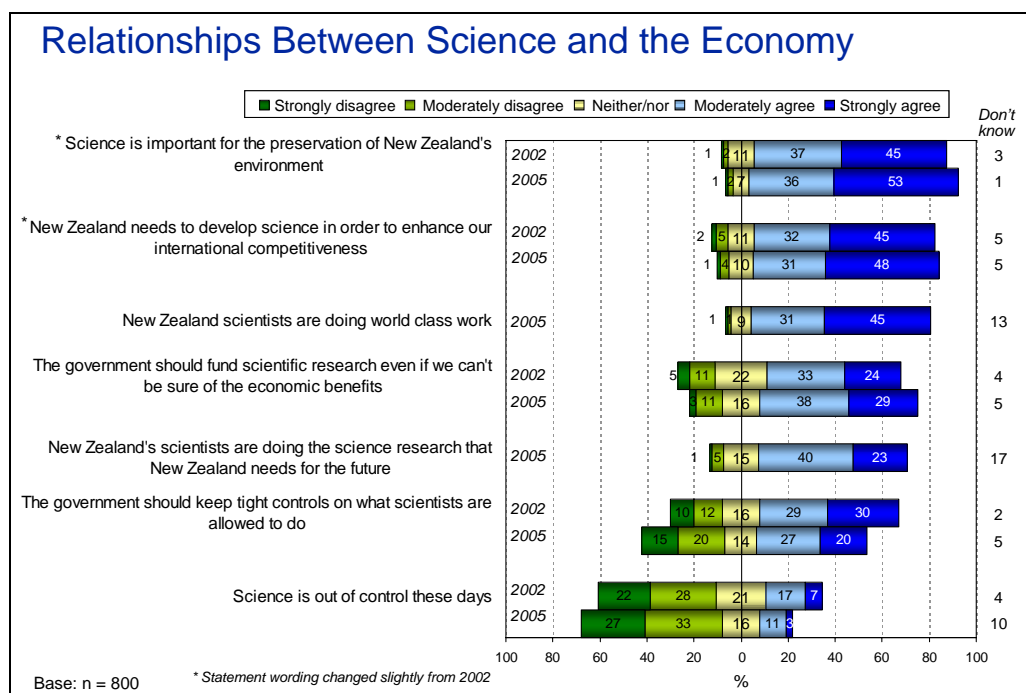
It is encouraging to note that perceptions of science being out of control have diminished significantly. Since 2002, disagreement with the statement “*Science is out of control these days*” has increased, outweighing agreement by four to one (60 percent disagreement versus 14 percent agreement).

However, people still expect there to be controls to manage the risks inherent in science, although the level of agreement about the need for Government controls has declined significantly since 2002. Just under half those interviewed (47 percent) agree that *the Government should keep tight controls on what scientists are allowed to do*, while 35 percent disagree. Note: in 2002, the Royal Commission on Genetic Modification and the GE debate had been in the public domain, possibly heightening concern about the need for controls over science.

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Interest in Science and Science Learning, Continued

The following chart compares responses in 2002 and 2005.



Subgroup Differences

- Those aged over 45 have a greater appreciation of the contribution of science to enhancing New Zealand's international competitiveness than younger people, as do people with higher levels of education, and those with formal science training.
- All demographic groups recognise the importance of science for the preservation of New Zealand's environment.
- Agreement as to whether New Zealand's scientists are doing world class work increases as people get older. Those with formal science training tend to agree with this statement, however Maori and Pacific people are less likely to agree.

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Interest in Science and Science Learning, Continued

- Views about the need for the Government to fund scientific research even if there is uncertainty about its economic benefits are more strongly held among a similar demographic: people over 35, people with higher educational levels and those with science training, and those in professional and managerial roles.
- Agreement that science is out of control does not outweigh disagreement among any subgroups. However, those aged between 45 and 64 years are more likely to disagree than younger or older age groups.
- People under 35 years and women have greater than average agreement that the Government should keep tight controls on what scientists are allowed to do.

Reasons for Attitudes towards Government Controls on Scientists

In total, 47 percent of those surveyed agree, while 35 percent disagree that *'the Government should keep tight controls on what scientists are allowed to do'*. 14 percent have a neutral view. Those who agreed or disagreed with the statement were asked the reasons for their agreement or disagreement.

Several factors motivate those who **agree** with the concept of Government control:

- There is a fear of what might happen if science gets out of control. A significant proportion talked of fears relating to specific science applications, such as cloning, GM, etc.
- Some people fear the purpose of some scientific research may not be ethical, and thus controls help ensure that scientists' work and intentions are ethical.
- Others argue that the government has a right to monitor, in its role as representative of the New Zealand community.
- Linked with this is the potential for unwise spending, and the importance of control by those who provide funding.

Two main factors concern those who do **not favour** government control:

- The major one is a distrust of government, and its involvement. There is a belief that politicians lack the scientific understanding and skills to make appropriate decisions.
- Freedom is considered a key element in innovation, and controls are regarded as potentially stifling this.

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Interest in Science and Science Learning, Continued

A full list of reasons given, follows in the following table.

Reasons for agreeing or disagreeing that 'the Government should Keep Tight Controls on what Scientists are Allowed to do'

Base	Total Answering Question 665 %	Agree With Statement 389 %	Disagree With Statement 276 %
Concern about results / what can happen if things get out of control	22	33	6
Need some controls, concerns about specific things such as cloning or GM .	19	30	4
Government represents community; has right to monitor	14	17	11
Need controls on scientific applications..	13	19	5
Concerned about unethical, bad intentions	11	17	2
Need controls on GM / GE.....	10	16	1
Financial concerns: money could be spent unwisely	9	13	3
Government has the right to control if they provide the funding/ Science not privately funded.....	2	1	4
Progress is safer with controls, scientists moving too fast	3	5	1
Need freedom to pursue knowledge	21	5	43
Distrust government; government ignorant; should stay out.....	13	2	30
Controls inhibit innovation.....	10	3	20
Government and politicians lack science knowledge.....	6	1	14
Government and science do not mix, have different agendas	3	1	7
Government should provide funding	1	1	1
Other reasons	2	3	1
Don't know	1	1	1

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Interest in Science and Science Learning, Continued

Reasons for Attitudes about Appropriateness of New Zealand Science

In total, 63 percent of those surveyed agree that New Zealand's *scientists are doing the science research that New Zealand needs for the future*, while 6 percent disagree. In total 15 percent have a neutral view. Those who agreed or disagreed were asked the reasons for this.

Agreement that New Zealand scientists are doing the science research that New Zealand needs for the future is based on several factors:

- Some are thinking of the benefits that are particular to New Zealand, for example protecting New Zealand's economy and environment, given its geographic remoteness and difference from other parts of the world.
- Some are thinking more in terms of the contribution to the whole world – New Zealanders have a history of successful scientific discoveries. The research will keep New Zealand science to the forefront internationally, and the work may have benefit for the whole world
- A significant group said they have heard of or read good work being done that has produced good results.

While agreeing to this statement some mentioned that there is a lack of resource and talents are lost to overseas countries. There is a feeling that New Zealand ought to be doing more, among this group

The small proportion who **disagree** with this statement are not convinced that New Zealand scientists have their priorities correct, or are heading in the right direction. (As this question was pre-coded, there is no indication as to what they consider appropriate priorities might be.)

A full list of reasons given, follows in the table overleaf.

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Interest in Science and Science Learning, Continued

Reasons for agreeing or disagreeing that 'New Zealand's scientists are doing the science research that New Zealand needs for the future'

Base	Total Answering Question 553 %	Agree With Statement 507 %	Disagree With Statement 46 %
Important to deal with NZ issues Look after our own interests. NZ a small isolated country	19	20	9
Heard/read good reports of work being done/ producing results	20	18	-
Providing important medical research	20	16	-
NZ scientists are forward thinking/ have a good reputation/ history of success in scientific discoveries	14	15	-
We are an agricultural, horticultural nation. Need to protect our industry, economy	11	12	-
Will benefit the environment.....	11	12	-
They are keeping our place recognised by the world.....	9	10	-
Science is an important part of everyday living/ Must continue to look to new technologies/ discoveries	9	3	-
Their work is benefiting not only NZ but the whole world	6	6	-
They lack resources, limits the work they can do.....	12	10	35
Should be doing more, not enough being done	6	5	15
Not convinced that they have their priorities correct /are heading in the right direction.....	5	3	37
Too many scientists are moving overseas	5	5	9
Too much emphasis on making money, commercialism	2	2	9
Public needs to be told more/kept better informed	2	2	9
Other reasons	4	4	9
Don't know	9	10	7

Sociological Aspects of Science

Introduction This section explores the more sociological aspects of people’s attitudes to science: in particular, beliefs about scientists’ motivations for research, and awareness of risk and uncertainty in science.

Trust in Scientists and Their Work Two statements examined the issue of people’s trust in scientists and their motivations for research. There has been little change in people’s perception since 2002.

- People believe strongly that *it is important for a community to have some scientists who are not linked to business interests* (86 percent agreement), indicating a degree of recognition of the importance of independent thinking.
- There is wide agreement (67 percent) that *scientists should have to explain and justify their research to the general public*; a key finding for scientists involved in research of public interest.

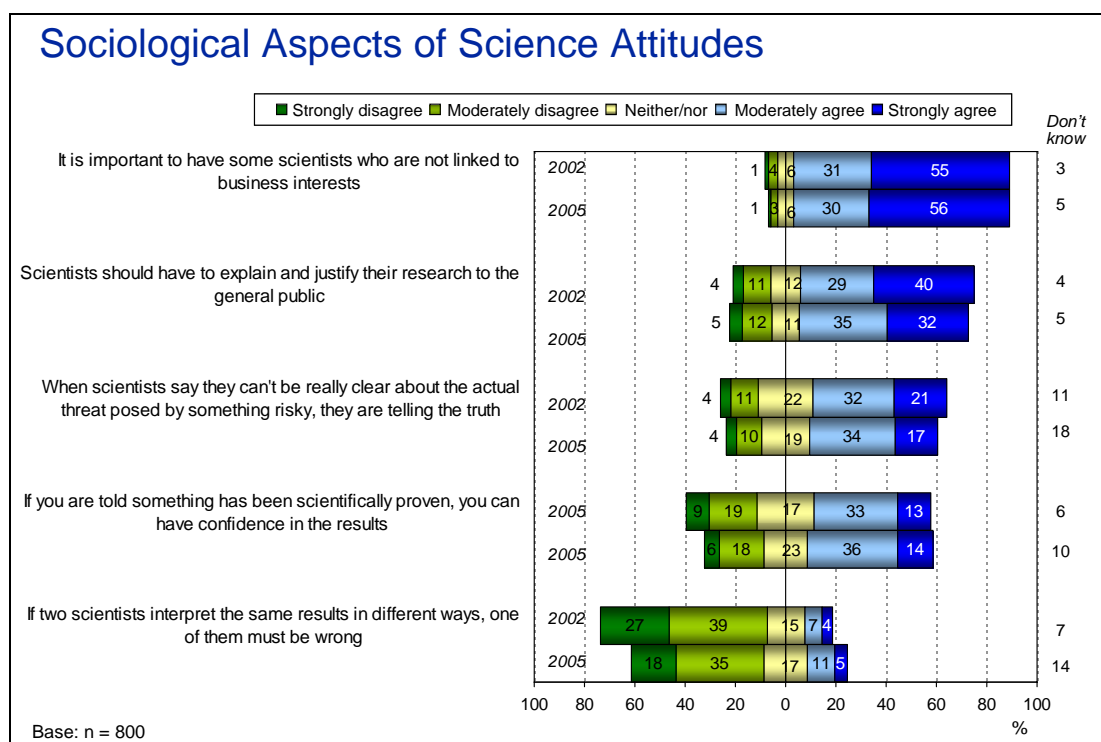
Responses to the other three statements in this section suggest that people have some appreciation of the complexities of the world of science. However, compared with 2002, a higher proportion gave a ‘don’t know’ response to these three statements.

- 53 percent disagree that, if two scientists interpret the same result in different ways, one of them must be wrong (only 16 percent agree).
- Agreement outweighs disagreement three to one that, when scientists say they can’t really be clear about the actual threat posed by something risky, they are telling the truth (51 percent agree while 14% disagree). – Note, 18 percent did not know whether this is the case.
- Agreement outweighs disagreement two to one that, when being told something has been scientifically proven, you can have the confidence in the results (50 percent agree while 24 percent disagree).

Continued on next page

Sociological Aspects of Science, Continued

The following chart summarises views of the total sample, comparing 2005 and 2002 responses.



Subgroup Differences

- People under 25 years of age are less likely than average to agree that it is important to have some scientists who are not linked to business.
- People with a tertiary education are generally less likely to trust the result if they were told that something has been scientifically proven, than are those without any tertiary education.
- Older people are more likely than average to believe that if two scientists interpret the same results in different ways, one of them must be wrong. Men are more likely to hold this view than women.
- There are indications that younger people (under 35 years) are more cynical of the motives of scientists than older people. For example, younger people are less inclined to agree that scientists are telling the truth when they say they can't be really clear about the actual threat posed by something risky.

Information and Trust in Relation to a Specific Science Issue

Introduction This section looks at the perceived trustworthiness of various sources of information about science, and whether or not people feel they are receiving the appropriate amount of information about science.

Source Trustworthiness Respondents were asked how trustworthy they would find information about a science issue to do with environmental pollution, from ten different sources. Four levels of trustworthiness emerged:

- Scientific sources – trusted by the majority
- Television documentaries, pamphlets from a source such as a regional council, and television news or current affairs – trusted by about half those surveyed
- Other media, the Internet and lobby groups – distrust outweighs trust
- Politicians – minimal trust

It is encouraging to see that *scientists* (either in the public sector or in industry) were the sources considered most trustworthy; public sector scientists more so than scientists in industry, (74 percent and 57 percent respectively).

Over half those surveyed indicated that they trust *television documentaries* and/or *pamphlets from a regional council* (each receiving a 53 percent trustworthy rating). Television news and current affairs are ranked as the fifth most trustworthy source over all, with nearly half (47 percent) considering it to be trustworthy.

Opinions were evenly divided about the trustworthiness of *newspapers*, with nearly a third of people considering them trustworthy, a third of people considering them not trustworthy and the remainder unsure.

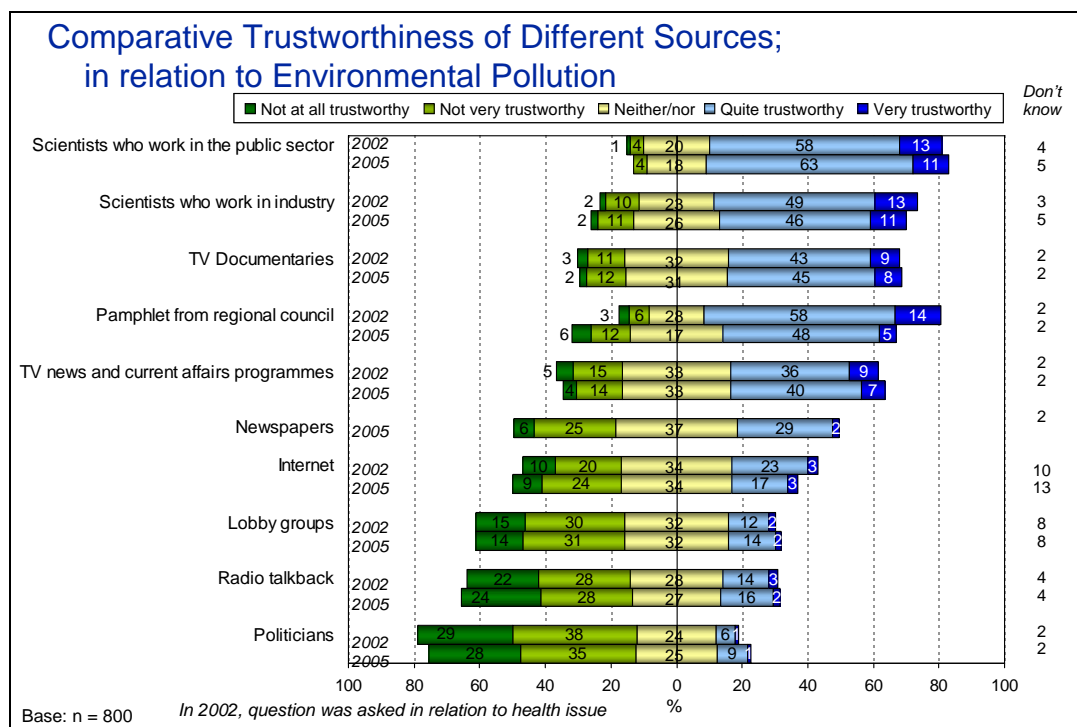
More people indicated they consider the following three sources less than trustworthy. These are the *Internet* (33 percent not trustworthy vs. 20 percent trustworthy), *lobby groups* (45 percent not trustworthy vs. 16 percent trustworthy), *radio talkback* (52 percent not trustworthy vs. 18 percent trustworthy).

Politicians are considered as the least trustworthy source (63 percent not trustworthy vs. 10 percent trustworthy).

Continued on next page

Information and Trust in Relation to a Specific Science Issue, Continued

The following chart compares trustworthiness ratings for the different sources for the 2002 and 2005 studies.



Subgroup Differences

- Generally, people aged under 45 years tended to rate each source as more trustworthy than did people aged 45 and over. The 45 to 54 year age group were the less trusting age group about any source. Women tended to regard each source as being more trustworthy than did men.
- There were differences according to whether or not people had formal science training:
 - People with formal science training tended to put more trust in a pamphlet from their regional council than those without formal science training (61 percent trustworthy and 51 percent trustworthy respectively)

Continued on next page

Information and Trust in Relation to a Specific Science Issue, Continued

-
- People without formal science training tended to put higher than average trust in television documentaries (54 percent trustworthy compared with 45 percent trustworthy among those with scientific training) and in television news and current affairs programmes (50 percent trustworthy vs. 41 percent trustworthy).
 - People without tertiary education tended to be more likely to trust radio talkback than did people with a university education (23 percent trustworthy vs. 10 percent trustworthy).
-

Whether had Environmental Issue in Mind

When asked if they had a particular environmental issue in mind when they answered the previous question about source trustworthiness, about a third (35 percent) of people said they did.

However, there were no difference in the ratings of source trustworthiness, by whether or not people had a specific issue in mind.

Generally speaking, people with a formal science background were more likely than others to have had a particular environmental issue in mind.

The issues people had in mind were wide ranging. The main three were *global warming/climate change*, *water supply* and *genetic modification or engineering*. (Note: with the exception of water supply, climate change and GM were mentioned to respondents earlier in the questionnaire.)

The table overleaf lists all mentions.

Continued on next page

Information and Trust in Relation to a Specific Science Issue, Continued

Specific Environmental Pollution Issue in Mind

Base (have specific issue in mind)	283
	%
Global warming, climate change, green house effect, ozone layer problem	25
Water supply, rivers (including farm effluent, chemical oil spills)	21
Genetic engineering or modification.....	19
Air pollution (including car emissions)	16
Environmental protection (n/s):	13
Power, energy, fuel (including alternative sources such as nuclear)	13
Health issues	11
Pollution (n/s)	10
Chemical sprays	7
Waste management	5
Conservation and protection of forests	5
Honest, credible information provided by the Government	5
Endangered species	4
Over-fishing, depletion of fish stocks	2
Pylons, cell phone towers.....	2
Natural disasters (e.g. tsunami, earthquakes, volcanoes)...	2
Transport and traffic congestion	2
Other issues	12

Whether Receive Sufficient Information about Science

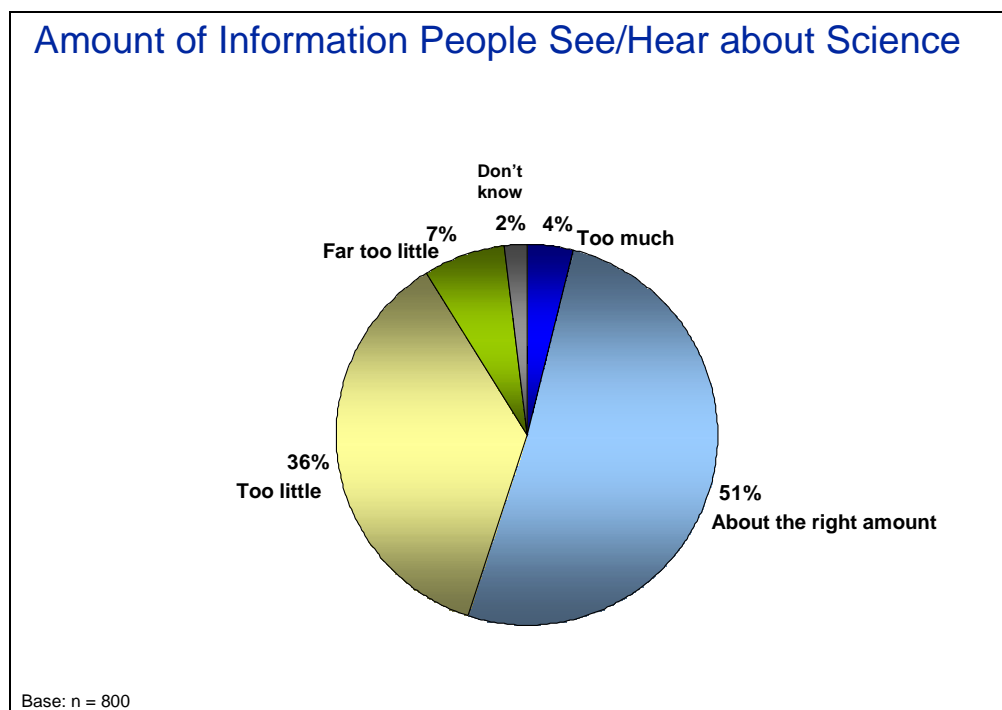
Information Amounts

People were asked whether or not they receive an appropriate amount of information about science these days.

About half of those surveyed (51 percent) said they received about the right amount of information.

However, more than four in ten people (43 percent) consider they receive too little information. In contrast, only a small minority (4 percent) said they receive too much information about science

The following chart summarises the views of the total sample.



Subgroup differences

- People between 25 and 34 years particularly feel they receive too little information about science (56 percent too little vs. 43 percent too little among the total sample).
- Interestingly, people with formal training in science are more likely to feel they receive too little information about science than those without formal science training (55 percent too little vs. 41 percent too little).

Appendix I: Questionnaire

Introduction: Good morning/afternoon/evening. My name is _____ from ACNielsen, the market research company.

We would like to speak to the person in your household aged 15 years or over who is having the next birthday.

RE INTRODUCE IF NECESSARY.

We are conducting a survey about how science are used and should be used in New Zealand today. We are keen to hear your views and opinions.

IF NECESSARY: The survey will take about 15 minutes.

IF NECESSARY MAKE APPOINTMENT TO CALLBACK.

Q1 Rotate statements

Read Out

First I would like to find out about your interest in some scientific and technological issues. As I read out each one, could you please tell me how interested you are in that topic, using the scale 1 = not at all interested, 2 = not very interested, 3 = neither/nor, 4 = quite interested, 5 = very interested.

	Not at all interested	Not very interested	Neither Nor	Quite interested	Very interested	Don't know
(R1) Genetic testing for human health issues	1	2	3	4	5	9
(R2) Space research and astronomy	1	2	3	4	5	9
(R3) New forms of energy for transport	1	2	3	4	5	9
(R4) Computing and the Internet	1	2	3	4	5	9
(R5) Cloning.....	1	2	3	4	5	9
(R6) Understanding earthquakes and their effects on people	1	2	3	4	5	9
(R7) Saving endangered species.....	1	2	3	4	5	9
(R8) Improving the quality of our agriculture and horticulture	1	2	3	4	5	9
(R9) New medical techniques and treatments ...	1	2	3	4	5	9
(R10) Research into climate change	1	2	3	4	5	9

Continued on next page

Appendix I: Questionnaire, Continued

Q2 Rotate statements

Read Out

For each of those same issues could you now please tell me how beneficial you feel that each of these developments has been or is likely to be to humanity, on a scale where 1 = not at all beneficial, 2 = not very beneficial, 3 = neither/nor, 4 = quite beneficial, 5 = very beneficial.

	Not at all beneficial	Not very beneficial	Neither Nor	Quite beneficial	Very beneficial	Don't know
(R1) Genetic testing for human health issues.....	1	2	3	4	5	9
(R2) Space research and astronomy	1	2	3	4	5	9
(R3) New forms of energy for transport	1	2	3	4	5	9
(R4) Computing and the Internet	1	2	3	4	5	9
(R5) Cloning.....	1	2	3	4	5	9
(R6) Understanding earthquakes and their effects on people	1	2	3	4	5	9
(R7) Saving endangered species.....	1	2	3	4	5	9
(R8) Improving the quality of our agriculture and horticulture	1	2	3	4	5	9
(R9) New medical techniques and treatments ...	1	2	3	4	5	9
(R10) Research into climate change	1	2	3	4	5	9

Q3 Rotate statements

Please read slowly and carefully

I have some statements some people have made about science. As I read out each one, please tell me how much you agree or disagree with it, using the scale, where 1 = Strongly disagree, 2 = moderately disagree, 3 = neither nor, 4 = moderately agree and 5 = strongly agree

For many of these statements there is no right or wrong answer. We are interested to hear your opinions. It's OK to say you don't know, rather than to guess.

	Strongly disagree	Moderately disagree	Neither Nor	Moderately agree	Strongly agree	Varies	Don't know
(R1) I enjoy finding out about new ideas in science.....	1	2	3	4	5	6	9
(R2) Science and technology are too specialised for me to understand.....	1	2	3	4	5	6	9
(R3) There is so much conflicting information about science, it is hard to know what to believe	1	2	3	4	5	6	9

Continued on next page

Appendix I: Questionnaire, Continued

(R4) It is important to know about science in my daily life	1	2	3	4	5	6	9
(R5) Science is an important subject for people to study at school	1	2	3	4	5	6	9
(R6) Science is a worthwhile career to pursue	1	2	3	4	5	6	9

Q4	If Q3 R6 coded as 1,2,4,5,6 , then ask Q4 , otherwise skip over this question Code others as 98 and code don't know as 99--	Code (157)
	<u>Do not read out</u> Why do you say _____? <i>PROBE Probe fully</i>	
	It's the future	01
	Good opportunities.....	02
	Equip them for day to day life in the future	03
	It will broaden their horizons, increase awareness of the world	04
	May make a contribution to the world	05
	It's a satisfying, rewarding career.....	06
	A career with good income prospects	07
	It offers a secure future	08
	It's my own background.....	09
	Won't provide a good living, such a good living as other careers.....	10
	Science jobs are poorly paid/won't earn very much.....	11
	Not many jobs in science	12
	All other (specify)	13
	Refused/Don't know.....	14

Continued on next page

Appendix I: Questionnaire, Continued

Q5 Rotate statements
Please read slowly and carefully
And now I have some more statements about science. Again, please tell me how much you agree or disagree with each one. (repeat scale if necessary)

	Strongly disagree	Moderately disagree	Neither Nor	Moderately agree	Strongly agree	Varies	Don't know
(R1) New Zealand needs to develop science in order to enhance our international competitiveness.....	1	2	3	4	5	6	9
(R2) Science is important for the preservation of New Zealand's environment	1	2	3	4	5	6	9
(R3) New Zealand scientists are doing world class work	1	2	3	4	5	6	9
(R4) New Zealand's scientists are doing the science research that New Zealand needs for the future.....	1	2	3	4	5	6	9

Q6 If Q5 R4 coded as 1,2,4,5,6, then ask Q6 , otherwise skip over this question
Code others as 98 and code don't know as 99
Do not read out
Why do you say _____?
PROBE Probe full

Q7 Rotate statements
If R6 coded as 1,2, 4,5,6, then ask , otherwise skip over this question
Please read slowly and carefully
And now I have some more statements about science in New Zealand. Again, please tell me how much you agree or disagree with each one. (repeat scale if necessary)

	Strongly disagree	Moderately disagree	Neither Nor	Moderately agree	Strongly agree	Varies	Don't know
(R1) Science is out of control these days ..	1	2	3	4	5	6	9
(R2) The government should fund scientific research even if we can't be sure of the economic benefits.....	1	2	3	4	5	6	9
(R3) The government should keep tight controls on what scientists are allowed to do	1	2	3	4	5	6	9

Continued on next page

Appendix I: Questionnaire, Continued

Q8	If code 6, 5 4 2 1 to Q7 R3 ask Q8 Code others as 98 and code 99 as don't know/refused Do not read out Why do you say _____? (probe fully)	Code (217)
	Government represents the community - has the right to monitor.....	01
	Concerned about what might happen if things get out of control - could change/destroy the world	02
	Concern about intentions: may be unethical, or evil.....	03
	Need some controls. Concern about specific issue, such as GM, cloning	04
	Need controls on GM/GE	05
	Need controls on some scientific applications	06
	Progress is safer with controls. Science is moving too fast	07
	Financial concerns if they are not controlled	08
	Distrust government. Keep government out	09
	Scientists need freedom to pursue knowledge	10
	Controls inhibit innovation	11
	All other (specify)	12
	Refused/Don't know.....	13

Q9	Rotate statements							
	Read out scale And now I have some more statements about science. Again, please tell me how much you agree or disagree with each one. Remember it is ok to say don't know rather than to guess an answer.							
		Strongly disagree	Moderately disagree	Neither Nor	Moderately agree	Strongly agree	Varies/d depends	Don't know
	(R1) If you are told something has been scientifically proven, you can have confidence in the results.....	1	2	3	4	5	6	9
	(R2) If two scientists interpret the same results in different ways, one of them must be wrong.....	1	2	3	4	5	6	9

Continued on next page

Appendix I: Questionnaire, Continued

(R3) It is important to have some scientists who are not linked to business interests.....	1	2	3	4	5	6	9
(R4) Scientists should have to explain and justify their research to the general public.....	1	2	3	4	5	6	9
(R5) When scientists say they can't be really clear about the actual threat posed by something risky, they are telling the truth.....	1	2	3	4	5	6	9

Q10 Rotate statements
Read out scale
If you were concerned about an science issue for example, to do with environmental pollution, how trustworthy would you find information about the issue, from each of the following sources. Firstly _____ would you regard information as ...

	Not at all trust-worthy	Not very trust-worthy	Neither Nor	Quite trust-worthy	Very trust-worthy	Don't know
(R1) TV documentaries	1	2	3	4	5	9
(R2) TV news and current affairs programmes.	1	2	3	4	5	9
(R3) Politicians.....	1	2	3	4	5	9
(R4) Newspapers	1	2	3	4	5	9
(R5) Scientists who work in industry	1	2	3	4	5	9
(R6) Scientists who work in the public sector...	1	2	3	4	5	9
(R7) Lobby groups	1	2	3	4	5	9
(R8) Internet	1	2	3	4	5	9
(R9) Radio talkback.....	1	2	3	4	5	9
(R10) Pamphlet from regional council	1	2	3	4	5	9

Q11 Did you have any particular environmental issue in mind when you answered the previous questions?	Code (238)
Yes	1
No.....	2
Don't know	9

Continued on next page

Appendix I: Questionnaire, Continued

Q12 Code don't know/refused as 99
What topic or issue in particular _____?

Q13	Read out	Code
	thinking now about the amount of information you see and hear about science these days. Would you say you see and hear...?	(243)
	Far too much	1
	Too much	2
	About the right amount	3
	Too too little.....	4
	Far too little.....	5
	Don't know	9

Classification

Now for a few questions about you. We collect this information to ensure we interview a cross section of the public. These details will be grouped with those other respondents, and you will not be individually identified.

Q14	Recode Gender	Code
	Now for a few questions about you. We collect this information to ensure we interview a cross section of the public. These details will be grouped with those other respondents, and you will not be individually identified.	(244)
	Gender	
	Male	1
	Female.....	2

Continued on next page

Appendix I: Questionnaire, Continued

Q15	Read out	Code
	Which of the following groups are you?	(245)
	15 to 19 years	01
	20 to 24 years	02
	25 to 29 years	03
	30-34 years	04
	35-39 years	05
	40-44 years	06
	45-49 years	07
	50-54 years	08
	55-59 years	09
	60-64 years	10
	65 plus	11

Q16	Read out	Code
	Which of these best describes your household situation?	(247)
	Young single living alone	01
	Group flatting together	02
	Young couple - no children	03
	Family - mainly preschoolers	04
	Family - mainly school children	05
	Family - mainly adults	06
	Older person/couple - no children	07

Q17	Occupation	
	(specify)	
	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	(249-252)

Continued on next page

Appendix I: Questionnaire, Continued

Q18	Code don't know as 99 code others as 98 Read out Which is the last level you reached in your education?	Code (253)
	Primary school	1
	Secondary school	2
	Technical.....	3
	University.....	4
	Other (please specify).....	8
	Don't know/refused	9

Q19	Do you have any formal training in science?	Code (254)
	Yes	1
	No.....	2
	Don't know	9

Q20	Please code Don't know as 99 Please indicate your personal income per year before tax?	Code (255)
	Under \$15,000.....	01
	\$15,000 to \$20,000	02
	\$20,001 to \$25,000	03
	\$25,001 to \$30,000	04
	\$30,001 to \$35,000	05
	\$35,001 to \$40,000	06
	\$40,001 to \$50,000	07
	\$50,001 to \$60,000	08
	\$60,001 to \$70,000	09
	More than \$70,000.....	10
	Refused/Don't know.....	11

Continued on next page

Appendix I: Questionnaire, Continued

Q21	Code don't know as 99 And in what group is your total household income per year before tax?	Code (257)
	Under \$20,000.....	01
	\$20,001 to \$30,000	02
	\$30,001 to \$40,000	03
	\$40,001 to \$50,000	04
	\$50,001 to \$60,000	05
	\$60,001 to \$70,000	06
	\$70,001 to \$80,000	07
	\$80,001 to \$100,000	08
	More than \$100,000	09
	Refused/Don't know	10

Q22	What is your ethnicity?	Code (258)
	European	1
	Maori.....	2
	Pacific Islander.....	3
	Asian	4
	Other	5

Q23	Location Type (Analysed from toll digits)	Code (259)
	Major City.....	1
	Town	2
	Rural.....	3