



Ministry for the
Environment
Manatū Mō Te Taiao

Valuing New Zealand's Clean Green Image

The Ministry for the Environment commissioned PA Consultants to carry out this study (funded by the Contestable Research Fund of the Ministry of Research, Science and Technology) to provide an estimate of the value for New Zealand's export trade of our clean green image.

There is considerable discussion about New Zealand's clean green image, but relatively little solid information about its value. This was clear from an earlier study which the Ministry commissioned through the Sustainable Management Fund, *Green Market Signals*, published in 1999. The current study is, in part, a response to the suggestions received from industry groups and others at that time.

The aim of this current study is to quantify the extent to which particular New Zealand exports benefit from positive perceptions about our environment. The project focuses on three export sectors: dairy, inbound tourism, and organic produce. It assesses the potential consumer reaction to an illustrative decline in New Zealand's cleanness and greenness.

The empirical work done in this study reinforces the qualitative evidence that our clean green image is valuable, and provides some useful insights into the size and nature of that value. The results are of course not definitive – no contingent valuation study can ever be so – but they do strongly indicate a significant vulnerability of export value (through reduction in product quantities likely to be purchased by consumers) in the event of a (hypothetical) degradation of New Zealand's environment.

While the research's approach and findings have been robustly peer reviewed, like all empirical economic estimates, the conclusions rest on assumptions and a specific methodology. That said, the study certainly provides food for thought. Main findings are as follows:

- New Zealand's clean green image does have a value. Environmental image is a substantial driver of the value New Zealand can derive for goods and services in the international market place.
- The study suggests this image is worth at least hundreds of millions, possibly billions, of dollars – aggregating value elements from dairy, tourism, and organic produce, and extrapolating to other sectors such as meat.
- New Zealand is relatively clean and green. This is mainly attributable to our low population density resulting in relatively benign environmental pressures.
- However, there are environmental problems that are sufficient to raise questions about the sustainability of the value of New Zealand's exports attributable to its environmental image. There is a risk that New Zealand will lose value that is created by the current environmental image if we are not vigilant in dealing with the problems that could threaten the image.

If you would like to discuss this report further, please contact Dr Ralph Chapman, Manager of the Strategic Policy Group, Ministry for the Environment, at (04) 917 7444 or email him at ralph.chapman@mfe.govt.nz.

3. ENVIRONMENTAL SECTOR SCAN

3.1 INTRODUCTION

In this chapter we provide an overview of the state of New Zealand's environment including an assessment of major environmental risk areas especially insofar as they may relate to the value of New Zealand's exports.

The analysis builds on existing reports along with insights contributed by staff members within the Ministry. In particular, it draws heavily on the 1997 report "The State of New Zealand's Environment", the results being generated within the Ministry's Environmental Performance Indicators (EPI) programme and, to a lesser extent, the 1996 OECD review of New Zealand's environmental performance.

The chapter is organised as follows;

- Section 3.2 provides an overview of the way in which environmental quality is monitored and measured in New Zealand;
- Sections 3.3 to 3.7 profile in more detail the state of key components of New Zealand's environment, namely; air, land, freshwater, and the marine environment along with the pressures posed by the generation of waste; and
- Section 3.8 presents a summary of conclusions.

Appendix C contains a complete list of environmental indicators developed and/or proposed by the Ministry, along with additional environmental statistics not specifically covered in the chapter.¹

3.2 ENVIRONMENTAL QUALITY AND ITS MEASUREMENT

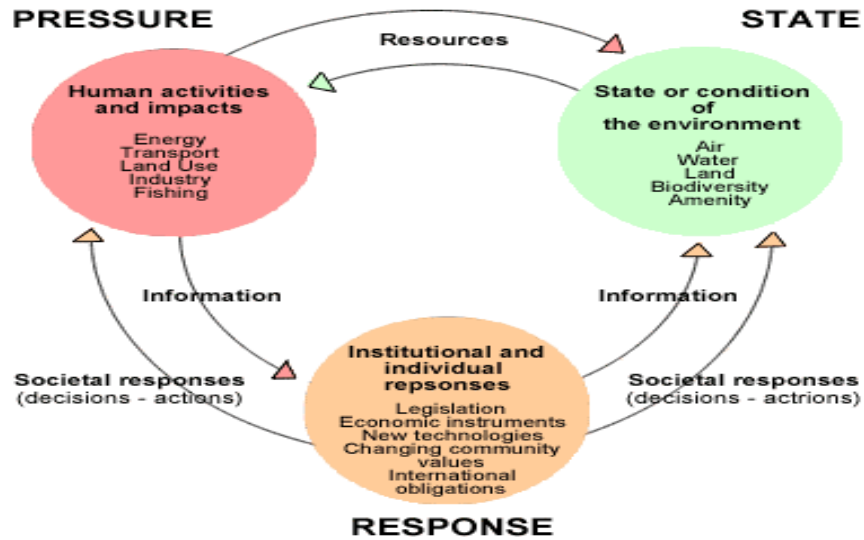
In New Zealand, initiatives aimed at measuring and tracking the state of the environment are being co-ordinated by the Ministry for the Environment within its Environmental Performance Indicators Programme. Like many other countries, the New Zealand environmental indicators programme relies on a model pioneered by the Organisation for Economic Co-operation and Development (OECD) known as the Pressure-State-Response (PSRM) Model.

The PSRM model classifies the indicators into one of three types (pressure, state or response). The model assumes human activities exert pressure on both the quality and the quantity of natural resources. These pressures alter the state, or condition, of the environment, which in turn give rise to human responses (behaviour aimed at reducing, preventing or mitigating undesirable environmental impacts). The responses in turn alter the pressures on the environment. The three indicator types are thus related to one another in a causal framework (see below).²

¹ Note, this scan is intended only to provide a brief synopsis of environmental quality in New Zealand focusing on those areas most closely related to New Zealand's major export industries. Inevitably we have passed over a number of contributory attributes of environmental quality. The state of New Zealand's biodiversity is perhaps the most obvious example. For a more comprehensive assessment of the quality of New Zealand's environment, the reader is referred to, in particular, "The State of New Zealand's Environment" produced by the Ministry for the Environment in 1997.

² From www.environment.govt.nz

Figure 5: The pressure state response characterisation of environmental indicators



In the remainder of this chapter, we focus primarily on *state* indicators under the presumption that these are the indicators that are most likely to have a bearing on the perception of New Zealand’s environmental quality. However, we also provide a brief overview of one of the more important pressure indicators (waste), on the grounds that this pressure indicator is most closely aligned to pending environmental risk. The indicators considered are listed in **Error! Reference source not found.** below.

Table 5: Environmental indicators considered in this report

Indicator Type	Indicator Category
State	Air Land Freshwater The marine environment
Pressure	Waste

3.3 AIR QUALITY

3.3.1 Overview

From the work done to date, it appears that, by world standards, New Zealand generally enjoys very high standards of air quality. This is especially the case in some of the remotest parts of the country where the air is virtually free of contaminants associated with human activities. There is no evidence of phenomena such as acid rain that afflict a number of Northern Hemisphere localities.

In large part this can be attributed to New Zealand’s relatively low population density, the relative lack of heavy industry, and its geographic location – away from other countries.

3. Environmental Sector Scan

The areas most susceptible to poorer air quality tend to be the larger urban centres where wintertime open fires, vehicle emissions and to a lesser extent industrial emissions can combine to create localised areas of concern. A look at the environmental data however (see Appendix C) suggests that even in the urban centres, the air quality looks acceptable – at least by current standards. It is really only in Christchurch (where the local geography plays a part) that urban air quality becomes a cause for concern – and then only occasionally. However, there are signs of emerging concern. The monitoring data shows that Auckland levels of pollutants associated with motor vehicle emissions (particularly CO and NO₂) are on the increase. In Christchurch, little impact has been made on the levels of particulate matter, despite this being an issue of concern for some considerable time.³

The Minister for the Environment has recently announced her intention to review the 1994 air quality guidelines with a view to making them more stringent. She referred to the carbon monoxide and nitrogen dioxide levels in Auckland and smog in Christchurch as being particular areas of concern.⁴

In rural areas, apart from isolated effects associated with incineration, the main air quality issue of concern is spray drift from agricultural chemicals. This is a particular issue when traditional farming businesses are co-located with organic farming enterprises or lifestyle blocks. Aerial spraying gives rise to most complaints.

3.3.2 Assessment of risk

In general terms, air quality in New Zealand is very good. However, it is plausible (in theory at least) that the areas in which air quality is under pressure may pose a risk for the value of New Zealand's exports.

For example, the times of the year when air quality in Christchurch is at its worst coincides with overseas visitors arriving for their ski holidays.⁵ The air quality in central Auckland may also create negative impressions of New Zealand's environment, as Auckland is the point at which the vast majority of visitors arrive in New Zealand.

Similarly, episodes of spraydrift in rural environments could compromise the value of New Zealand's growing organic trade, especially if this leads to pesticide residues being found in New Zealand's organic produce.⁶

³ Woodward (2001), Vehicle emissions in the urban environment – their effects on health.

⁴ Hon Marian Hobbs Minister for the Environment Media Statement "Air quality problems spark guidelines review," 23 January 2001.

⁵ It is worth noting here that the number of visitors arriving in Christchurch during the winter is comparatively low and the majority of those arriving tend to stay only one night before moving onto a skiing destination.

⁶ Note that "residue-free" product schemes are currently being undertaken in both the organic and "non-organic" horticultural sectors. Examples of the latter include the kiwifruit industry's "kiwigreen" scheme and the pipfruit industry's Integrated Fruit Production (IFP) scheme. Such programmes would be negatively impacted by chemical residue contamination.

3.4 LAND

3.4.1 Overview

The State of New Zealand's Environment Report notes that, since the time of human settlement, New Zealand's landscape has undergone a dramatic transformation. In particular human settlement has resulted in indigenous forests being reduced from around 23 million hectares (or 85% of the land area) to approximately 6.2 million hectares (23% of the land area) in the last 700-800 years.

Concomitant with the decline in indigenous forests has been a rise in the area of grassed land to around 14 million hectares (over 50% of the land area). Most of the pasture used for grazing is now in the form of introduced species. The remaining native grasslands are under pressure from grazing, rabbits, and invasive weeds, or are being oversown by introduced species.

The conversion to pasture has also led to soil erosion in many areas. Survey data collected in the 1970s indicates that around half the country is affected by moderate to slight erosion with around 10% being classified as having a severe to extreme erosion risk.

Besides pastoral farming, the other major land use is forestry based around exotic conifers. Approximately 1.6 million hectares are planted in conifers with new plantings running at around 70,000 hectares per year. The rise in exotic forestry has brought additional environmental impacts. In particular the logging of exotic forests can sometimes lead to impacts on the visual amenity of rural landscapes (particularly hillsides) and increased pressure on roads from the resultant logging truck traffic.

As well as the soil erosion and amenity issues raised above, New Zealand also has its share of contaminated sites – albeit not to the same extent as the more highly industrialised countries. Although good data in this area is hard to come by, it is estimated that there are around 7800 urban and industrial sites, which may be chemically contaminated, 1500 seriously. Sites include landfills, service stations, sawmills, timber treatment plants, railway yards, engine works, metal industries and chemical manufacturers.

In addition, several thousand of the nation's 80,000 farms, orchards and market gardens may have contaminated sites or have heavy metal residues from fungicides. Some farms have DDT residues.

3.4.2 Assessment of risk

Notwithstanding the fact that New Zealand has an international reputation built around the quality of its land and landscape, there do appear to be some reasonably significant environmental issues which could plausibly affect the value of New Zealand's export products.

First, the susceptibility of New Zealand's steeper landscapes to erosion and the visual impact caused by some of New Zealand's land use practices (such as the logging of exotic forests) may compromise the credibility of the images used to sell New Zealand as a tourism destination or as a sustainable producer of agricultural and forestry products.

3. Environmental Sector Scan

Second, the possibility of contaminated sites in New Zealand's rural areas resulting in chemical residue in exported food and beverages may pose a threat to any value derived from New Zealand's international environmental image.

3.5 FRESHWATER

3.5.1 Overview

The more remote parts of New Zealand have some of the finest water quality in the world. Water quality is particularly high in mountain streams and in sparsely developed areas particularly in the South Island and the upper reaches of most North Island rivers. Similarly, New Zealand's 30 or so large, deep lakes all appear to be of high quality.

However, water quality declines measurably in lowland streams and rivers, particularly in pasture-dominated catchments; some lowland rivers are unsuitable for swimming because of faecal contamination from farm animals, poor water clarity, and nuisance algae growths. Furthermore, the stream water in some intensive dairy farming areas is in such poor condition that it may be unsafe for livestock to drink. The lower reaches of some rivers are also polluted by discharges of industrial wastes, urban sewage and stormwater run-off.

In addition between 10% and 40% of New Zealand's 700 smaller shallow lakes are nutrient enriched (eutrophic). Most of these are located in the North Island and in pasture-dominated catchments. A number are subject to fish kills or are no longer capable of supporting fish life.

By far and away, the main source of pressure on water quality is pastoral agriculture. Agriculture is a contributing factor to the degradation of many surface waters and some groundwater. Pollutants include sediment, animal waste and nutrients. Pastoral agriculture also contributes to increased flooding and erosion in many areas by removing deep-rooted vegetation from hillsides and riverbanks.

In addition, the use of irrigation water, mainly for pasture, is a source of pressure on water levels, particularly in some South Island rivers and aquifers. Land drainage for agriculture has led to an 85% reduction in New Zealand wetlands.

In the main, degradation of freshwater quality can be put down to non-point sources particularly in the guise of organic matter, nutrients, and sediment washing into waterways or nitrates leaching into groundwater. Pollution from point sources (such as dairy sheds, factories etc.) has declined over the last 20 to 30 years, as treatment systems have been upgraded and alternative disposal methods (e.g. onto land or onto constructed wetlands) have been developed.

Recent trends in agriculture, including the conversion of sheep farms to dairy are likely to be increasing the pressure on water quality in the rural New Zealand environment.

In urban areas, pressures on water quality come from increasing consumption and from sewage and stormwater discharges along with the damming of rivers for electricity and water supply. The impact of pests and weeds, and the potential impacts of climate change have also been identified as contributing risk factors.

There is considerable uncertainty about the impact of these pressures on the quality of New Zealand drinking water. Of New Zealand's 1638 community drinking water supplies,

3. Environmental Sector Scan

serving 85% of the population, only 29% (serving 92% of the population) have been classified.⁷ Of those water supplies classified, 7% (serving 54% of the population) are considered safe, while a further 2% (serving 5% of the population) are considered to be marginal. Nineteen percent (serving 18% of the population) have an unsatisfactorily high risk of contamination.

The state of New Zealand's groundwater is subject to a considerable amount of uncertainty. However, the limited information available suggests that shallow aquifers, particularly beneath dairying or horticultural land are susceptible to elevated nitrate levels. In addition, in some coastal areas, excessive drawdown of freshwater aquifers has resulted in seawater intrusion. The extent of contamination from seepage from landfills, other waste disposal systems, and contaminated sites are unknown. The few surveys to date have found pesticide traces, but at very low concentrations.

3.5.2 Assessment of risk

The evidence on the state of New Zealand's freshwater resources suggests that freshwater quality varies considerably. Notwithstanding the fact that New Zealand has some of the world's most pristine water, there are considerable areas of the country where water quality is significantly degraded.

There are several plausible hypotheses for how threats to water quality may impact on the value of New Zealand's export receipts. The most obvious of these are outlined below.

First, it is conceivable that there may be a link between water quality and the tourism industry. Water quality is a key component of the overall image of environmental quality sold to overseas tourists. Examples include rivers and lakes suitable for outdoor experience activities such as jetboating, rafting, swimming and fishing. Any degradation of drinking water quality can also be expected to have an impact on the tourism industry.

Second, it is evident that the impact on water quality of pastoral farming (and the dairy industry in particular) is something that needs to be carefully managed. Although New Zealand's population density is low by international standards, its farmland aided by favourable climatic conditions supports high stock numbers. This contributes to considerable pressure from effluent on New Zealand's rural waterways. It is possible that the environmental impacts of dairy farming in New Zealand could have an impact on the purchase behaviour of environmentally conscious consumers.

3.6 THE MARINE ENVIRONMENT

3.6.1 Overview

From the limited data available, it seems that the state of the seawaters around New Zealand is of generally high quality. The exceptions are near some river mouths and in some harbours and estuaries where sediment, heavy metals, nutrients, bacterial counts and marine debris levels have been elevated by urban stormwater, sewage and agricultural run-off.

⁷ As at the time of the publication of the State of the Environment Report. The remaining 71 percent of water supplies (serving 8% of the population) have not been graded because they serve communities of less than 500 people. Approximately 15% of the population are not connected to community supplies.

3. Environmental Sector Scan

The areas most under threat tend to be the harbours and estuaries close to major population centres. The State of New Zealand's Environment report notes the results of a qualitative survey carried out in the mid-70s in which the perceived quality of estuaries was assessed. Of the 162 estuaries for which responses were required, 38% were considered to be "clean", 41% rated as "slightly polluted", 16% "moderately polluted" and 4% "grossly polluted".

The problem estuaries included Waitemata Harbour, Manukau Harbour, Kaipara Harbour, Tauranga Harbour, Porirua Harbour, Wanganui River mouth, Ahuriri Estuary, Pauatahanui Inlet, Wellington Harbour, Waimea Inlet (Nelson), Brooklands Lagoon and the Waimakiriri River mouth, Avon-Heathcote estuary, Lyttelton Harbour and the New River Estuary (Invercargill).

Although there is no recent comprehensive national data on the state of the coastal environment, some areas are relatively well documented. In particular, studies carried out in the mid-1990s by the Auckland Regional Council of estuaries in the Auckland region show a steady increase in the degree of heavy metal contamination (lead, zinc and copper) and hydrocarbons (polycyclic aromatic hydrocarbons in particular) attributable in the main to motor vehicle emissions transported into the harbour via stormwater.

In terms of bathing water quality, evidence from the Ministry's Environmental Performance Indicators Programme shows that, of the sites monitored around the country, only a handful show signs of enterococci concentrations being elevated to levels sufficient to cause concern. Further detail is contained in Appendix C.

Other issues of particular note include the prevalence of non-biodegradable litter and the emergence of toxic algae blooms. As well as the impacts this causes on visual amenity, the build up of plastic litter on the sea floor can inhibit gas exchange between the seafloor and overlying waters reducing the oxygen levels required to sustain life.

There appear to be two primary pathways by which non-biodegradable litter enters the coastal environment. Material lost overboard from vessels is an obvious source. Less obvious perhaps is the stormwater pathway already noted above with respect to heavy metal contamination. A study published in 1995 by the Island Care New Zealand Trust found that over 28,000 pieces of litter per day (10 million items per year) enter Auckland's Waitemata Harbour via the stormwater drainage system.⁸

Invasive species of plants, fish and other animals pose a potential threat in some parts of the coast (as they do in other New Zealand ecosystems). Of particular note are the toxic algae blooms which have recently become an intermittent problem in our coastal waters. There is some speculation that they may involve exotic species introduced in ship ballast water.

3.6.2 Assessment of risk

While many of New Zealand's coastal waters are of high quality, there are localised areas in which environmental quality is of concern – particularly estuaries and harbours near main population centres.

Potentially, the most significant connection between the (localised) degradation of the coastal marine environment and New Zealand's export receipts comes through the

⁸ Island Care New Zealand Trust (1995), "Marine Debris – A Stormwater Problem", *Water and Wastes in New Zealand* 85: 20-25.

tourism industry. Of possible concern is the impact of litter on the visual amenity of the coastal environment – particularly around the main population centres – and on eco-tourism operations such as whale or dolphin watching. Although the standard of beachwater is occasionally a problem in some locations (such as the inner reaches of Wellington Harbour) it is generally of a very high quality.

3.7 WASTE

3.7.1 Overview

The State of the Environment Report estimates that New Zealand industry and households account for the following volumes of waste being sent to landfills on an annual basis:

- 3 million tonnes of construction and demolition debris;
- 1 million tonnes of plant matter and foodscraps;
- 600,000 tonnes of paper and cardboard; and
- 220,000 tonnes of plastic.

Other significant items in the solid waste stream include 300 million steel cans and 30 million litres of used oil. In addition, New Zealand generates approximately 500 billion litres of sewage flowing into 258 public waste water plants.

Since the publication of the 1997 State of the Environment Report, the EPI programme has begun tracking some indicators of waste and waste management – notably the amount of waste disposed to landfill and the amount of waste recycled.

The increasing volumes of waste are putting pressure on the remaining available capacity of landfills and sewage and stormwater infrastructure. In addition, only a third of the country's landfills are reported as having any kind of clay lining indicating that the remainder are likely to be porous creating risks of leachate reaching waterways. As of 1997, only 13% had systems for preventing leachate entering waterways. Similarly, only 9% of landfills had systems in place for treating landfill stormwater runoff.

The development of new waste disposal infrastructure is hampered both by the large capital cost involved, particularly for stormwater and sewerage treatment, and by the NIMBY (Not in my backyard) phenomenon. This is leading to increasing pressures on the existing infrastructure as well as the desire to look at alternative waste management strategies such as recycling and eco-efficient production techniques.

The generation and disposal of hazardous waste provides an additional dimension to the pressures posed by waste. It is only recently that the nature of the pressure posed by hazardous wastes has begun to be understood. A survey in 1996 conducted in the Auckland region by the Auckland Regional Council found that the volumes of hazardous waste were much higher than previously thought. The hazardous waste stream included: timber treatment chemicals, metal finishing wastes (such as cyanides, chromium sludges, acids and alkalis, degreasing chemicals), pesticides, asbestos, sludges of mineral acids and alkalis, polychlorinated biphenyls, numerous chemical wastes, solvents, dyes etc as well as pharmaceutical and laboratory wastes.

The management of hazardous wastes has long been a matter of concern in New Zealand. The need to reform the legislation governing hazardous substances was

identified as early as the 1980s. In addition, the OECD raised concerns about the lack of facilities within New Zealand to dispose of hazardous wastes. Although the new statute governing the management of hazardous wastes generated from hazardous substances *The Hazardous Substances and New Organisms Act 1996* was passed five years ago, it only came into effect on 2 July 2001, with respect to hazardous substances.

3.7.2 Assessment of risk

The evidence available to date suggests that the generation of waste, including hazardous wastes within New Zealand, continues to pose a threat to the New Zealand environment.

It is plausible that this in turn could impact on the perception of environmental quality that underpins New Zealand exports. The sectors most likely to be affected include:

- tourism, particularly if the quality of waste management is such that the waste stream is allowed to degrade the quality of marine and freshwater resources (including groundwater)
- the agricultural and horticultural sectors (including organics) particularly if the hazardous waste stream results in chemical residues being found in food exports.

3.8 CONCLUSIONS: ENVIRONMENT AND EXPORT SECTOR COUPLETS

Generally, the evidence available suggests that the quality of New Zealand’s environment is relatively high, commensurate with the relatively low levels of population pressure. However, with respect to all of environmental indicators considered in this report, there is evidence of environmental degradation sufficient to raise questions about the sustainability of the value of New Zealand’s exports attributable to its environmental image.

Perhaps, even more striking however, is the lack of good quality information on the state of New Zealand’s environment including information on how environmental quality may be changing over time. Notwithstanding the fact that the State of New Zealand’s Environment report collated and synthesised previous research and the Environmental Indicators’ Programme has developed a comprehensive range of indicators, there’s no escaping the fact that more work is needed to coordinate the reporting of environmental indicators so that the information is both consistent and current. Until we can access meaningful environmental information on an ongoing basis and link this to other social and economic information, the relationship between environmental quality and export value will remain less clear than it might be.

Notwithstanding this uncertainty, it is possible to develop several plausible hypotheses concerning the links between the state of the New Zealand environment and the value of New Zealand’s exports. These are summarised in Table 1 below. The left-hand column records the environmental issue, the right hand column identifies the export sector that could possibly be affected.

Table 1: Principal likely links between environmental issues and export value

Environmental Issue	Associated Export Sector
Air Urban smog	Tourism

3. Environmental Sector Scan

Environmental Issue	Associated Export Sector
Rural spray drift	Organic food exports Other “non-organic” food exports
Land Erosion Contaminated sites	Tourism/sustainable agriculture Organic food exports/tourism
Freshwater Lowland rural water quality Drinking water quality	Tourism, pastoral farming (dairy in particular) Tourism
Coastal marine Non-biodegradable litter	Tourism
Waste Waste volumes and landfill quality Management of the hazardous waste stream	Tourism Agricultural exports (including organic food exports/tourism)