NEW ZEALAND ENVIRONMENTAL PERCEPTIONS SURVEY: 2022

Manaaki Whenua – Landcare Research

Pamela L. Booth, Kenneth F.D. Hughey, Geoffrey N. Kerr, Philip Stahlmann-Brown

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FOREWARD

How do New Zealanders perceive the natural environment? This was the visionary question posed by Ken Hughey, Geoff Kerr, and Ross Cullen. At Lincoln University, they launched the Survey of Public Attitudes, Preferences, and Perceptions of the New Zealand Environment in 2000. At that time, they had no inkling that this survey would become the longest-running such survey undertaken worldwide.

The 'Lincoln Survey' has provided empirical evidence for dozens of scientific articles and has informed countless policy debates across Aotearoa. It is, unquestionably, the single most influential research project on environmental preferences and perceptions in New Zealand. Indeed, it inspired Manaaki Whenua – Landcare Research to begin its own longitudinal survey, the Survey of Rural Decision Makers, in 2013.

The project was repeated under the leadership of Ken, Geoff, and Ross in 2002, 2004, 2006, 2008, 2010, 2013, 2016, and 2019 – marking an astonishing nine waves of the survey in total. Ross retired in 2013 but continued to play an active role until 2019. Ken and Geoff both retired in 2022, and although they are co-authors of this report, they decided that the survey needed new stewards moving forward.

Ken and Geoff have entrusted the legacy of this groundbreaking work to Manaaki Whenua – Landcare Research. We are honoured by their trust. The newly renamed New Zealand Environmental Perceptions Survey will endeavour to maintain the same high standards established in all previous waves of the survey.

Pam Booth

Pike Stahlmann-Brown

SUMMARY

The 10th iteration of the New Zealand Environmental Perceptions Survey (EPS) was conducted during autumn 2022. The survey was based on the Pressure-State-Response (PSR) framework of environmental reporting and reports on public perceptions of the pressures on, state of, and response to pressures across 10 environmental domains.

The EPS was conducted by researchers from Lincoln University biennially from 2000 to 2010 and then triennially from 2010 to 2019. The 2022 survey was undertaken by Manaaki Whenua-Landcare Research in partnership with the original researchers. It introduces a nationally representative sample, reports on trends since 2010 using appropriate survey sample weights, re-characterises four environmental domains, and uses a consistent set of 10 environmental domains across pressures, states, and responses.

Notable findings from the 2022 EPS include:

- The overall state of the New Zealand environment was perceived to be 'adequate' to 'good'.
- The perceived state of New Zealand's air, protected natural areas, and native bush and forests was rated 'good' to 'very good', but the state of rivers and lakes was rated 'bad' to 'adequate'.
- The perceived quality of management of protected natural areas, air, and native bush and forests was rated as `adequate' to 'good' while the perceived quality of management of the remaining environmental domains was perceived to be `adequate'.
- Sewage and stormwater were thought to exert the greatest pressure on coastal waters and beaches, marine environments, marine plants and animals, and river and lakes.
- Pests and weeds were thought to exert the most pressure on protected natural areas, native bush and forests, terrestrial plants and animals, and wetlands.

Key trends since 2010 include:

- The perceived state of air, natural environments in towns and cities, rivers and lakes, wetlands, and native bush and forests improved significantly since 2010.
- The perceived quality of management of most environmental domains declined between 2010 and 2016 then improved between 2016 and 2022. Perceptions in 2022 were not significantly different from their 2010 levels.
- The proportion of respondents who thought sewage and stormwater exerted pressure on any environmental domain increased since 2010 while the proportion of respondents who thought farming exerted pressure on any environmental domain peaked in 2016 and subsequently declined.

Other findings include:

- Recycling household waste was the most popular pro-environmental activity in 2022. However, participation rates for all environmental activities have dropped significantly.
- Freshwater was considered the most important issue facing New Zealand from 2010 to 2019. In 2022, more respondents considered climate change to be the most important issue facing New Zealand.
- Climate change was identified as the most important issues facing the world by the respondents in every survey between 2010 and 2022.
- More respondents thought that farms were doing their part for water quality than respondents who thought that farms were doing their part for climate change and biodiversity.
- At least half of respondents across all regions thought the overall environmental performance of farms in their regions was at least adequate.

There is some disconnect between perceptions and the actual state of the environment:

- Perceptions of the three marine domains either remained static or improved. This contrasted with biophysical trends showing poor conditions and increasing pressures from land-based activities and climate change.
- Perceptions and actual PSRs were more congruent when the biophysical data were better quality (e.g., air) and/or more readily communicated to the public (e.g., swimmable rivers).

Nevertheless, respondents were increasingly aware of how intensive development and urbanisation activities put pressure on the environment and were willing to actively engage in mitigating some of these pressures by, for example, recycling and growing their own vegetables.

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Moeraki Boulders/Kaihinaki, Koekohe Beach

INTRODUCTION

1.1 BACKGROUND

The New Zealand Environmental Perceptions Survey (EPS) is based on the Pressure-State-Response (PSR) framework for environmental reporting (Organisation for Economic Co-operation and Development, 1996; Ministry for the Environment (MfE), 1997). Initiated in 2000, the survey was run every 2 years as a paper-based postal survey from 2000 to 2010, and then every 3 years as an electronic survey from 2010 onwards (Hughey et al. 2001, 2002, 2004, 2006, 2008, 2010, 2013, 2016, 2019). This report provides an overview of the results from the 10th EPS, which was conducted in autumn 2022. It compares results from the 2022 wave to the 2010, 2013, 2016, and 2019 waves of the survey in order to describe trends.

1.2 OBJECTIVES

The main objectives of the EPS are to measure, analyse, and monitor changes in New Zealanders' perceptions of, attitudes to, and preferences towards a range of environmental issues in order to improve environmental reporting. The more specific aims of the survey are to:

- monitor changes in New Zealanders' environmental attitudes, perceptions, and preferences over time through repeated surveys
- publicly report on findings from the survey, and trends in environmental attitudes, perceptions, and preferences
- provide independent commentary on environmental issues of public concern, both as a contribution to public debate and as a way to alert government and others to these issues
- provide opportunities for organisations and/or other researchers to derive one-off research data for their areas of interest.

1.3 CHANGES FROM PREVIOUS REPORTS

This wave of the EPS was undertaken jointly by Manaaki Whenua – Landcare Research and Lincoln University. We decided to report the trends for only the electronic versions of the survey in this report (i.e., 2010 onwards). This decision was motivated by the desire to present easily interpretable graphical results and to ensure representativeness by weighting results for demographic representation. However, the paper-based results are still available and analysed in previous reports (see Hughey et al. 2019) and may be included in future reports. In contrast to previous years, there is no 'Special topics' section in this report, but topics of specific interest to other organisations and/or researchers may be included in future surveys.

Background empirical and biophysical information on the current state, trends and pressures on the 10 environmental domains is discussed in Section 2. Changes to the questionnaire content and methods are discussed in Section 3. Section 4 covers the 2022 PSR for 10 environmental domains and the time series trends for these 10 environmental domains individually, Sections 5, 6, and 7 cover additional questions in the survey, Section 8 discusses these PSR results in the context of biophysical status and national and international reporting, and Section 9 discusses all the EPS results and presents overall conclusions.

02

Waiwhakareke Natural Heritage Park, Hamilton

BACKGROUND IN BIOPHYSICAL STATE, TRENDS, AND PRESSURES OF ENVIRONMENTAL DOMAINS

This section provides background empirical and biophysical information from the Ministry for the Environment and Statistics NZ environmental reporting series and Environmental Performance Index (EPI) on the current state, trends and pressures on the 10 environmental domains. The Ministry for the Environment and Statistics NZ environmental reporting series Environment Aotearoa (Ministry for the Environment and Statistics NZ (MfE & StatsNZ), 2022), Our Air (MfE & StatsNZ, 2021a), Our Freshwater (MfE & StatsNZ, 2020), Our Land (MfE & StatsNZ, 2021b), and Our Marine Environment (MfE & StatsNZ, 2019) provides comprehensive, up-to-date, high-quality data on the biophysical state of the New Zealand environment. The global EPI is used for international comparison, as it is the most widely cited source of comparable international data (Wolf *et al.*, 2022a). Although the indicators included in the EPI do not map perfectly onto the environmental domains discussed in this survey, they do facilitate useful comparisons. New Zealand's EPI and individual resources are also contrasted against 11 other countries that share cultural similarities, environmental conditions, regulatory environments, and/or economic relationships (See Appendix 1).

2.1 AIR QUALITY

Air quality in New Zealand is measured directly by six biophysical indicators and indirectly by the impact of poor air quality on people's health. The biophysical indicators are concentrations of: particulate matter (PM) of 2.5 micrometres ($PM_{2.5}$) or 10 micrometres (PM_{10}), ozone (O_3), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and carbon monoxide (CO), on an 8-hour, 24-hour, seasonal, and/or annual basis depending on the specific metric. These indicators are discussed in comparison to the National Environmental Standards for Air Quality and the World Health Organisation (WHO) guidelines (WHO 2021; MfE & StatsNZ, 2021a). The impact of poor air quality on people is often indirectly measured by the incidence of hospitalisations and premature deaths due to respiratory diseases (MfE & StatsNZ 2021a, 2022).[1]

Overall, air quality trends have been improving across most of New Zealand over the last 10 years. Air quality trends during the winter months improved the fastest for Arrowtown, Rotorua, and Milton (MfE & StatsNZ, 2022). Between 2012 and 2022, New Zealand's air quality EPI score also improved by 4.5%, but its ranking fell from second to fourth as Finland and Sweden improved their air quality scores more (Wolf *et al.*, 2022a). Air quality trends also worsened at 8% of New Zealand locations on an annual basis and at 12% of locations during the summer months (MfE & StatsNZ, 2022).

Concentrations of PM_{10}, $PM_{2.5}$, NO_2, SO_2, and CO at most measured sites have improved since 2011. However, 76% of PM_{10} monitoring sites, 95% of $PM_{2.5}$ monitoring sites, and 71% of NO_2 monitoring sites exceeded the 24-hour concentration WHO guidelines at least once between 2017 and 2020. Also, 50% of PM_{10} monitoring sites exceeded the annual concentration WHO guidelines on at least 1 day between 2017 and 2020. The highest $PM_{2.5}$ concentration sites tended to remain high for at least a quarter of the year, most often during the colder months. Two NO_2 sites also exceeded the 24-hour concentration guidelines for most of each year between 2017 and 2020 (MfE & StatsNZ, 2021a).

The most significant human health impacts from poor air quality are associated with exposure to PM. PM in the air can penetrate the lungs and bloodstream to cause shortness of breath, coughing, cardiovascular diseases, and respiratory diseases (WHO 2013, 2022). Modelling of premature deaths, total hospital admissions, and restrictive days in New Zealand due to human generated PM_{10} showed a slight decline between 2006 and 2016. However, Our Air notes that the improvement in effects from PM_{10} during that time period is more likely to be due to more people living in places with lower PM_{10} concentrations than to declining PM_{10} concentrations (MfE & StatsNZ, 2021a). There are also correlations between the incidence of hospitalisations for respiratory disease, ethnicity, and socio-economic status. Hospitalisation rates among Pasifika and Māori people are 2.2 and 2.6 times higher than the average, and people from households qualifying as the most deprived households are 2.3 times more likely to be hospitalised (MfE & StatsNZ, 2022).

Sources of $PM_{2.5}$, PM_{10}, O_3, NO_2, SO_2, and CO include vehicle emissions, manufacturing and industry, wood burning for homes, and dust from unsealed roads (MfE & StatsNZ, 2022). The residential sector contributes $PM_{2.5}$ and CO, unsealed roads contribute PM_{10}, vehicles contribute NO_2, and coal and manufacturing contributes SO_2. Total emissions of these pollutants have been trending downward since 2012, except for PM10. Also, while per vehicle emissions of these pollutants have declined (except SO_2), total emissions have increased as the number of cars has increased (MfE & StatsNZ, 2021a).

2.2 MARINE ENVIRONMENTS

New Zealand has an exclusive economic zone (EEZ) 15 times larger than its land area (Land Information New Zealand (LINZ), 2019). The condition of the marine environment is mixed. For example, among the marine mammals and seabirds assessed, 22% of marine mammals and 90% of seabirds are threatened or at risk of extinction. Most coastal

1 *Our Air discusses modelling of premature deaths, total hospital admissions, and restrictive days for 2006 to 2016 (MfE & StatsNZ, 2021a).*

and marine habitats have also declined in extent over time. Marine environments are also under threat from non-native species: 43% of the non-native marine species detected in New Zealand since 2007 have become established (MfE & StatsNZ, 2019). Unfortunately, Our Marine Environment identified assessment of the condition of marine habitats as a knowledge gap, due largely to the cost of monitoring, especially of habitats that remain underwater (e.g., stony coral; MfE & StatsNZ, 2019).

Marine environments face the same land, ocean, coastal, and climate pressures as coastal waters and beaches (Section 2.3) and marine plants and animals (Section 2.9), but are affected differently. Marine environments are also under pressure from runoff from the land, climate change, and human activities. Sediment runoff and nutrient loading enter marine environments through river systems and coastal erosion. The overall impact of either pollutant on the marine environment is dependent on how well wave and tidal activity disperse the land-based runoff. However, between 1977 and 2013, there has been a 74% increase in total nitrogen, 159% increase in nitrate-nitrites, 48% increase in total phosphorus, and 18% increase in dissolved reactive phosphorus entering New Zealand's oceans (MfE & StatsNZ 2019, 2022).

Marine environments are affected in two different ways by increasing greenhouse gas (GHG) levels in the atmosphere. Carbon dioxide (CO_2) in the atmosphere is absorbed by the oceans, mitigating the effects of this GHG on the climate. However, this CO_2 undergoes a process, once absorbed, that makes the pH level of the water more acidic. The oceans are also affected by increasing global temperatures. Acidification and increased temperatures damage marine life and taonga species (e.g., pāua, cockles, kuku, and kina) and have caused upwelling events of less acidic colder water in other parts of the world with more acidic waters. New Zealand's oceans have become 7.1% more acidic over the last 20 years, sea-surface temperatures have increased 0.2 C° each decade since 1981 and since 1981, there have been more years when the average ocean temperature exceeds the long-term average temperature (MfE & StatsNZ, 2019, 2022).

The third source of pressures on marine environments comes from activities on the ocean and along coastal areas. Trawling and dredging are still practised in New Zealand, with 24% of the fishable areas in the EEZ trawled since 1990, although the number of commercial trawlers and dredgers has decreased over the last 20 years. Boat traffic (including commerce and pleasure cruises) facilitates the spread of invasive species and causes noise, air, and water pollution. Shipwreck debris and fuel damages both the immediate environment and water further afield as the debris and fuel travel. Infrastructure to support marine traffic also directly affects coastal areas. Pressures from boat traffic were increasing on water and on land before the Covid-19 border closures in 2020. Between 2004 and 2015, the number of cruise ships and passengers coming to New Zealand increased five-fold (MfE & StatsNZ, 2019). With borders opening to marine traffic and tourism mid-2022, some harbours are considering continuing to limit cruise ship and passenger numbers to reduce the environmental impacts (Environment Canterbury, 2022; Parliamentary Commissioner For the Environment (PCE), 2021a).

The EPI has no indicator for the marine environment, but does include an indicator for the control of ocean plastic pollution. Over the last 10 years, New Zealand improved its ranking of management of plastics entering its oceans from 70th to 50th and improved its raw score of management by 38% (Wolf *et al.*, 2022a).

2.3 COASTAL WATERS AND BEACHES

New Zealand has one of the longest coastlines in the Organisation for Economic Co-Operation and Development (OECD), with about 15,000 km of rocky shore, fjords, inlets, soft beaches, harbours, sounds, and estuaries (Organisation for Economic Co-Operation and Development (OECD), 2019). The condition of coastal waters and beaches is generally worse than in open ocean because of the direct impact of human activities on land and in the immediate vicinity of the coast (MfE & StatsNZ, 2022). Sediments, nutrients, rubbish, infrastructure, dredging, shipping activities, pathogens, and sea-level rise combine to affect the condition of coastal water quality, habitats, and species.

Coastal waters and beaches face the same land, ocean, coastal, and climate pressures as marine environments (Section 4.7) and marine plants and animals (Section 4.14) but are affected slightly differently. Soft sand beaches are popular destinations for recreation, including swimming, shellfish gleaning, and fishing. Unfortunately, these activities also degrade the quality of the beaches and waters. Plastic pellets have been recorded on New Zealand beaches since 1972 (Gregory, 1978 as cited in MfE & StatsNZ, 2019). Surveys of litter at 44 beaches across the country in 2019 found that 66% of the litter collected was made of plastic (MfE & StatsNZ, 2019). Physical manipulation of coastal areas from driving, fishing/shellfish gleaning, boating, and infrastructure that supports recreation activities causes compaction and erosion of habitats. These physical activities also disturb coastal species, cause noise pollution, and contribute nutrients and pathogens to the ecosystem. There is also evidence to suggest that compaction from driving on beaches is contributing to declining toheroa populations (MfE & StatsNZ, 2019).

Earthworks around the coast, including roads, ports, seawalls, residential and commercial building, reclaimed land, and dredging disturb and damage habitats, coastal species, and water quality. While the number of dredges declined between 1999 and 2019, the number of cruise ships and passengers coming to New Zealand increased five-fold over a similar time

period.[2] Nearly all imports and exports are transported by sea, and the volume of exports grew continuously from 2004 to 2014 (MfE & StatsNZ, 2019). This increased commercial shipping demand puts pressure on coastal infrastructure, facilitates the spread of invasive species, and causes noise, air, and water pollution (MfE & StatsNZ, 2019). Earthworks along the shore also cause re-suspension of sediment, alter wave and tidal patterns, and damage biogenic habitats (MfE & StatsNZ, 2019).

The amount of sediment entering coastal areas via rivers has increased over time but is highly variable around the country. For example, models estimate that 2,106 tonnes of sediment enter West Coast's waterways per km^2 per year and 4,844 tonnes enter Gisborne's waterways per km^2 per year, but only 566 tonnes enter Manawatū-Whanganui's waterways per km^2 per year (StatsNZ, 2018). Excess sedimentation is driven largely by deforestation and exacerbated by drainage of wetland and floodplains (MfE & StatsNZ, 2022). Sedimentation also tends to be greater in catchments with more urban land cover than in catchments with pastoral, exotic forest, and native vegetation land cover (MfE & StatsNZ, 2020). The effects of sediment on coastal areas range from overloading habitats and transporting nutrients into the water to clogging fish gills and suffocating filter-feeders (MfE & StatsNZ, 2022).

Coastal waters are also under pressure from nutrients and pathogens transported from the land and human activities via rivers, sewage, stormwater, and runoff. Between 1977 and 2013, total nitrogen increased by 74%, nitrate-nitrites increased by 159%, total phosphorus increased by 48%, and dissolved reactive phosphorus entering New Zealand's oceans increased by 18% (MfE & StatsNZ, 2022). Since 2008, more monitored estuaries show a declining trend than an improving trend in total nitrogen, ammoniacal nitrogen, and dissolved oxygen. However, 72% of monitored estuaries showed improving total phosphorus trends over the same period (StatsNZ, 2019; MfE & StatsNZ, 2019), and heavy metal concentrations between 2015 and 2018 were below levels expected to affect bottom-dwelling species (MfE & StatsNZ, 2020).

Coastal waters and beaches are affected by climate change and extreme events from land and the ocean. Changes in precipitation affect the quantity and quality of freshwater running from the land into estuaries, lagoons, wetlands, and bays. Sea-level rise, changes in wave height and intensity, and increasing water temperature affect the coastal areas from the ocean side. Transitional zones (e.g., estuaries) along the coast are unique ecosystems that are sensitive to changes in salinity levels, and changes in the amount of freshwater and/or salt water in transitional zones have a significant impact on plants and animals because of changes in salinity (MfE, 2017; MfE & StatsNZ, 2020). Wave action causes localised erosion and redistribution of sediment (GESAMP, 2001; Larned *et al.*, 2018). Since 1981, the yearly average ocean temperature exceeded the long-term average temperature in more years than not (MfE & StatsNZ, 2022). Extreme wave events (>8 metres) are also increasing along the eastern and southern coasts of New Zealand while decreasing along West Coast of the North Island and north of the Bay of Plenty (MfE & StatsNZ, 2019). Coupled with sea-level rise and increasing sea temperatures, the impacts of wave action and increasing likelihood of extreme events exacerbate erosion and degradation of the coastline (MfE & StatsNZ, 2019).

2.4 RIVERS AND LAKES

New Zealand has more than 425,000 km of rivers and over 50,000 lakes, 3,820 of which are larger than 1 ha (MfE & StatsNZ, 2020). River water quality is measured by nitrate-nitrogen, ammoniacal nitrogen, dissolved reactive phosphorus (DRP), turbidity, sedimentation, macroinvertebrate community index (MCI), *Escherichia coli* (*E. coli*), *Campylobacter,* and heavy metals. Lake conditions are measured by total nitrogen, total phosphorus, chlorophyll-a, submerged plant index (SPI), and trophic level index (TLI).

Excessive nutrients can lead to algal blooms and overgrowth of plants, both native and invasive, which degrade aesthetic, cultural, and recreational values. High turbidity and sedimentation lead to reduced water clarity and poor ecological health of rivers and lakes. *E. coli* and *Campylobacter* are measured to assess the probability of causing illness if contaminated water is consumed: higher concentrations imply a higher risk of illness and lower suitability for drinking-water and swimming. SPI measures ecological health, where a higher SPI score means more native plants compared with invasive species are present. TLI measures water quality and ecological health via the concentration of chlorophyll-a, total nitrogen, and total phosphorus, where a higher TLI score indicates excessive nutrient enrichment, poor conditions to support aquatic life, and a higher likelihood of algal blooms. MCI is a measure of water quality and the health of ecological processes, as reflected by the diversity of macroinvertebrates that live in the rivers. Higher MCI scores mean the river is able to support diverse biological and ecological processes (MfE & StatsNZ, 2020).

Overall, rivers are in a mixed condition, depending on the level of modification of the land cover in the upstream catchment. Rivers in catchments with more modified land, such as urban and pastoral land, have higher nutrient, sediment, heavy metal, and pathogen pollution than rivers in catchments with less human modification. However, across the country, 64% of rivers have excessive phosphorus, 69% have excessive nitrogen, 37% have high turbidity, 9% have

2 *As noted in Section 2.2, the number of cruise ships and passengers post-Covid may not return to their pre-Covid numbers (PCE, 2021a).*

poor water clarity, 17% have MCI scores indicating severe organic or nutrient pollution, and only 7% have MCI scores indicating pristine conditions (MfE & StatsNZ, 2022).

Rivers in catchments dominated by urban, pastoral, and exotic forest land cover are in worse ecological condition than those in catchments dominated by native land cover. MCI scores for rivers in catchments dominated by urban land cover were 33% lower than in catchments dominated by native land cover. In catchments dominated by pastoral land cover, MCI scores were 15% lower (MfE & StatsNZ, 2020).

Nearly all rivers in catchments dominated by urban land cover, 95% of rivers in catchments dominated by exotic forest land cover, and 95% of rivers in catchments dominated by pastoral land cover exceed at least one nutrient or turbidity limit. In comparison, only 55% of rivers in catchments dominated by native land cover exceed at least one nutrient or turbidity limit. These rivers are also less likely to be unsafe for swimming. In contrast, 94% of the river length in catchments with urban land cover, 76% in catchments with pastoral land cover, and 27% in catchments with exotic forest land cover are deemed unsafe for swimming (MfE & StatsNZ, 2020).

Between 2001 and 2020, nitrate-nitrite-nitrogen concentrations improved at 38% of monitored sites on rivers, ammoniacal nitrogen concentrations improved at 61% of monitored sites, DRP concentrations improved at 67% of monitored sites, clarity and turbidity improved at 50% of sites (but worsened at 33% of sites), and MCI scores worsened at 56% of monitored sites (MfE & StatsNZ, 2022). Over a similar time period, turbidity, nitrate-nitrogen, DRP, and ammoniacal nitrogen concentrations improved in a majority of rivers in catchments dominated by urban land cover while ammoniacal nitrogen concentrations improved at a majority of rivers in catchments dominated by pastoral or native land cover. Ammoniacal nitrogen and *E. coli* improved but DRP worsened at a majority of rivers in catchments dominated by exotic forest (MfE & StatsNZ, 2020).

Of the 3,820 lakes larger than 1 ha, 8% have SPI data available, 99% have modelled TLI scores, and 2.6% have monitored TLI scores. Over 20 years of SPI data, 12% of lakes had no invasive plants present, 34% were in excellent or high ecological condition, 31% were in moderate ecological condition, and 36% were in poor ecological condition or lacked any submerged plants (MfE & StatsNZ, 2020). Modelled TLI for 2016 to 2020 showed that 2.4% of lakes are microtrophic (very good) or oligotrophic (good), 51.8% are mesotrophic (average), and 46% are eutrophic (poor) or supertrophic. However, across 101 lakes monitored for TLI, 11.9% were microtrophic or oligotrophic, 25.7% were mesotrophic, and 62.4% were eutrophic or supertrophic (StatsNZ 2022b). Data are insufficient for estimating 20-year TLI trends (MfE & StatsNZ, 2022).

Lakes in catchments dominated by urban, pastoral, and exotic forest land cover are in worse ecological condition than lakes in catchments dominated by native land cover. More lakes in catchments with pastoral (28%), urban (44%), and exotic forest (19%) land cover exceeded total nitrogen concentration limits than lakes in catchments with native land cover (8%; MfE & StatsNZ, 2020). TLI was poor or very poor for 77% of lakes in catchments dominated by urban, 70% of lakes in catchments dominated by pastoral, and 67% of lakes in catchments dominated by exotic forest land cover, compared with 19% of lakes in catchments dominated by native land cover. SPI scores were also lower for lakes in catchments with urban and pastoral land cover than for those in native and exotic forest land cover (MfE & StatsNZ, 2020).

Heavy metals such as zinc and copper from cars can accumulate in aquatic species that people eat, such as fish and shellfish, and have been linked to an increased risk of cancers (Stewart *et al.*, 2011 as cited in MfE & StatsNZ, 2020). Heavy metals enter waterways via stormwater runoff from roads, vehicles, roofs, industrial activities, and other impervious surfaces found around developed areas. Between 2015 and 2017, median concentrations of zinc exceeded limits at 73% of sites in Auckland, 60% of sites in Wellington, and 33% of sites in Christchurch. Median concentrations of copper exceeded limits at 36% of sites in Auckland, 20% of sites in Wellington, and both sites in Christchurch (MfE & StatsNZ, 2020).

Pathogens and bacteria such as *Campylobacter, E. coli,* and cyanobacteria (toxic algae) are monitored in rivers and lakes because they cause several illnesses if contaminated water is consumed through drinking-water, swimming, or spray. *Campylobacter* infection risk greater than 7% was found at 22% of modelled rivers and 32% of monitored sites. Median *E. coli* concentrations exceeded limits at 15% of modelled rivers and 28% of monitored sites (StatsNZ, 2022c). Over the last 20 years, 37% of monitored sites improved their *E. coli* concentrations while 41% worsened their *E. coli* concentrations (MfE & StatsNZ, 2022). Over the last 10 years, Manawatū-Whanganui, Hawke's Bay, Taranaki, Wellington, Marlborough, Canterbury, and Southland saw worsening *E. coli* concentrations while Gisborne, Waikato, and Northland saw improving *E. coli* concentrations (MfE & StatsNZ, 2020). Pets are also at risk of illness from contaminated water: since 2006, more than 70 dogs have been reported to have died after consuming river water containing toxic algae (MfE & StatsNZ, 2020).

The EPI has several indicators related to freshwater resources that do not explicitly measure *in situ* conditions or management of freshwater but that do attempt to capture the impacts on freshwater from human users. The EPI ranking of access to safe drinking-water ranking did not change over the last 10-years despite access improving by 1.4%. Similarly, New Zealand's access to safe sanitation—an indirect indicator for management of freshwater important to human health—ranking declined from 33rd to 35th, but access improved nominally by 4% (Wolf *et al.*, 2022a).

There are several gaps in knowledge and monitoring of river and lake quality. The effects and sources of non-natural contaminants (particularly from urban centres)

on water quality, ecosystems, and humans is an emerging area of research (MfE & StatsNZ, 2020). There is little understanding of the cumulative and long-term effects of human-induced pollutants, known and emerging, on the ecosystem (MfE & StatsNZ, 2020). There is also little understanding of the source of pollution and ability to differentiate the source(s) of pollution in catchment areas (e.g., pollution from wastewater and farm runoff could mimic each other downstream). This limited ability to track the effects of land activities extends to measuring the positive and negative effects of where, when, and what management practices and land-use changes occur in agricultural areas (MfE & StatsNZ, 2020). Finally, there are gaps in measuring the quantity of consented water actually taken, how much water is available for use, and the effects of excessive water take on the ecosystem (MfE & StatsNZ, 2020).

2.5 WETLANDS

Wetlands enhance water quality and quantity, provide habitat for freshwater plants and animals, and sequester carbon (Clarkson *et al.*, 2013; Schallenberg *et al.*, 2013). Reducing the extent of wetlands influences these important services (MfE & StatsNZ, 2020). Wetlands are also taonga for Māori and often plentiful sources of harakeke, raupō, plants and trees used for carving and tools, and rongoā plants (Harmsworth, 2002 as cited in MfE & StatsNZ, 2020).

Wetlands are sensitive to changes in hydrological processes, climate, and salinity. Surface water take and changes in precipitation affect the aquifer, and aquifer take affects surface water levels. Take from either source also affects other water sources, such as wetlands, estuaries, and lakes, so taking water from rivers and aquifers can reduce the water in these other ecosystems (White *et al.*, 2001 and Cameron & White, 2004 as cited in MfE & StatsNZ, 2020). Changes in the climate also affect wetlands through precipitation and temperature. Environmental drought leads to increased water takes and reduced water in wetlands while flooding puts increased pressure on wetlands' water quality and quantity (MfE & StatsNZ, 2020). Coastal wetlands and estuaries are also at risk of salinity changes due to land changes and sea-level rise (Rodríguez *et al.*, 2017 as cited in MfE & StatsNZ, 2020).

Less than 250,000 ha of wetlands remain in New Zealand, equal to 10% of the pre-human settlement extent of wetlands (MfE & StatsNZ, 2020) after Polynesian and European settlers cleared areas of forest and drained wetlands to make way for farming and settlements (McGlone, 1989 and Gluckman *et al.*, 2017 as cited in MfE & StatsNZ, 2020). This conversion of wetlands to agriculture and settlements continues in the present day. For example, Robertson *et al.* (2018) found that between 1990 and 2012, Southland lost 7,395 ha of wetlands, 2,665 of which were freshwater wetlands converted to farming and forestry (MfE & StatsNZ, 2022). Dymond *et al.* (2021) also found that since 2012, 1,498 ha of freshwater and 69 ha of saline wetlands have been lost. Of the remaining wetlands, 60% are estimated to be in a moderately to severely degraded state based on surrounding land uses (Ausseil *et al.*, 2011 as cited in MfE & StatsNZ, 2020). However, the actual state of wetlands across New Zealand is not well understood or monitored (MfE & StatsNZ, 2020).

2.6 NATIVE BUSH AND FORESTS

Indigenous land cover in New Zealand encompasses 12 million ha and includes native forests, tussock, scrub/shrubland, lightly vegetated land, and other herbaceous vegetation. Since 1995, a net 88,146 ha of indigenous land cover has been converted to agriculture, exotic forestry, or development, contributing to a net loss in 14 out of 16 regions. However, only 14% of that loss has occurred within the last 10 years. Native forests (4,979 ha), scrubland (25,144 ha), and tussock (1,758 ha) land cover have seen the largest losses since 2012, 74% of which was converted to exotic grassland (16,444 ha) and exotic forestry (7,037 ha) (StatsNZ, 2021; MfE & StatsNZ, 2021b).

It is estimated that 80% of pre-human New Zealand was covered with native forests, but by 2018 only 27% of the country remained covered in native forest. Changes in native forest cover since 2012 vary across the regions. Northland, Auckland, Canterbury, West Coast, and Southland all had a net loss, while Taranaki, Gisborne, Hawke's Bay and Manawatū-Whanganui all had a net gain of over 1,000 ha (MfE & StatsNZ, 2022). Among the 4,974 ha of native forest converted to another land use between 2012 and 2018, 57% was converted to exotic grasslands, 21% to exotic forests, and 11% to artificially bare land, with the remaining 11% converted to lightly vegetated land, indigenous scrubland, urban development, water bodies, cropping, and exotic scrubland (StatsNZ, 2021).

According to the EPI, New Zealand's ranking for tree cover loss improved from 128th to 107th. However, this improvement was due more to other countries losing more tree cover over the last decade as New Zealand's raw tree loss score declined 15%, indicating a net loss of canopy (Wolf *et al.*, 2022a). This metric does not distinguish between native and non-native forestry cover. In addition to the 27% of land covered in native trees, an additional 8% of land is covered in exotic forests, including that used for commercial forestry (MfE & StatsNZ, 2021b).

Native bush and forests face additional pressures from climate change, invasive species, land fragmentation, and poor soil conditions. Warmer temperatures may be more advantageous for invasive and exotic species to expand at the expense of natives (Macinnis-Ng *et al.*, 2021; PCE, 2021a) while providing better conditions for fungi and diseases to spread. For example, myrtle rust, which arrived in 2017, affects taonga species and thrives in humid and warm climates (Campbell *et al.*, 2020). Changes in land cover and increased conversion cause fragmentation of

native land, which, coupled with climate change, puts pressure on existing native species and provides avenues for invasive species to spread (Macinnis-Ng *et al.*, 2021). Unfortunately, there is still limited understanding of the distribution and rate of spread of invasive weeds (PCE, 2021b). Land used for intensive farming with a history of nitrogen fertilisation may be more difficult to convert back to native bush while being less resilient to the effects of climate change (Addison *et al.* 2021 as cited in MfE & StatsNZ 2022).

2.7 PROTECTED NATURAL AREAS

Protected natural areas include national parks, marine reserves, and rāhui (restricted access). New Zealand has 13 national parks across eight regions and 44 marine reserves, covering 17,430 km^2 (DOC n.d.; StatsNZ 2016). National parks consist of difficult-to-access mountainous areas, fjords, lowland native bush, volcanoes, glacial zones, and remote sandy beaches and are primarily located in the South Island. Marine reserves consist of benthic protected areas, seamount closures, marine mammal sanctuaries, and marine protected areas (StatsNZ, 2016).

The condition of protected natural areas is often dependent on many of the pressures that similar environmental domains face. For example, the state of forests within some national parks is most likely mixed due to invasive species, climate change, and human-induced pollution (e.g., Abel Tasman has a significant wilding tree problem). Areas are often put under protection in response to these pressures to preserve rare ecosystems, threatened species, and areas of cultural significance (MfE & StatsNZ, 2022).

There are two indicators in the EPI that relate to protected natural areas, and especially biodiversity and ecological representativeness within protected natural areas. New Zealand's Terrestrial Biome Protection and Protected Areas Representation index rankings declined over the last decade for both indicators; the Terrestrial Biome Protection declined from 52nd to 66th and the Protected Areas Representation from 18th to 104th. However, only the raw Protected Areas Representation score declined over the same period (by 2.7%), while the Terrestrial Biome Protection score improved by 1.6%. Taken together, New Zealand has increased the overall amount of biome protected within its borders but has not improved the diversity of plants and animals within those protected natural areas (Wolf *et al.*, 2022a).

2.8 NATURAL ENVIRONMENTS IN TOWNS AND CITIES

Just under 240,000 ha (1%) of New Zealand is classified as urban, but 87% of the population live in this 1% of land (StatsNZ, 2017). Over the last 30 years, urban land has increased 15%. Of that increase, 83% was converted from exotic grassland and 9% from cropping or horticultural land (MfE & StatsNZ, 2021b). Expanding urban zones often abut productive land, causing fragmentation and tension between residential and agricultural land use (Greenhalgh *et al.*, 2017 as cited in MfE & StatsNZ, 2021b).

River and lake water in catchments dominated by urban land cover tends to have more nutrients, sediments, pathogens, and heavy metals than fresh water in catchments dominated by other land types. Modelling has shown that rivers in catchments dominated by urban land cover contained 23 times higher nitrate-nitrogen levels, 26 times higher *E. coli* levels, 4 times higher dissolved reactive phosphorus levels, and 3 times higher turbidity levels than rivers in indigenous land cover. Dissolved reactive phosphorus and turbidity were 39% and 59% higher in rivers in catchments dominated by urban land cover, respectively, than rivers in catchments dominated by pastoral land cover (MfE & StatsNZ, 2020). Heavy metals from vehicles, plastic litter, nutrients from garden fertiliser, and pathogens from urban and residential areas can enter rivers and lakes through stormwater, wastewater, and runoff (MfE & StatsNZ, 2019, 2020, 2021b).

With less land cover and potentially damaged riparian areas, there is less vegetation to slow and capture these pollutants. However, turbidity trends have improved at 72% of monitored urban sites since 2008, nitrate-nitrogen trends have improved at 70% of urban sites, dissolved reactive phosphorous trends have improved at 64% of urban sites, and ammoniacal nitrogen trends have improved at 55% of urban sites (MfE & StatsNZ, 2020).

High levels of nutrients, sediment, and pathogens in river and lake catchments dominated by urban land cover negatively affect the ecological health of freshwater biota (MfE & StatsNZ, 2020, 2021b). High levels of nitrate-nitrogen and ammonia in urban catchments are toxic to freshwater species and increase the probability of algal blooms, including toxic algae (MfE & StatsNZ, 2020).

Access to green spaces, which include urban parks and nearby bush, is beneficial to people's well-being and health. Air quality is lower in urban areas due to increased emissions from motor vehicles but is mitigated by increased urban tree cover, which also mitigates extreme temperatures. However, access to green spaces is unevenly distributed and low on average compared to developed land area. New Plymouth has the highest proportion of green space at 13%, and Wellington and Dunedin have urban green belts (MfE & StatsNZ, 2022). Several communities have completed (or have already completed) urban restoration projects to increase urban tree cover, bird habitat, and overall biodiversity, including Waiwhakareke Natural Heritage Park in Hamilton (Wallace & Clarkson, 2019 as cited in MfE & StatsNZ, 2022), Avon Ōtakaro River Park (Orchard *et al.*, 2017 as cited in MfE & StatsNZ, 2022), Cape to City in Hawke's Bay (Predator Free Hawke's Bay, n.d. as cited in MfE & StatsNZ, 2022), and Taranaki Mounga (Taranaki Mounga Project, 2022 as cited in MfE & StatsNZ, 2022).

2.9 MARINE PLANTS AND ANIMALS

New Zealand has one of the longest coastlines in the OECD, with about 15,000 km of rocky shore, fjords, inlets, soft beaches, harbours, sounds and estuaries, and an exclusive economic zone 15 times larger than its land area (OECD, 2019; LINZ ,2019). The marine area accounts for 30% of New Zealand's known biodiversity, but there are thousands of known species that have not been studied, and a handful of previously unknown species are discovered every year (Gordon *et al.*, 2010 as cited in MfE & StatsNZ, 2019). Sediments, nutrients, rubbish, infrastructure, dredging, shipping activities, and pathogens combine to affect the condition of marine plants and animals.

The condition of fisheries depends on location, but it is also poorly understood. Among the 642 fish stocks that are managed under the quota system, 82% are in good condition and 9% are considered collapsed. However, 32% of fish under the quota system have not been assessed, and species caught by accident are not usually recorded (MfE & StatsNZ, 2019). Pāua stocks in the North Island and Canterbury are in good condition while stocks in the upper South Island and Marlborough Sounds have declined, and the condition of pāua elsewhere is unknown. Kuku (green lipped mussel) stocks have not been assessed nationally, but local assessments in Ōhiwa Harbour, near Whakatāne, suggest a 99% reduction between 2006 and 2015 due to sedimentation (MfE & StatsNZ, 2022).

Among marine mammal and seabird species that have been assessed, 22% of marine mammals, 90% of seabirds, and 80% of shorebirds were threatened or at risk of extinction. Sea lions, Hector's dolphins, leopard seals, false killer whales, and the southern right whale are also considered threatened or at risk of being threatened. However, ~10% of assessed shark, ray, and chimaera species are considered threatened or at risk of being threatened while >50% are considered not threatened (MfE & StatsNZ, 2019).

Phytoplankton abundance indicates overall marine productivity, ecological sustainability, and the health of the marine environment. Over the last 20 years, phytoplankton abundance has declined near Northland, Coromandel, Bay of Plenty, Tasman, Golden Bay, and off West Coast of the South Island, and has increased near the Hauraki Gulf, between Kaipara and New Plymouth, Hawke's Bay, Kaikōura, Oamaru, and Stewart Island / Rakiura (Pinkerton *et al.*, 2019). Phytoplankton abundance further offshore has decreased in northern waters west of the North Island and increased in southern waters west of Fiordland, east of Banks Peninsula, and over the Chatham Rise (MfE & StatsNZ, 2019). While decreasing abundance is of concern for ecological health, too much productivity could lead to phytoplankton blooms, mass die-offs, and fluctuations in oxygen (Morrison *et al.*, 2009).

Marine plants and animals face the same land, ocean, coastal, and climate pressures as marine environments (Section 2.2) and coastal waters and beaches (Section 2.4) but are affected slightly differently. Marine plants and animals face pressures from activities on and in the ocean and along coastal areas. Trawling and dredging damage seabed ecosystems, and dredging also disturbs sediments that ran off from the land. Trawling and dredging are still practised in New Zealand, with 24% of the fishable areas in the EEZ trawled since 1990. That said, the number of commercial trawlers and dredges has decreased over the last 20 years (MfE & StatsNZ, 2019). Commercial and recreational fishing also apply pressure directly through overfishing and indirectly through bycatch of other fish species, seabirds, and sea mammals. For example, an estimated 4,186 seabirds were killed during the 2017/18 fishing year as a result of being accidentally caught in fishing nets (MfE & StatsNZ, 2019). Fur seal bycatch fell from 1,443 in 2005 to 387 in 2014, sponges, crustaceans, and cold-water corals bycatch fell 72% between 2001 and 2012, and sea lion bycatch decreased from 51 in 2005 to 34 in 2012 (MfE & StatsNZ, 2019).

The EPI includes several indicators related to fish stocks and harvesting methods. Although these indicators focus on only one aspect of the ocean's plants and animals, the trawling indicator is correlated with the condition of other marine plants and animals. Unfortunately, New Zealand has not improved its ranking or raw scores for either over-exploitation of fish stocks or use of trawling for fishing. It saw a decline in ranking of using over-exploited fish stocks from 99th to 103rd, and a raw score decline of 36%, indicating an increasing reliance on over-exploited fishing stocks. It also saw a decline in ranking of the use of trawling for fishing from 74th to 88th, and a raw score decline of 17%, indicating an increasing reliance on the use of trawling or dredging for fishing (Wolf *et al.*, 2022a). This increased pressure on already-pressed fisheries and methods that damage the marine floor bed do not bode well for the condition of marine plants and animals.

Nutrients, sediment, and heavy metals enter marine environments through sewage, stormwater, and runoff from land-based activities. Sediments clog the gills of filter feeders such as cockles, pipi, and scallops, starving and suffocating the adults (Office of the Prime Minister's Chief Science Advisor, 2021; MfE & StatsNZ, 2022). Sedimentation also reduces the nursery grounds and gill structures of some fish species, affecting spawning and juvenile survival (MfE & StatsNZ, 2019). High nutrient concentrations promote algal growth, which negatively affects water oxygen levels, clarity of water, and the ability of sunlight to reach lower levels. More than a quarter of estuaries in New Zealand are estimated to be highly or very highly susceptible to ecosystem harm from an excess of nutrients (Plew *et al.*, 2018; MfE & StatsNZ, 2022).

Urban and industrial sewage and stormwater also introduce man-made chemicals that degrade ecosystems and have

visible impacts on plants and animals near these outlets. For example, pipi shell colour, abundance, and suitability for consumption near the Whakatāne River significantly declined after effluent was allowed to be discharged into the river (MfE & StatsNZ, 2019). Degradation of the Ahuriri estuary in Napier from sediment contaminants was associated with urban and industrial stormwater, which contained man-made chemicals (e.g., galaxolide) above management limits (MfE & StatsNZ, 2019).

Plastics, pharmaceuticals, and human-made chemicals also negatively affect plants and animals in the marine environment. For example, microplastics have been found in the guts of 25% of samples from six species in the Hauraki Gulf and 95% of hoki samples from West Coast, Cook Strait, and the Chatham Rise (National Institute of Weather and Atmosphere (NIWA), 2021a). Microplastics have also been found on the seabed floor (Fisheries New Zealand, 2020; NIWA, 2021b), in shellfish, and in seabirds (Forrest & Hindell, 2018 and Markic *et al.*, 2018 as cited in MfE & StatsNZ, 2022). Pharmaceuticals cause mussels to bind less successfully to rock surfaces and cause changes in their immune responses and biochemical markers (Gaw *et al.*, 2014 as cited in MfE & StatsNZ, 2019). However, there are gaps in monitoring, managing, and understanding the effects of these and emerging contaminants on the marine environment (MfE & StatsNZ, 2019).

In addition, marine plants and animals are affected directly and indirectly by increasing GHG levels in the atmosphere. Increased carbon dioxide in the atmosphere undergoes a process once absorbed by the oceans that changes the pH of the water to be more acidic. Acidification negatively affects the health and survivability of taonga species (e.g., pāua, cockles, kuku and kina). Unfortunately, New Zealand's marine waters have become 7.1% more acidic over the last 20 years (MfE & StatsNZ, 2022).

Marine plants and animals are also being affected by increasing global temperatures, warming ocean temperatures, and invasive species. Sea-surface temperatures have increased 0.2 °C each decade since the 1980s, and since 1981, the yearly average ocean temperature exceeded the long-term average in more years than it did not (MfE & StatsNZ, 2019). As native species move to waters more comfortable or die out in regions that are no longer hospitable, invasive species may fill the void. For example, when bull kelp disappeared from areas around the South Island during the 2017/18 heatwave, a non-native kelp genus, Undaria, invaded (Thomsen *et al.*, 2019).

New species could also have negative impacts on humans. For example, Gambierdiscus, a genus of plankton that causes ciguatera fish poisoning, has been recorded in the northern waters of New Zealand (Rhodes *et al.*, 2017). It triggers neurological, gastrointestinal, and cardiovascular symptoms in humans if contaminated fish are consumed (Armstrong *et al.*, 2016 as cited in MfE & StatsNZ, 2019).

2.10 TERRESTRIAL (LAND AND FRESHWATER) PLANTS AND ANIMALS

Since human settlement, New Zealand's terrestrial biodiversity has dramatically changed. Less than 27% of original indigenous land cover remains, 81 plant and animal species have become extinct (including 62 bird species; DOC, 2021; Robertson *et al.*, 2021), 10% of the land has been artificially drained, and more than 90% of wetlands have been lost (MfE & StatsNZ, 2022). Terrestrial plants and animals are also threatened by non-native plants and animals, climate change, and land development in addition to the negative effects from legacy and continued habitat degradation.

Among the assessed terrestrial species, 76% of native freshwater fish, 25% of native freshwater invertebrates, 33% of native freshwater plants, 46% of vascular plants, 74% of terrestrial birds, 66% of native birds, and 94% of reptiles are either threatened or at risk of being threatened with extinction (MfE & StatsNZ, 2020, 2022). Also, two of New Zealand's five known bat species are threatened, two are at risk, and the condition of one is unknown. Among the 71 ecosystems identified as 'rare, 45 are threatened with collapse, including 16 ecosystems in inland alpine areas (MfE & StatsNZ, 2022).

Taonga species are under threat. While kererū are classified as 'not threatened', they are dependent on ongoing conservation efforts. Monitoring activities show population declines (MfE & StatsNZ, 2022). Flax species are also classified as not threatened, but historical comparisons indicate that at least one culturally significant species may have already gone extinct. Mānuka, while still widespread, declined between 2001 and 2018, with some variants considered threatened with extinction, particularly form myrtle rust (MfE & StatsNZ, 2022). Among freshwater species, all five species of mudfish, four species of whitebait, lamprey (kanakana/piharau), longfin eel (tuna), Stokell's smelt, crayfish (kēkēwai/wai kōura), and mussels (kākahi/kaaeo) are at risk or threatened with extinction, and the New Zealand greyling is extinct (MfE & StatsNZ, 2020).

Land and freshwater habitats have degraded due to sediments, dams and weirs, non-native species, and disease. Just under 11% of monitored stream beds had more than 20% of their usually stony streambeds covered with fine sediment, which chokes in-stream plants, fish, and invertebrates (MfE & StatsNZ, 2020). Physical barriers such as dams, weirs, culverts, and tide gates alter water flow, habitat quality, and access of migration runs. Two migration species of whitebait and longfin eel have seen declines in number and habitat from historical levels (MfE & StatsNZ, 2020). Terrestrial plants and animals are also affected directly or indirectly by fungal diseases such as myrtle rust, non-native animals such as koi and stoats, and non-native plants such as wilding exotic conifers. Non-native mammals such as stoats, possums, and rats are responsible for 26.6 million egg and chick losses per

year (Russell *et al.*, 2015). Koi carp, which account for up to 70% of fish in the lower Waikato River, stir up sediments and nutrients when they feed (MfE & StatsNZ, 2020) affecting native fish species and habitat quality.

Climate change will exacerbate the spread of invasive species and diseases, change the timing and severity of weather events, and alter temperature patterns. Plants flower, insects pollinate, and animals respond to shifts in frosts, snowfall, and sunlight. Drought, changes in precipitation, and increased temperatures negatively affect mudfish, whitebait, bird nesting, kauri tree functions (Keegan *et al.*, 2022), and tuatara sex balance (Mitchell *et al.*, 2006). Future scenarios show increasing temperatures in some places of the country, which could aid the spread of the fungal disease myrtle rust (Campbell *et al.*, 2020 as cited in MfE & StatsNZ, 2022).

The EPI has an indicator for estimating potential extinction risk based on habitat availability and effects of habitat loss on terrestrial biodiversity. New Zealand's Species Habitat Index declined in rank from 44th to 101st and the raw score by 17% over the last decade. New Zealand also ranks 129th for biodiversity habitat index, with a raw score of 38/100. Taken together, these indicators paint a grim picture for terrestrial plants and animal retention (Wolf *et al.*, 2022a).

PATRIK STEDRAK

*Wellington green geckos/Moko kākāriki (*Naultinus punctatus*)*

*Crown fern/Puipui (*Lomaria discolor*)*

03

METHODS

3.1 BACKGROUND

We used an electronic questionnaire based on the PSR framework (OECD, 1996; MfE, 1997) complemented by belief statements and participation in environmental activities to gather information on New Zealanders' perceptions of the environment and environmental management. The electronic version was introduced in 2010 and has been used since (see Hughey *et al.* (2010) for more detail). This report covers all waves of the survey between 2010 and 2022. Results from earlier waves of the survey, which were paper based, are available in previous reports.

3.2 QUESTIONNAIRE

There are 32 questions in the 2022 survey wave in addition to the demographic questions (see Appendix 2). The questions are divided into six sections:

1. impressions of the environment
2. Pressure-State-Response
3. participation in environmental activities
4. most important environmental issues
5. perceptions of how well farms are doing environmentally
6. demographics.

These questions are explained in detail below.

3.2.1 Impressions of the Environment

The survey begins by asking respondents for their impression of the state of the environment. Respondents were asked to complete the statement 'The overall state of the natural environment in New Zealand is:' on a five-point scale, where 1 equals 'very good' and 5 equals 'very bad'. A sixth option of 'don't know' was also included.

3.2.2 Pressure-State-Response

The second section of the survey asked respondents about their perceptions of the state of the environment, the management of the environment, and the causes of damage to the environment as guided by the PSR framework. These questions covered the following environmental domains:

- air quality
- marine environments
- coastal waters and beaches
- rivers and lakes
- wetlands
- native bush and forests
- protected natural areas
- natural environment in towns and cities
- marine plants and animals
- terrestrial plants and animals.

Changes in question phrasing from earlier waves of the survey are discussed below.

Perceptions of pressures on each environmental domain were measured by asking, 'What are the main causes of damage, if any, to New Zealand's [environmental domain]?'. Respondents could choose up to three pressures from the following list of 15 pressures

- motor vehicles and transport
- household waste and emissions
- industrial activities
- pests and weeds
- farming
- forestry
- urban development
- mining
- sewage and stormwater
- tourism
- commercial fishing
- recreational fishing
- dumping of solid waste
- hazardous chemicals
- other pressure.

An identical list of pressures was used in previous waves of the survey.

Perceptions of the state of the environment were measured on a five-point scale, from 1 ('very good') to 5 ('very bad'), in response to the statement 'The condition of New Zealand's [environmental domain] is:'. Respondents could also choose 'don't know'. The five-point scale is consistent with previous surveys.

Perceptions of New Zealand's response to environmental pressures was again measured on a five-point scale, from 1 ('very good') to 5 ('very bad') in response to the statement 'Current management of New Zealand's [environmental domain] is:'. Respondents could also choose 'don't know'.

The five-point scale used in the response questions was rephrased from previous surveys to be consistent with the five-point scale used in state questions to reduce potential cognitive loading on respondents. Previous survey waves measured response on a five-point scale where from 1 ('very well managed') to 5 ('extremely poorly managed'). Future iterations of the EPS will use the new phrasing.

The 2022 wave of the survey used a consistent set of environmental domains across pressures, states, and responses. Some environmental domains were rephrased from previous survey waves and some environmental domains were not repeated across pressures, states, and responses in previous survey waves. Table 3.1 shows the environmental domains listed in the 2022 questionnaire compared with the environmental domains listed in the 2019 questionnaire. Seven environmental domains were dropped and four environmental domains were added in 2022. Time series for environmental domains that were dropped

are not reported here but can be found in previous reports (e.g., the 2019 report). Future iterations of this survey will use the 2022 phrasing.

3.2.3 Participation in Environmental Activities

In the third section of the survey, respondents were asked about their participation in activities related to the environment. Participation in activities was measured to explore the relationships between environmental behaviour and responses to the PSR framework. The 2022 questionnaire included the same list of 15 activities as previous waves of the survey. However, the scale was changed from 'Yes', 'Regularly', 'No', and 'Don't know' for each activity, to ticking an activity implies 'Yes' and not ticking an activity implies 'No' or 'Don't know'. Previous survey responses were recoded to the 2022 binary categorisation in which (a) 'Yes' and 'Regularly' were recoded 'Yes' and (b) 'No' and 'Don't know' were recoded to 'No'.

3.2.4 Most Important Environmental Issues

Since the 2006 wave, the EPS has asked, 'What do you think is the most important environmental issue facing New Zealand today?' and 'What do you think is the most important environmental issue facing the world today?' Following both questions, respondents were asked why they chose that issue. All responses are qualitative.

3.2.5 Perceptions About Land-use Behaviours

The 2022 survey included five new questions about respondents' perceptions of the environmental performance of farms in their region. Respondents were asked, 'How would you describe the environmental performance of farms in your region?', 'How well are farms in your region doing their part for water quality?', 'How well are farms in your region doing their part for climate change?', and 'How well are farms in your region doing their part for biodiversity?'. Responses were measured on a five-point scale from 1 ('very good') to 5 ('very bad'). Respondents were also asked, 'Farm environmental performance in my region over the last 3 years has gotten:' on a five-point scale from 1 ('much better') to 5 ('much worse').

3.2.6 Demographics

Respondents were asked to provide their gender, age, ethnicity, current employment and occupation, household income, education, and residential location, generally using the same categories employed in the New Zealand Census. Key demographic information for the 2022 survey is provided in Appendix 3.

The categories for gender and education were updated in 2022. Gender now includes 'another gender'. Education no longer includes 'primary school', 'high school, with qualification', 'high school, without qualification', 'undergraduate diploma/certificate' and 'trade/technical

Table 3.1 Comparison of environmental domains mentioned in the 2022 and 2019 questionnaires.

2019 Questionnaire Resources	2022 Questionnaire Resources	Change from 2019 to 2022
Air	Air	No change
Coastal waters and beaches	Coastal waters and beaches	No change
Rivers and lakes	Rivers and lakes	No change
Natural environment in towns and cities	Natural environment in towns and cities	No change
Native bush and forests	Native bush and forests	No change
Wetlands	Wetlands	No change
	Marine environment	Added
	Protected natural areas (e.g., national parks and marine reserves)	Added
	Terrestrial (land and freshwater) plants and animals	Added
	Marine plants and animals	Added
Marine reserves		Dropped
National parks		Dropped
Native land and freshwater plants and animals		Dropped
Marine fisheries		Dropped
Groundwater		Dropped
Natural environment compared to other developed countries		Dropped
Soils		Dropped

qualification or something similar'. For reporting purposes, 'primary school' and 'high school, without qualification' are included in the 'no formal school qualification' category, and 'high school, with qualification' is included in the 'NCEA level 1' category. Respondents were asked, 'Are you currently in paid employment?' in 2013, 2016, 2019, and 2022, but not in 2010.

3.3 SOCIAL ETHICS

The 2022 survey instrument was approved by the Manaaki Whenua – Landcare Research social ethics process (SE#2122/18). Previous waves of the survey were approved by the Lincoln University Human Ethics Committee (see previous reports for details).

3.4 SAMPLING

The survey was programmed and enumerated by Horizon Research and was open in March and April 2022. All responses were recorded by Horizon Research and the anonymised data were provided to Manaaki Whenua – Landcare Research.

Horizon Research endeavoured to obtain a sample that is representative across gender, age, ethnicity, education, and region. Random Iterative Method (RIM) weights were applied to account for minor deviations from a fully representative sample. To ensure comparability, RIM weights were also applied to data collected in previous waves of the survey. Summary statistics for these weights are given in Table 3.2.

3.5 ANALYSIS

The survey data were analysed using the statistical software Stata and figures were created using Microsoft Excel. Where possible, results from the 2010, 2013, 2016, and 2019 surveys are presented alongside the 2022 results. The 2022 survey wave results are presented descriptively. Analysis of trends uses a one-way ANOVA, with a post hoc pairwise comparison of means using a Bonferroni procedure (preferred) or multivariate regression to test significant changes in means across years. Only statistically significant results are described in the text. Summary statistics of all questions are provided in Appendix 4 and full results from these statistical tests are provided in Appendix 5.

3.6 MAJOR CHANGES IN THE 2022 SURVEY

Several questions from earlier waves of the survey were dropped from the 2022 wave to reduce respondent burden. These included:

- availability and area of natural resources
- management of hazardous or damaging actions (e.g., sewage disposal)
- perceptions of standard of living, knowledge of issues, and perceptions of New Zealand's image .

It was also decided to drop the 'Special topics' section to ease the transition of the survey and reporting from Lincoln University to Manaaki Whenua. 'Special topics' remains an option for future surveys.

Limiting the analysis to the 2010–2022 waves of the survey facilitates data weighting and reduces visual clutter in the figures.

Table 3.2 Summary statistics of RIM weights applied to 2010, 2013, 2016, 2019, and 2022 data.

Statistic	2010	2013	2016	2019	2022
Minimum	0.365	0.311	0.621	0.400	0.317
25th percentile	0.506	0.536	0.680	0.658	0.664
Median	0.684	0.696	0.837	0.830	0.896
75th percentile	1.063	1.035	0.916	1.094	1.146
Maximum	14.450	6.734	2.148	2.296	3.721
Average	1.007	0.979	0.910	0.916	0.993
Variance	0.969	0.664	0.158	0.134	0.238
Skewness	5.398	2.541	1.915	1.166	1.691
Kurtosis	52.762	10.291	5.737	4.002	6.801
N	2,476	2,220	2,468	2,011	2,098

04

Native bush

PRESSURE-STATE-RESPONSE

This section reports on the perceived state, quality of management, and causes of damage to 10 environmental domains results. Subsection 4.1 discusses results of the 2022 wave of the EPS, subsection 4.2 discusses the overall trends in perceptions from 2010 to 2022, and subsections 4.3 to 4.12 discuss the trends in perceptions from 2010 to 2022 for each environmental domain.

4.1 THE 2022 SURVEY

4.1.1 Overall State of the Environment in 2022

Survey respondents were asked, 'The overall state of the natural environment in New Zealand is…'. Responses were based on a five-point Likert scale, ranging from 'very good' to 'very bad'. Respondents generally consider the state of the New Zealand environment to be 'adequate' (35%) to 'good' (37%; Figure 4.1). Ten percent of respondents consider the overall environment to be 'very good' while 13% consider it 'bad' and 3% 'very bad'.

4.1.2 Perceived State of the Environment in 2022

Perceptions of the quality of the New Zealand environment was measured on a five-point Likert scale, ranging from 'very good' to 'very bad'. Figure 4.2 shows that majority of respondents rated the state of New Zealand's environmental domains 'adequate' to 'good'. The state of New Zealand's air, protected natural areas, and native bush and forests was rated higher, on average, ranging from 'good' to 'very good'. However, roughly 20% of respondents think the state of marine environments, coastal waters and beaches, marine plants and animals, terrestrial plants and animals, and natural environments in towns and cities are in a 'bad' to 'very bad' condition.

The perceived condition of resources and environments, ranked in order from best to worst, is: air (mean score 3.91), protected natural areas (3.84), native bush and forests (3.59), marine environments (3.32), coastal waters and beaches (3.3), marine plants and animals (3.24), terrestrial plants and animals (3.21), natural environments in towns and cities (3.19), wetlands (3.12), and rivers and lakes (2.89).

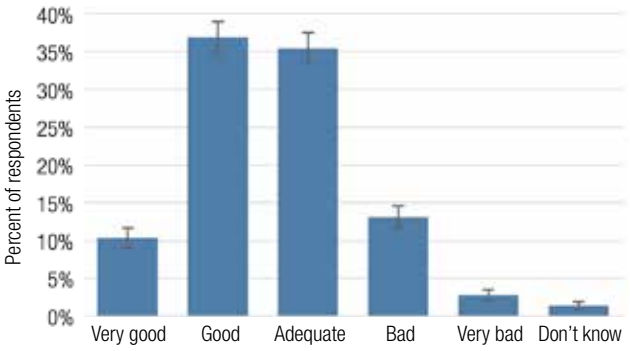

Figure 4.1 Perception of the overall state of New Zealand's natural environment in 2022.

Note: Error bars are 95% confidence bands around percent of respondents.

4.1.3 Perceived Response to Pressures on the Environment in 2022

The quality of management of the 10 environmental domains was assessed on a scale ranging from 'very good' to 'very bad' (Figure 4.3). Respondents think the current management of most environmental domains is 'adequate' on average, with a few exceptions. Management of air and native bush and forests is considered 'adequate' to 'good' while management of protected natural areas is considered 'good'. However, nearly a quarter of respondents think the current management of marine environments, coastal waters and beaches, marine plants and animals, terrestrial plants and animals, wetlands, and natural environments in towns and cities is 'bad' to 'very bad', and 32% think management of rivers and lakes is 'bad' or 'very bad'. The perceived quality of management, ranked in order from best to worst condition, is: protected environments (mean score of 3.56), air (3.51), native bush and forests (3.40), terrestrial plants and animals (3.19), marine plants and animals (3.18), marine environments (3.17), coastal waters and beaches (3.13), natural environments in towns and cities (3.13), wetlands (3.1), and rivers and lakes (2.94).

4.1.4 Perceived Pressures on the Environment in 2022

Respondents were asked to identify what they considered to be the main pressures on the 10 environmental domains, choosing up to three pressures from a list of 15. Table 4.1 shows the proportion of respondents who chose each cause of damage for each resource or environment. Red-highlighted cells signify the most frequently cited pressure; orange indicates the second-most-frequently-cited pressure; and yellow the third-most-frequently-cited pressure.

For some environmental domains, several pressures were identified. At least 50% of respondents think that motor vehicles and transport (57%) and industrial activity (50%) are causes of poor air quality. Similar proportions of respondents think that pests and weeds (48%) and forestry (47%) are damaging native bush and forests, while 48% think that sewage and stormwater and 47% think that commercial fishing are significant pressures on marine plants and animals. Between 30 and 35% of respondents consider that sewage and stormwater (30%), pests and weeds (35%), urban development (30%), and farming (31%) are damaging wetlands.

For other environmental domains, there is one dominant perceived pressure. Pests and weeds are the leading attributed pressure on protected natural areas (45%) and terrestrial plants and animals (39%). Sewage and stormwater are the leading attributed pressures on marine environments (55%), coastal waters and beaches (60%), and rivers and

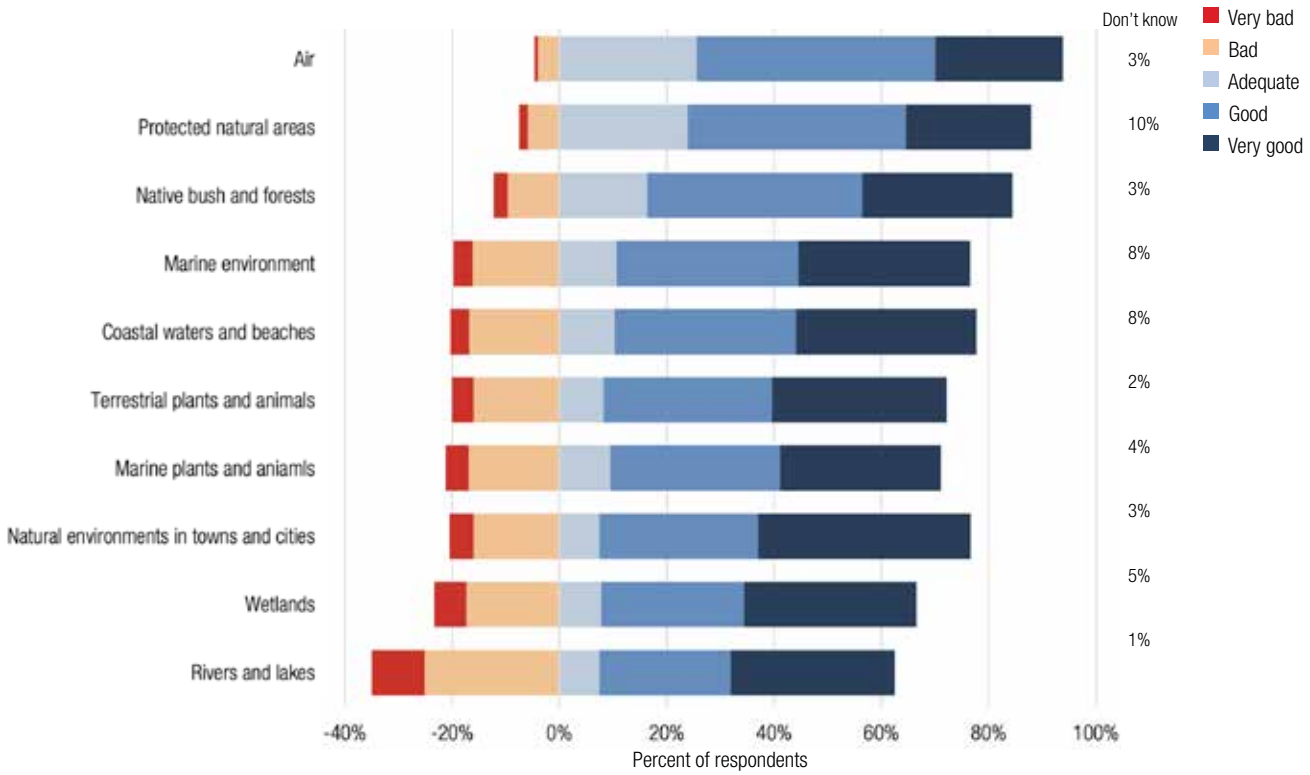

Figure 4.2 Perceived state of environmental domains in 2022.

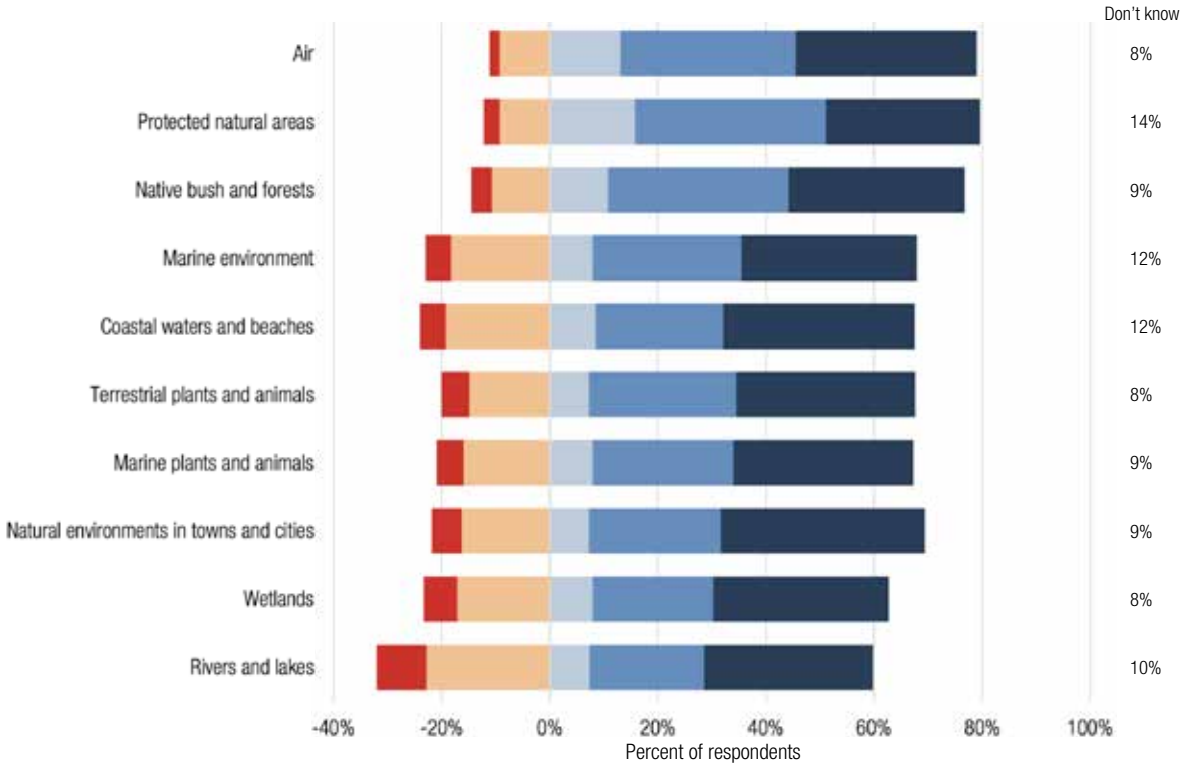

Figure 4.3 Perceived quality of management of environmental domains in 2022.

lakes (44%). Not surprisingly, 51% of respondents think that urban development is the leading cause of damage to natural environments in towns and cities.

There is also overlap in the environmental domains affected by a given pressure. Sewage and stormwater are thought to cause significant damage to marine environments (55%), coastal waters and beaches (60%), marine plants and animals (48%), terrestrial plants and animals (30%), and rivers and lakes (44%). Pests and weeds are perceived to contribute to damage to protected natural areas (45%), native bush and forests (48%), terrestrial plants and animals (39%), and wetlands (35%). At least one-quarter of respondents think that urban development is a cause of damage to protected natural areas (26%), native bush and forests (36%), wetlands (30%), and natural environments in towns and cities (51%).

4.2 2010–2022 SURVEYS

In this section, time-series trends are discussed for each environmental domain. The discussion and statistical analysis of trends relate to the electronic waves of the survey from 2010 to the present. Results from ANOVA and multivariate regression analysis are presented in simple form in this chapter, and full results are provided in Appendix 5.

4.2.1 Trends in Perceived Overall State of the Environment, 2010–2022

Perceptions of the overall state of the environment declined from 2010 to 2013 and 2013 to 2016, but improved between 2016 and 2019 and again between 2019 and 2022 (Table 4.2). This u-shaped pattern is mimicked in the proportion of respondents who said the overall state of the environment is either 'good' or 'bad' (Figure 4.4). There was a significant jump in the proportion of respondents who think the overall state of the environment is 'very good' in 2019 compared with previous survey waves.

Over the last 10 years, New Zealand's EPI declined from 8th place to 26th, while the UK, Finland, Sweden, Australia, Canada, Chile, and China improved their EPI. Also, the EPI raw score for every country of interest except for New Zealand has increased since 2012 (Wolf *et al.* 2022a).

Table 4.1 Perceived main pressures on environmental domains in 2022. The fill colours (■ ■ ■) indicate, in order, the three most-frequently-cited pressures on the environmental domain.

Perceived Cause of Damage	Air Quality	Protected Natural Areas	Native Bush	Marine Environment	Coastal Waters & Beaches	Marine Plants & Animals	Terrestrial	Wetlands	Natural Environment in Towns	Freshwater
Sewage & stormwater	13%	13%	6%	55%	60%	48%	30%	29%	28%	44%
Pests & weeds	8%	45%	48%	11%	10%	21%	39%	35%	13%	27%
Motor vehicles & transport	57%	8%	5%	4%	4%	3%	6%	5%	36%	3%
Urban development	24%	26%	36%	10%	19%	10%	24%	30%	51%	17%
Farming	16%	14%	19%	12%	12%	9%	25%	31%	4%	40%
Industrial activities	50%	18%	17%	24%	21%	19%	23%	20%	31%	26%
Hazardous chemicals	28%	15%	13%	31%	24%	28%	24%	20%	16%	28%
Dumping of solid waste	16%	17%	12%	29%	33%	22%	22%	26%	21%	27%
Household waste & emissions	24%	10%	8%	17%	25%	15%	16%	11%	41%	18%
Commercial fishing	6%	5%	3%	48%	20%	47%	7%	3%	2%	4%
Forestry	6%	18%	47%	5%	6%	6%	15%	12%	3%	10%
Tourism	5%	27%	17%	4%	10%	7%	7%	5%	8%	8%
Mining	6%	11%	14%	5%	4%	4%	8%	5%	3%	5%
Recreational fishing	2%	3%	2%	10%	8%	14%	5%	4%	2%	5%
Other	2%	3%	2%	2%	3%	2%	2%	3%	3%	2%

Note: Percentages in each column do not sum to 100% because respondents could identify up to three causes of damage to each environmental domain.

4.2.2 Trends in the State of the Environmental Domains, 2010–2022

Figures 4.5 to 4.7 show mean scores and 95% confidence intervals for six environmental domains over time. As discussed in Section 3, the wording was updated in 2022 to improve consistency across the PSR framework. Four environmental domains, marine plants and animals, terrestrial plants and animals, marine environments and protected areas, do not have time series to report because they were not included before the 2022 wave of the survey.

The perceived condition of wetlands, rivers and lakes, and native bush and forests trended downward from 2010 to 2016 (Figure 4.5 and 4.7). Wetlands and rivers and lakes improved in 2019 compared to 2016, but still remained below their 2010 averages. The perceived condition of these environmental domains in 2022 did not change from their 2019 averages but was significantly improved from 2016[3]. The perceived condition of native bush and forests finally improved in 2022 compared to 2013, 2016, and 2019, but was not significantly different from the 2010 average[4]. The perceived condition of coastal waters and beaches declined in 2019 compared to 2010, 2013, and 2016 (Figure 4.6), but improved in 2022 compared to 2019[5].

Table 4.2 Yearly mean, difference in means, and test for significance of the difference for overall state of the environment for each wave of the survey since 2010. Overall state of the natural environment was ranked from 1 = very bad to 5 = very good. Significance is indicated by p-value (in parentheses) below each difference.

Year		2010	2013	2016	2019
	Mean	3.38	3.24	3.17	3.25
2013	3.24	-0.140			
		(0.00)			
2016	3.17	-0.212	-0.073		
		(0.00)	*(0.09)*		
2019	3.25	-0.131	0.009	0.081	
		(0.00)	*(1.00)*	*(0.04)*	
2022	3.39	0.010	0.150	0.223	0.141
		(1.00)	*(0.00)*	*(0.00)*	*(0.00)*

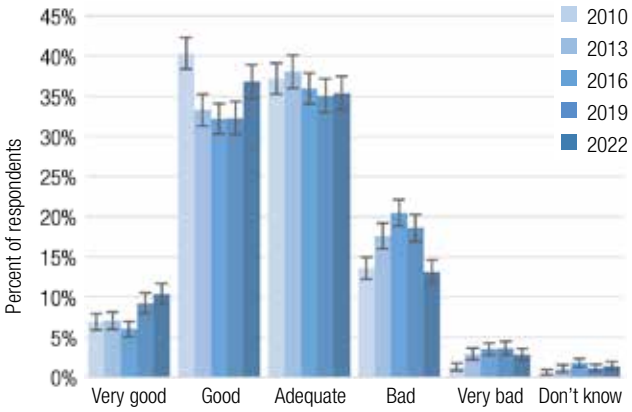

Figure 4.4 Perceived overall state of the natural environment, 2010–2022.

Note: Error bars are the 95% confidence bands around the percent of respondents.

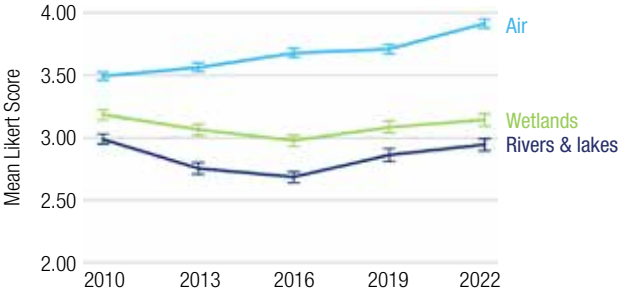

Figure 4.5 Trends in average perceived state of the environment for air, rivers and lakes, and wetlands, 2010–2022.

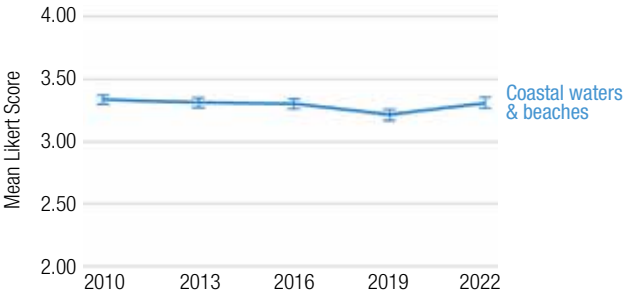

Figure 4.6 Trends in average perceived state of the environment for coastal waters and beaches, 2010–2022.

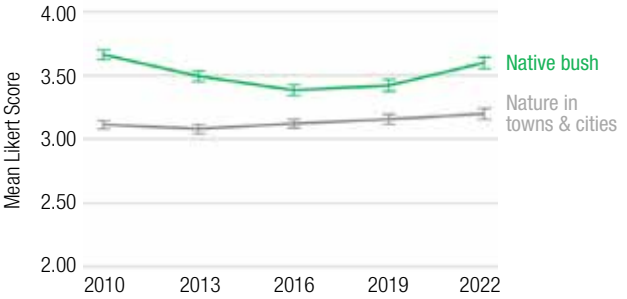

Figure 4.7 Trends in average perceived state of the environment for natural environments in towns and cities, and native bush and forests, 2010–2022.

Notes for Figures 4.5, 4.6 and 4.7: Scale is 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good. Error bars are the 95% confidence band around the average.

3 *See Appendix 5, Table A5.2 and Table A5.3 for full Bonferroni pairwise comparison results.*

4 *See Appendix 5, Table A5.5, for full Bonferroni pairwise comparison results.*

5 *See Appendix 5, Table A5.4, for full Bonferroni pairwise comparison results.*

4.2.3 Trends in Responses to Pressures, 2010–2022

Figures 4.8, 4.9, and 4.10 show mean scores and 95% confidence intervals for six environmental domains over time. As discussed in Section 3, the wording was updated in 2022 to improve consistency across the PSR framework. Four environmental domains, marine plants and animals, terrestrial plants and animals, marine environments and protected areas, do not have time series to report because they were not included before the 2022 wave of the survey.

Perceptions of the quality of management of natural environments in towns and cities, air quality, and coastal waters and beaches were stable for most of the time series (Figures 4.8, 4.9, and 4.10). In comparison to previous waves of the survey, perceptions of management of natural environments in towns and cities and air quality did not change until 2019, while management of coastal waters and beaches did not improve until 2022[6].

Respondents' perceptions of the quality of management of native bush, rivers and lakes, and wetlands (Figures 4.8 and 4.10) in 2016 were worse than in 2010, but all these environmental domains started to see improvements in the 2019 and/or 2022 waves of the survey[7].

4.2.4 Trends in Pressures on Environmental Domains, 2010–2022

Respondents were asked to select what they considered to be the main pressures on the 10 environmental domains, choosing up to three from a list of 15. As discussed in Section 3, the wording was updated in 2022 to improve consistency across the PSR framework. Five environmental domains, marine plants and animals, terrestrial plants and animals, marine environments, protected areas and natural environments in towns and cities, do not have time series to report because they were not included before the 2022 wave of the survey.

Farming has been a significant perceived pressure on rivers, lakes, and wetlands since 2010[8]. Pests and weeds have been identified as putting significant pressure on wetlands since 2010 and on rivers and lakes in 2022. A relatively stable and significant proportion of respondents since 2013 attribute damage to rivers, lakes, and wetlands to sewage, stormwater, and urban development.

Similarly, the proportion of respondents who think pests and weeds are putting pressure on native bush and forests has remained stable over time while farming was seen as a significant pressure on native bush and forests prior to the 2022 survey[9]. However, the proportion of respondents identifying

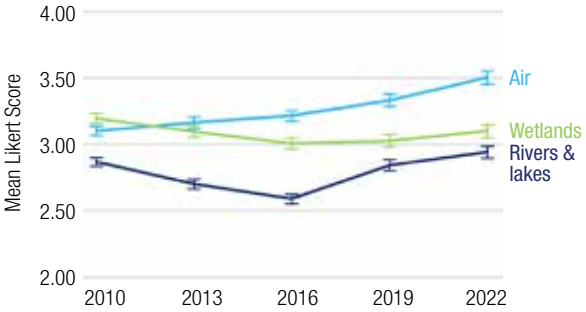

Figure 4.8 Trends in average perceived quality of management for air, rivers and lakes, and wetlands, 2010–2022.

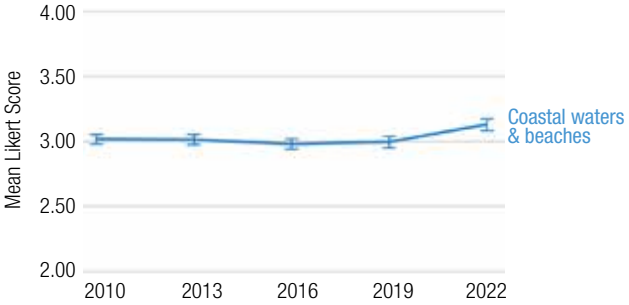

Figure 4.9 Trends in average perceived quality of management for coastal waters and beaches, 2010–2022.

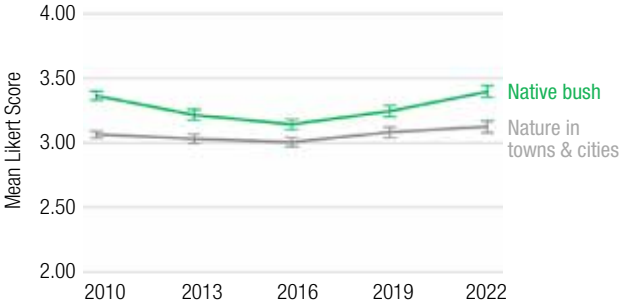

Figure 4.10 Trends in average perceived quality of management for natural environments in towns and cities, and native bush and forests, 2010–2022.

Notes for Figures 4.8, 4.9 and 4.10: Scale is 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good. Error bars are the 95% confidence band around the average.

6 *See Appendix 5, Table A5.7, Table A5.12 and Table A5.10, for full Bonferroni pairwise comparison results.*

7 *See Appendix 5, Table A5.8, Table A5.9 and Table A5.11, for full Bonferroni pairwise comparison results.*

8 *See Appendix 5, Table A5.14 and Table A5.15, for full Bonferroni pairwise comparison results.*

9 *See Appendix 5, Table A5.16, for full Bonferroni pairwise comparison results.*

farming as a pressure on this environmental domain has been in decline since 2016: 12.6% fewer respondents think farming is putting pressure on native bush and forests in 2022 compared with 2016.

Since the 2013 wave of the survey, damage to coastal waters and beaches has mostly been attributed to sewage and stormwater. However, significantly more respondents in 2022 than in all previous surveys think hazardous chemicals, dumping of solid waste, and pests and weeds put pressure on coastal waters and beaches. For example, 19.7% more respondents in 2022 than in 2010 think hazardous chemicals are causing damage, 11.3% more respondents in 2022 than in 2013 think dumping of solid waste is causing damage and 4.6% more respondents in 2022 than in 2019 think pests and weeds are damaging coastal waters and beaches[10].

GARY WEBBER

Polluted storm water run-off from an industrial site going into a drainage ditch, Motueka.

10 *See Appendix 5, Table A5.17, for full Bonferroni pairwise comparison results.*

4.3 TRENDS IN THE AIR DOMAIN

4.3.1 Trends in Perceptions of State, Pressures, and Management

Air quality has been perceived to have improved nearly continuously year on year since 2010, with most New Zealanders considering air quality to be 'good' on average and a decreasing proportion considering air quality to be 'adequate' and an increasing proportion consider air quality to be 'very good' (Figure 4.11). Perceived conditions in 2019, while not significantly different from 2016, were still an improvement over the 2010 and 2013 averages[11]. Also, the proportion of respondents who consider air quality to be 'bad' has been decreasing since 2010 while the proportion of respondents who consider air quality to be 'very bad' has remained relatively stable and low (between 1 and 2%). These trends are also apparent in some regions. For example, respondents in Auckland, Waikato, and Canterbury think the air quality has been improving each year since 2010 (Table 4.3).

Respondents think the quality of management of air is 'adequate' to 'good' on average, and this remained stable until 2019, when it improved from its 2016 average (Figure 4.12). The proportion of respondents who think management of air is 'adequate' or 'bad' has declined since 2010 while the proportion of respondents who think the management of air is 'good' or 'very good' has increased since 2010. This has meant the average perception of management continues to improve in 2022[12]. Similar to the state of air quality since 2010, respondents in Auckland and Canterbury think the management of air quality has been improving each year since 2010 (Table 4.4). However, respondents in Nelson, Tasman, Marlborough, and Southland think the management of air quality declined sharply in 2019 before rebounding by 2022.

Motor vehicles, transport, and industrial activities are the among the top three largest contributors to poor air quality according to respondents in 2022 (Figure 4.13). However, the proportion of respondents who think motor vehicles and transport or industrial activities are putting pressure on air quality is lower in 2022 than in any previous wave of the survey[13]. Pressures on air quality are increasingly attributed to hazardous chemicals, dumping of solid waste, and sewage and stormwater. For example, 27% of respondents in 2022 think hazardous chemicals are damaging air quality, which is 7% more than in 2019, 7.2% more than in 2016, 8.6% more than in 2013, and 26% more than in 2010.

4.3.2 Summary

Air quality has been improving across most indicators over the last 10 years, and survey respondents' perceptions of air quality reflect this improvement. Winter months and urban centres tend to have worse air quality because of particulate matter produced by vehicle emissions, manufacturing and industry, and wood burning for homes (MfE & StatsNZ 2022). Respondents concur that air quality is degraded by motor vehicles, transport, and industrial activities. However, of all the air quality indicators measured, PM_{10} is the only one that has not been trending down over time, most likely due to an increase in motor vehicles on the road. Overall, it appears that air quality is improving, both empirically and in people's perception, and respondents are very attuned to the overall state of and pressures on air.

ROBERT CALVERT

Newmarket overpass, Southern Motorway, Auckland

11 *See Appendix 5, Table A5.1 for full Bonferroni pairwise comparison results.*

12 *See Appendix 5, Table A5.7 for full Bonferroni pairwise comparison results.*

13 *See Appendix 5, Table A5.13 for full Bonferroni pairwise comparison results.*

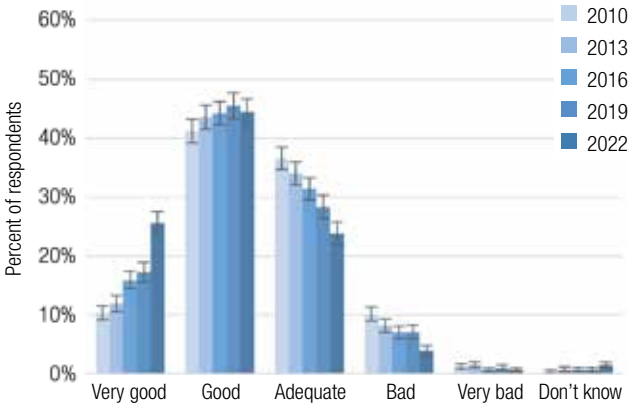

Figure 4.11 Perceived state of air quality, 2010–2022.

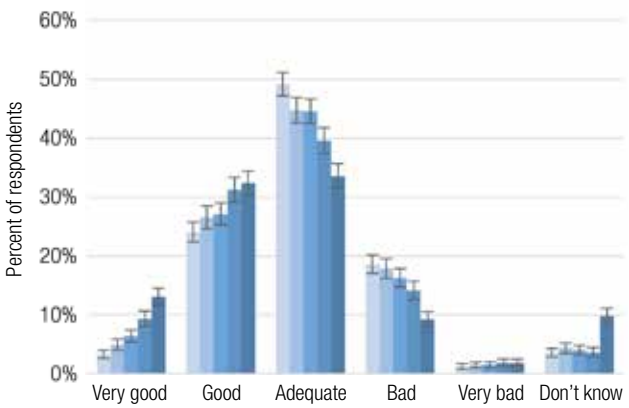

Figure 4.12 Perceived quality of management of air quality, 2010–2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.3 Average perceived state of air quality, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.58	3.30	3.56	3.47	4.07
Auckland	3.44	3.59	3.66	3.72	3.93
Waikato	3.51	3.52	3.69	3.83	3.91
Bay of Plenty	3.57	3.52	3.69	3.77	4.06
Gisborne	3.59	3.76	4.00	3.60	3.57
Hawke's Bay	3.63	3.76	3.57	3.85	3.89
Taranaki	3.46	3.93	3.83	3.66	3.91
Manawatū-Whanganui	3.68	3.47	3.81	3.94	3.89
Wellington	3.76	3.76	3.83	3.76	4.11
South Island					
Nelson	3.46	3.42	3.79	3.46	3.82
Tasman	3.24	3.56	3.70	3.32	3.63
Marlborough	3.69	3.49	3.81	3.55	3.89
Canterbury	3.29	3.36	3.50	3.60	3.84
West Coast	2.99	3.83	3.47	3.64	3.78
Otago	3.44	3.52	3.66	3.58	3.74
Southland	3.33	3.66	3.51	3.56	3.86
Overall	3.49	3.57	3.68	3.71	3.92

Table 4.4 Average perceived quality of management of air quality, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.09	2.98	2.94	2.95	3.33
Auckland	3.03	3.17	3.24	3.40	3.59
Waikato	3.16	3.00	3.24	3.31	3.41
Bay of Plenty	3.19	3.06	3.28	3.41	3.42
Gisborne	3.34	3.21	3.07	3.00	3.16
Hawke's Bay	3.02	2.99	3.10	3.34	3.54
Taranaki	3.11	3.56	3.37	3.43	3.32
Manawatū-Whanganui	3.26	3.27	3.27	3.51	3.47
Wellington	3.25	3.35	3.31	3.41	3.58
South Island					
Nelson	3.12	3.23	3.26	2.91	3.20
Tasman	2.96	2.81	3.27	2.69	3.37
Marlborough	3.06	3.21	3.14	2.98	3.47
Canterbury	3.02	3.02	3.11	3.28	3.59
West Coast	3.01	3.45	2.92	3.30	3.39
Otago	3.08	3.16	3.15	3.17	3.34
Southland	3.02	3.20	3.20	2.85	3.45
Overall	3.10	3.16	3.21	3.33	3.50

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

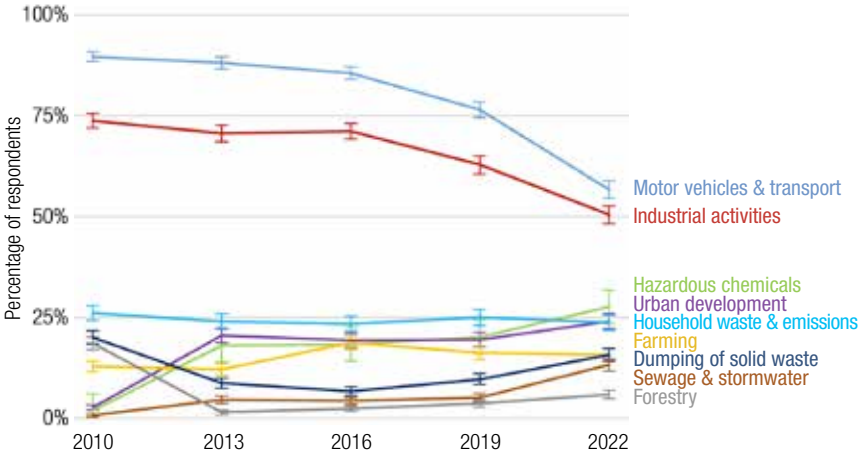

Figure 4.13 Trends in perceived pressures on air quality, 2010–2022.

Notes: Respondents could choose up to three pressures. Error bars are 95% confidence bands around percent of respondents.

4.4 MARINE ENVIRONMENTS DOMAIN

4.4.1 Perceptions of State, Pressures, and Management

Overall, most respondents think marine environments are in an 'adequate' to 'good' condition' and are 'adequately' managed (Figure 4.14 and Figure 4.15). However, 20% of respondents think marine environments are in a 'bad' to 'very bad' state and 23% of respondents think management is 'bad' or 'very bad'. Perceptions of state and quality of management across regions was highly variable (Table 4.5 and Table 4.6). On average, respondents in Gisborne scored the state of their marine environment the lowest and respondents in Nelson scored the state of their marine environments the highest relative to elsewhere in the country. Respondents in Gisborne also scored the quality of management of their marine environment the lowest while respondents in Auckland and Hawke's Bay scored the quality of management of their marine environments the highest relative to elsewhere in the country.

Pressures on marine environments are mostly attributed to sewage and stormwater (54.7%), commercial fishing (48.2%), hazardous chemicals (30.9%), and dumping of solid waste (29.4%; Table 4.7).

4.4.2 Summary

Marine environments are in a mixed condition overall, but understanding of long-term trends and knowledge gaps is limited due to monitoring limitations and lack of data. Marine environments are also under pressure from the land, the ocean, and the atmosphere (MfE & StatsNZ 2019). Survey respondents think marine environments are in relatively decent condition and are being managed adequately. Respondents also identified several pressures that mirror the known biophysical pressures. For example, 55% of respondents think sewage and stormwater are damaging marine environments which is consistent with evidence that nutrient loading from the land, including from sewage and stormwater, has increased over time, affecting water quality, habitats, and biodiversity in the marine environment (MfE & StatsNZ 2019). Overall, respondents seem to be attuned to the variable management and pressures on the marine environment. However, with the increasing pressures from climate change, greenhouse gases, and acidification on marine habitats, future perception surveys may better capture the changes in condition of marine environments.

NAREETA MARTIN

*White-capped mollymawk/Toroa (*Thalassarche steadi*)*

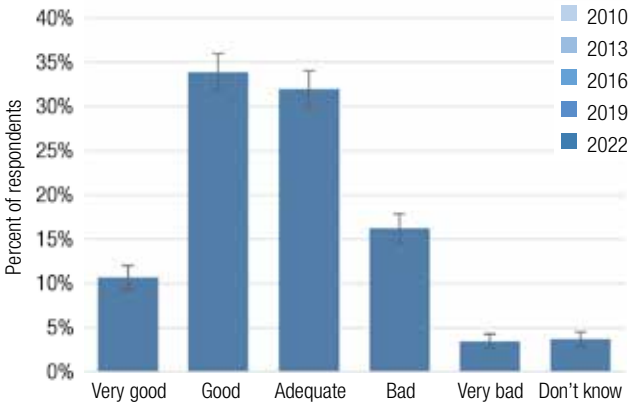

Figure 4.14 Perceived state of marine environments, 2022.

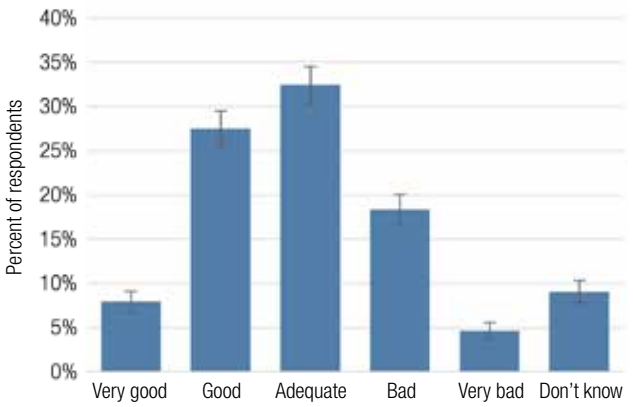

Figure 4.15 Perceived quality of management of marine environments, 2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.5 Average perceived state of marine environments, by region, 2022.

		2022
North Island	Northland	3.24
	Auckland	3.44
	Waikato	3.21
	Bay of Plenty	3.28
	Gisborne	2.73
	Hawke's Bay	3.16
	Taranaki	3.29
	Manawatū-Whanganui	3.31
	Wellington	3.35
South Island	Nelson	3.48
	Tasman	3.20
	Marlborough	3.31
	Canterbury	3.36
	West Coast	3.31
	Otago	3.17
	Southland	3.30
Overall		3.33

Table 4.6 Average perceived quality of management of marine environments, by region, 2022.

		2022
North Island	Northland	3.09
	Auckland	3.25
	Waikato	3.05
	Bay of Plenty	3.12
	Gisborne	2.73
	Hawke's Bay	3.25
	Taranaki	3.16
	Manawatū-Whanganui	3.09
	Wellington	3.21
South Island	Nelson	3.13
	Tasman	2.96
	Marlborough	3.17
	Canterbury	3.24
	West Coast	3.13
	Otago	3.01
	Southland	3.15
Overall		3.17

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

Table 4.7 Perceived pressures on marine environments, 2022.

Pressures	% of respondents
Sewage and stormwater	54.7
Commercial fishing	48.2
Hazardous chemicals	30.9
Dumping of solid waste	29.4
Industrial activities	23.9
Household waste and emissions	16.7
Farming	11.7
Pests and weeds	10.5
Urban development	10.2
Recreational fishing	10.2
Mining	4.9
Forestry	4.5
Motor vehicles and transport	4.4
Tourism	4.2
Other	2.0

Note: Respondents could choose up to three pressures.

4.5 TRENDS IN THE COASTAL WATERS AND BEACHES DOMAIN

4.5.1 Trends in Perceptions of State, Pressures, and Management

Most respondents consider the condition of coastal waters and beaches to be 'adequate' to 'good' while 9–10% of respondents think coastal areas are in 'very good' condition and 20–25% think coastal areas are in 'bad' or 'very bad' condition (Figure 4.16). The proportion of respondents who think coastal areas are in a 'bad' condition spiked in 2019, causing the average perceived condition to decline in 2019 compared to 2010, 2013, and 2016. However, the average condition improved in 2022 compared to 2019[14].

In contrast, a decreasing proportion of respondents think coastal areas are 'adequately' managed (43% in 2010, down to 35% in 2022), a steady 24% of respondents think management is 'good', and an increasing proportion think management is 'very good' (3% in 2010, up to 8% in 2022; Figure 4.17). This translated into the average quality of management of coastal areas remaining stable until 2022, when it improved in comparison to all previous waves of the survey[15].

Tasman and Southland regions each saw large drops in perceived condition and management of their coastal areas in 2019 before seeing improvement in 2022. The perceived condition of coastal areas in Gisborne was similar to other regions until 2022 when perceived conditions deteriorated (Table 4.8 and Table 4.9). The top perceived pressures on coastal areas in 2022 are sewage and stormwater (60%), dumping of solid waste (33%), household waste (25%), and hazardous chemicals (24%; Figure 4.16). The proportion of respondents attributing pressures on coastal areas to sewage and stormwater jumped between 2010 and 2013 before declining slightly in 2016. Dumping of solid waste is also increasingly perceived as a major cause of damage to coastal areas: for example, 22% of respondents in 2010 thought dumping of solid waste was a cause versus 33% of respondents in 2022.

4.5.2 Summary

Coastal waters and beaches tend to be in worse condition than open marine environments due to multiple human-induced pressures. Over the last 10 years, concentrations of some nutrients, sediments, and pathogens have remained relatively high, but total phosphorus trends have improved for the majority of monitored sites (MfE & StatsNZ, 2019). Survey respondents' perceptions did not always mirror the biophysical condition of coastal regions, but respondents are aware of some of the human-induced pressures on water quality along the coast.

FYLETTO

Curio Bay/Tumu Toka, Southland

14 *See Appendix 5, Table A5.4 for full Bonferroni pairwise comparison results.*

15 *See Appendix 5, Table A5.10 for full Bonferroni pairwise comparison results.*

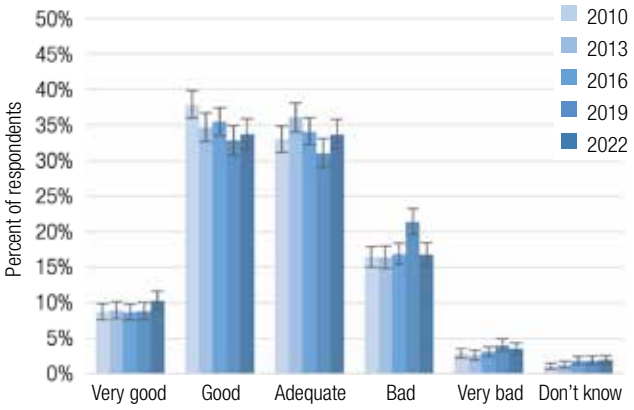

Figure 4.16 Perceived state of coastal waters and beaches, 2010–2022.

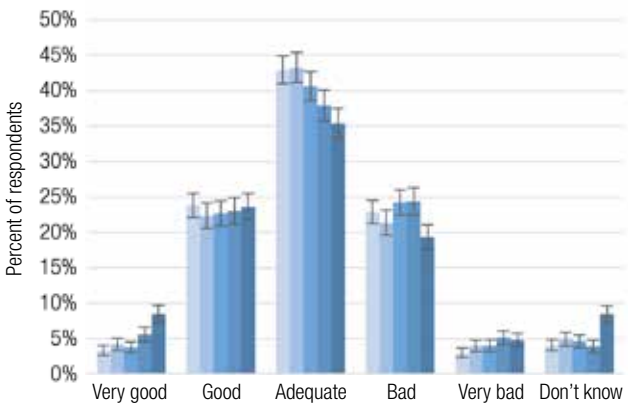

Figure 4.17 Perceived quality of management of coastal waters and beaches, 2010–2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.8 Average perceived state of coastal waters and beaches, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.48	3.21	3.04	3.18	3.21
Auckland	3.38	3.49	3.45	3.30	3.42
Waikato	3.30	3.35	3.40	3.33	3.15
Bay of Plenty	3.29	3.19	3.30	3.37	3.46
Gisborne	3.34	3.15	3.34	3.15	2.55
Hawke's Bay	3.40	3.17	3.17	3.15	3.21
Taranaki	3.37	3.63	3.38	3.13	3.36
Manawatū-Whanganui	3.26	3.19	3.18	3.20	3.24
Wellington	3.35	3.19	3.16	3.05	3.30
South Island					
Nelson	3.46	3.23	3.51	3.14	3.06
Tasman	3.31	3.35	3.60	2.88	3.31
Marlborough	3.17	3.21	3.51	3.27	3.33
Canterbury	3.31	3.20	3.21	3.09	3.33
West Coast	3.23	3.49	3.25	3.18	3.15
Otago	3.09	3.32	3.25	3.09	3.18
Southland	3.24	3.17	3.51	2.82	3.25
Overall	3.34	3.31	3.30	3.21	3.31

Table 4.9 Average perceived quality of management of coastal waters and beaches, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	2.95	2.85	2.76	2.94	3.01
Auckland	3.08	3.21	3.12	3.09	3.25
Waikato	3.03	2.94	3.03	3.10	2.98
Bay of Plenty	3.07	2.96	3.17	3.07	3.13
Gisborne	3.04	2.86	3.22	2.76	2.82
Hawke's Bay	2.98	2.69	2.80	2.97	3.16
Taranaki	2.99	3.41	3.06	3.06	3.17
Manawatū-Whanganui	2.87	2.90	2.86	2.81	3.01
Wellington	3.03	2.90	2.88	2.84	3.09
South Island					
Nelson	2.96	3.26	3.15	2.86	2.85
Tasman	2.97	3.17	2.92	2.51	3.07
Marlborough	2.87	3.22	2.94	2.94	3.19
Canterbury	2.99	2.90	2.89	3.00	3.22
West Coast	2.79	2.58	2.56	2.73	3.16
Otago	2.79	3.01	2.84	2.80	2.99
Southland	2.80	3.08	3.06	2.67	3.02
Overall	3.02	3.02	2.98	3	3.13

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

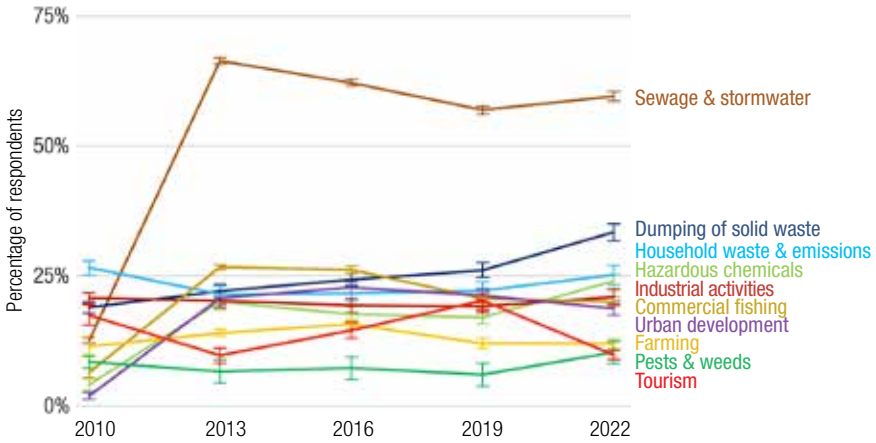

Figure 4.18 Trends in perceived pressures on coastal waters and beaches, 2010–2022.

Notes: Respondents could choose up to three pressures. Error bars are 95% confidence bands around percent of respondents.

4.6 TRENDS IN THE RIVERS AND LAKES DOMAIN

4.6.1 Trends in Perceptions of State, Pressures, and Management

Perceptions of the condition of rivers and lakes trended downward from 2010 to 2016, then upward in 2019 compared to 2013 and 2016, even as they remained below the 2010 average. Perceived condition remained stable in 2022, but was still significantly improved from 2013 and 2016 (Figure 4.19)[16]. Perceived quality of management in 2016 was also worse than in 2010, but this improved in 2019 and then again in 2022 compared with 2013, 2016, and 2019 (Figure 4.20)[17]. These u-shaped trends in condition and management were largely driven by an increase in respondents who thought rivers and lakes were in bad to very bad condition and were being managed badly to very badly from 2010 to 2016, followed by a decrease from 2016 to 2022.

Most regions saw a slow decline in perceived river and lake conditions and stable perceived management quality from 2010 to 2016, and then a slow improvement in perceived condition and management of rivers and lakes from 2016 to 2022. Respondents in Gisborne, Marlborough, and Southland thought the condition and management of their rivers and lakes had improved in 2016 before declining in 2019 and then improving again in 2022 (Table 4.10 and Table 4.11).

Respondents think farming, sewage, and stormwater are among the top three pressures putting the most pressure on the condition of rivers and lakes (Figure 4.21). However, the perceived impact of farming on rivers and lakes has been overshadowed by the effects of sewage and stormwater since 2016. Dumping of solid waste, pests and weeds, and industrial activities are also perceived to be putting pressure on river and lake quality, but 6% fewer respondents in 2022 think that industrial activities are causing damage compared with the peak in 2010[18]. Also, 22.8% and 12.1% more respondents attribute declining river and lake quality to hazardous chemicals and urban development, respectively, in 2022 compared with 2010. However, while the perceived pressures from urban development have remained stable since 2013, more respondents think hazardous chemicals, dumping of solid waste, and pests and weeds are damaging rivers and lakes in 2022 than in any previous year.

4.6.2 Summary

The condition of rivers and lakes is highly dependent on the surrounding land uses. Improvement over the last 10 to 20 years across rivers and lakes quality indicators is also dependent on upstream land uses (MfE & StatsNZ 2020). Survey respondents have been able to pick up on the diverse biophysical conditions of lakes and rivers. They are also relatively attuned to the pressures on river and lakes quality. Respondents attribute damage to rivers and lakes to farming (i.e., pastoral land use) and sewage and stormwater (e.g., towns and cities) which is consistent with evidence that nutrients, pathogens, sediment, and chemical pollutants enter freshwater systems through sewage, stormwater and land runoff, degrading domestic, recreational and cultural values (MfE & StatsNZ, 2020).

SIMON BRADFIELD

River valley in the Southern Alps

16 *See Appendix 5, Table A5.2 for full Bonferroni pairwise comparison results.*

17 *See Appendix 5, Table A5.8 for full Bonferroni pairwise comparison results.*

18 *See Appendix 5, Table A5.15 for full Bonferroni pairwise comparison results.*

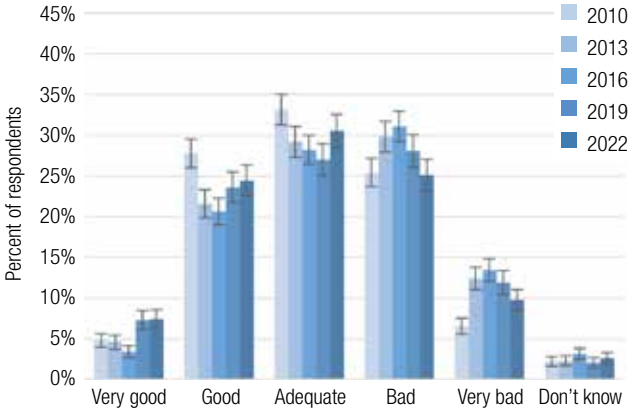

Figure 4.19 Perceived state of rivers and lakes, 2010–2022.

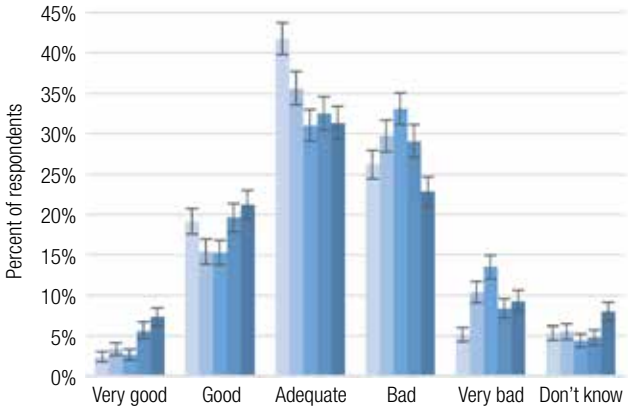

Figure 4.20 Perceived quality of management of rivers and lakes, 2010–2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.10 Average perceived state of rivers and lakes, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.07	2.55	2.57	2.65	2.74
Auckland	3.11	2.99	2.90	3.04	3.18
Waikato	2.94	2.64	2.71	2.88	2.78
Bay of Plenty	2.99	2.88	2.81	3.01	2.90
Gisborne	2.84	2.84	3.33	2.59	2.39
Hawke's Bay	3.06	2.54	2.61	2.76	2.85
Taranaki	3.10	2.98	2.97	2.98	3.08
Manawatū-Whanganui	2.88	2.58	2.61	2.86	2.77
Wellington	2.85	2.61	2.40	2.52	2.82
South Island					
Nelson	2.98	2.65	2.51	2.68	2.95
Tasman	2.66	2.84	2.67	2.56	3.20
Marlborough	2.98	2.79	3.27	2.61	3.04
Canterbury	2.92	2.61	2.52	2.72	2.79
West Coast	2.87	2.96	2.55	2.87	3.09
Otago	2.80	2.64	2.63	2.71	2.78
Southland	2.84	2.73	2.86	2.56	2.83
Overall	2.99	2.76	2.68	2.86	2.95

Table 4.11 Average perceived quality of management of rivers and lakes, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	2.81	2.45	2.35	2.64	2.81
Auckland	2.96	2.94	2.79	2.99	3.11
Waikato	2.91	2.64	2.59	2.82	2.81
Bay of Plenty	2.93	2.60	2.70	2.94	2.83
Gisborne	2.83	2.77	2.94	2.61	2.66
Hawke's Bay	2.74	2.45	2.53	2.74	2.99
Taranaki	3.00	3.12	2.85	3.00	2.98
Manawatū-Whanganui	2.59	2.57	2.48	2.83	2.88
Wellington	2.81	2.59	2.40	2.59	2.84
South Island					
Nelson	3.07	2.58	2.69	2.67	2.74
Tasman	2.80	2.70	2.71	2.92	2.84
Marlborough	3.09	2.52	2.96	2.64	3.00
Canterbury	2.82	2.57	2.42	2.75	2.95
West Coast	2.68	2.40	2.57	2.96	2.76
Otago	2.70	2.67	2.47	2.60	2.80
Southland	2.67	2.60	2.88	2.72	2.81
Overall	2.87	2.7	2.59	2.84	2.94

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

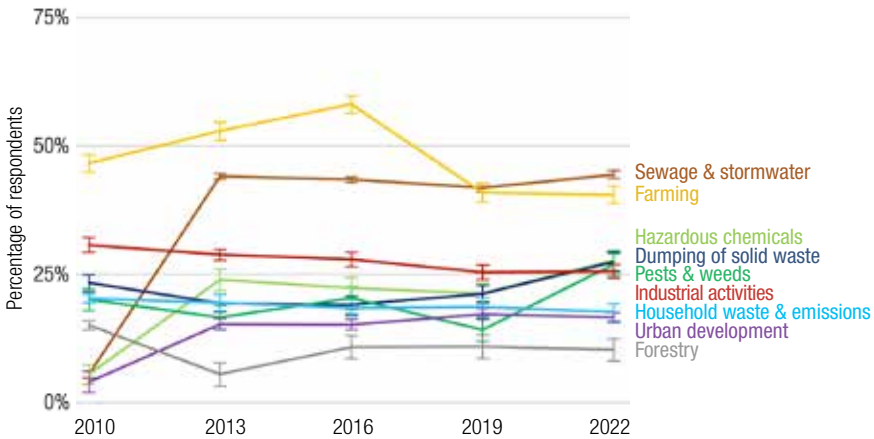

Figure 4.21 Trends in perceived pressures on rivers and lakes, 2010–2022.

Notes: Respondents could choose up to three pressures. Error bars are 95% confidence bands around percent of respondents.

4.7 TRENDS IN THE WETLANDS DOMAIN

4.7.1 Trends in Perceptions of State, Pressures, and Management

Perceptions of the condition of wetlands trended downward from 2010 to 2016, mainly due to a declining proportion of respondents who think wetlands are in 'very good' or 'good' condition (Figure 4.22)[19]. Perceived conditions of wetlands improved in 2019 compared to 2016, but still remained below the 2010 average. The average perceived condition of wetlands in Tasman, Wairarapa, West Coast, and Taranaki peaked in 2013 then declined before improving again by 2022 (Table 4.12). Marlborough, Gisborne, and Southland saw the perceived condition of their wetlands improve in 2016 before declining again.

Perceptions of the management of wetlands continuously declined from 2010 to 2016 while the proportion of respondents who thought management was of 'adequate' quality also declined from 2010 to 2022 (Figure 4.23). Perceived quality of management improved slightly in 2022 compared to the average in 2016, but still remained below its 2010 average[20]. The average perceived quality of management also declined between 2010 and 2016 and has yet to improve back to their 2010 averages in most regions (Table 4.13).

Respondents perceive farming, pests, and weeds to be the largest among the top three pressures on wetland conditions over the time series (Figure 4.24). However, 27.2% more respondents think urban development and 21.6% more respondents think sewage and stormwater was affecting the state of wetlands in 2022 compared with 2010[21].

4.7.2 Summary

The condition of wetlands across New Zealand is poorly understood, but less than 10% of pre-human wetland area remains today and, based on surrounding land uses, 60% are estimated to be in a moderately to severely degraded state (Ausseil *et al.*, 2011; MfE & StatsNZ, 2020). Survey respondents are relatively unaware of the condition of wetlands, perceiving them to be in adequate to good condition on average. However, a proportion are aware of their knowledge gaps, with over 10% of respondents saying they 'don't know' the condition and roughly 14% saying they don't know the quality of management of wetlands. Survey respondents did identify a complex array of pressures from farming, pests, weeds, urban development, sewage, stormwater, and dumping solid waste.

Waiwhakareke Natural Heritage Park, Hamilton

19 *See Appendix 5, Table A5.3 for full Bonferroni pairwise comparison results.*

20 *See Appendix 5, Table A5.9 for full Bonferroni pairwise comparison results.*

21 *See Appendix 5, Table A5.14 for full Bonferroni pairwise comparison results.*

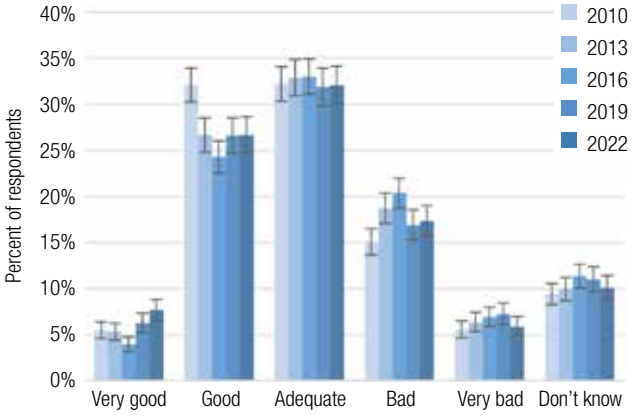

Figure 4.22 Perceived state of wetlands, 2010–2022.

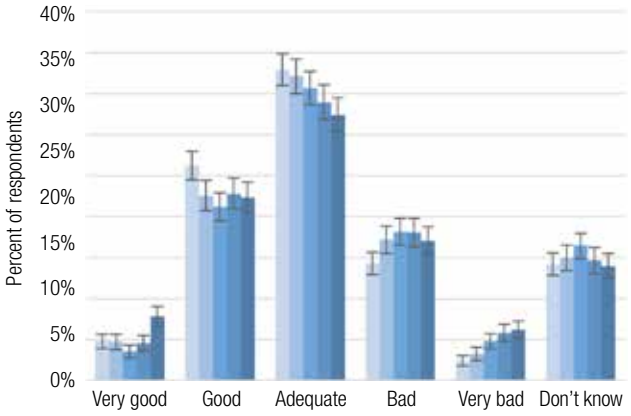

Figure 4.23 Perceived quality of management of wetlands, 2010–2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.12 Average perceived state of wetlands, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.05	2.97	2.85	2.89	3.12
Auckland	3.30	3.25	3.16	3.26	3.28
Waikato	3.13	3.12	2.90	3.05	2.99
Bay of Plenty	3.21	2.96	3.04	3.20	3.09
Gisborne	2.79	2.77	3.18	2.79	2.43
Hawke's Bay	3.22	2.98	2.90	3.02	3.14
Taranaki	3.37	3.66	3.16	3.20	3.12
Manawatū-Whanganui	3.00	2.81	2.88	3.02	2.95
Wellington	3.09	2.98	2.76	2.80	3.02
South Island					
Nelson	3.27	3.08	2.76	2.66	2.83
Tasman	2.67	3.16	2.90	2.59	3.01
Marlborough	3.10	2.91	3.50	2.82	3.07
Canterbury	3.19	2.99	2.96	3.03	3.24
West Coast	3.10	3.38	2.72	2.70	3.15
Otago	3.24	2.90	2.95	3.01	3.08
Southland	2.98	2.81	3.11	2.64	3.17
Overall	3.19	3.07	2.98	3.09	3.14

Table 4.13 Average perceived quality of management of wetlands, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	2.97	3.01	2.73	2.78	3.09
Auckland	3.24	3.26	3.15	3.14	3.19
Waikato	3.29	3.04	2.97	3.10	2.98
Bay of Plenty	3.24	2.95	3.02	3.13	2.96
Gisborne	2.92	3.06	3.34	2.58	2.66
Hawke's Bay	3.16	3.10	3.05	3.01	3.28
Taranaki	3.13	3.54	3.12	3.12	3.09
Manawatū-Whanganui	2.98	3.07	2.89	2.98	3.01
Wellington	3.16	3.00	2.83	2.79	2.96
South Island					
Nelson	3.25	3.11	2.54	2.89	2.83
Tasman	2.79	3.03	2.94	2.73	2.96
Marlborough	3.31	2.95	3.20	2.81	3.28
Canterbury	3.17	3.05	2.98	3.02	3.25
West Coast	2.98	3.05	2.91	2.79	2.91
Otago	3.37	3.06	3.09	2.90	3.06
Southland	3.07	2.72	3.18	2.73	3.11
Overall	3.19	3.1	3.01	3.03	3.10

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

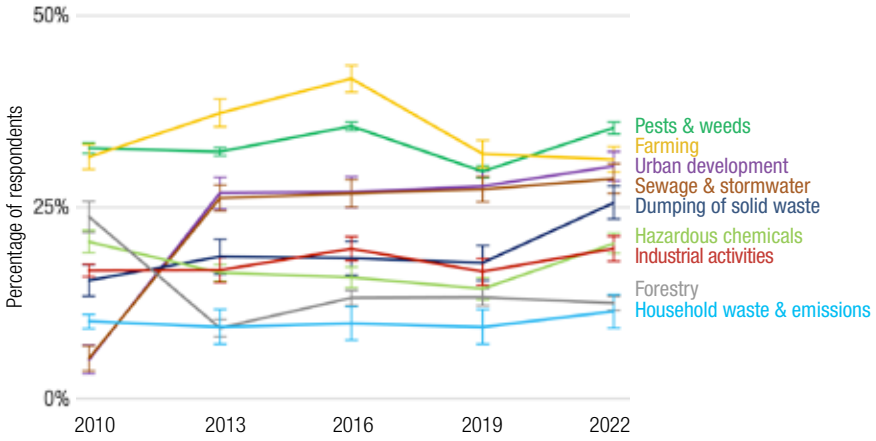

Figure 4.24 Trends in perceived pressures on wetlands, 2010–2022.

Notes: Respondents could choose up to three pressures. Error bars are 95% confidence bands around percent of respondents.

4.8 TRENDS IN THE NATIVE BUSH AND FORESTS DOMAIN

4.8.1 Trends in perceptions of state, pressures, and management

Most respondents think native bush and forests are in 'good' condition and quality of management is 'adequate' to 'good'. However, on average, the perceived condition of native bush and forests trended downward from 2010 to 2016, but improved in 2022 compared to 2013, 2016, and 2019 (Figure 4.25)[22]. The perceived quality of management of native bush and forests in declined from 2010 to 2016, but improved in 2019 from 2016, and then improved again in 2022 in comparison to 2013, 2016, and 2019 (Figure 4.26)[23].

While perceptions of both the condition and management of native bush and forests in most regions have improved over time, the averages in Gisborne and Wairarapa declined sharply in 2019 before recovering slightly in 2022 (Table 4.14 and Table 4.15). However, the perceived average state of Gisborne's native bush remains lower in 2022 than in 2010.

Pests and weeds are the most common perceived pressure on native bush and forests over the time series, followed by forestry, urban development, and farming (Figure 4.27). However, the proportion of respondents who think farming is among the top three pressures on native bush and forests has been declining since 2016 and is 12.6% lower in 2022 than in 2016[24].

4.8.2 Summary

Although there is uncertainty about the condition of native bush and forests, survey respondents generally think it is in good condition. However, the overall quantity of native land cover is significantly reduced from pre-human settlement, and the conversion of native land to primarily exotic grassland and forests still continues in most regions (MfE & StatsNZ, 2021b).

There are some interesting differences between perceptions and empirical data. For example, Southland lost 3,944 ha of indigenous land cover between 2012 and 2018 (MfE & StatsNZ, 2021b). However respondents from Southland thought both the condition and quality of management of indigenous land cover in their region was above average, at adequate to good (Table 4.14 and Table 4.15), over the same period. Nevertheless, respondents across the country are cognizant of the diverse pressures affecting native bush and forests.

LOSTATION PHOTOGRAPHY

Native bush walk, West Coast

22 *See Appendix 5, Table A5.5 for full Bonferroni pairwise comparison results.*

23 *See Appendix 5, Table A5.11 for full Bonferroni pairwise comparison results.*

24 *See Appendix 5, Table A5.16 for full Bonferroni pairwise comparison results.*

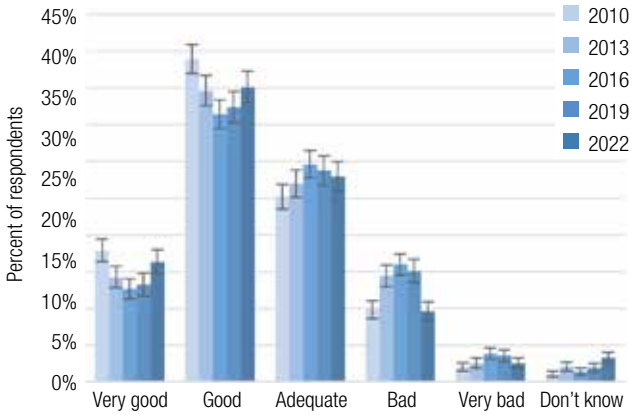

Figure 4.25 Perceived state of native bush and forests, 2010–2022.

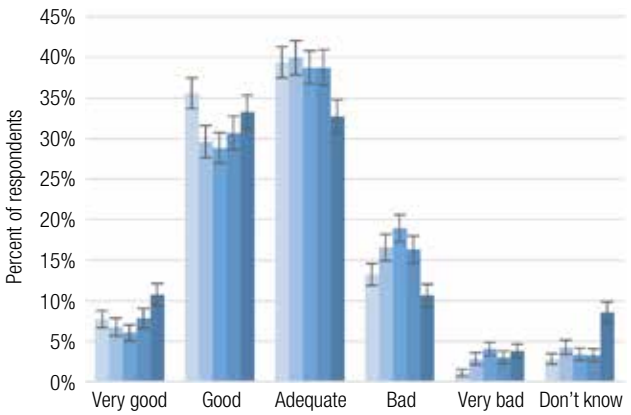

Figure 4.26 Perceived quality of management of native bush and forests, 2010–2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.14 Average perceived state of native bush and forests, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.44	3.40	3.05	3.25	3.42
Auckland	3.74	3.62	3.53	3.53	3.66
Waikato	3.65	3.40	3.31	3.43	3.59
Bay of Plenty	3.71	3.53	3.45	3.40	3.56
Gisborne	3.50	3.13	3.44	2.62	2.75
Hawke's Bay	3.75	3.70	3.30	3.42	3.47
Taranaki	3.71	3.92	3.61	3.44	3.62
Manawatū-Whanganui	3.54	3.39	3.30	3.45	3.43
Wellington	3.68	3.41	3.28	3.26	3.57
South Island					
Nelson	3.78	3.39	3.34	3.24	3.61
Tasman	3.07	3.80	3.55	3.06	3.32
Marlborough	3.47	3.04	3.89	3.52	3.66
Canterbury	3.64	3.39	3.30	3.40	3.63
West Coast	3.31	3.82	3.25	3.17	3.40
Otago	3.60	3.45	3.40	3.27	3.56
Southland	3.79	3.45	3.49	3.26	3.74
Overall	3.66	3.5	3.39	3.42	3.6

Table 4.15 Average perceived quality of management of native bush and forests, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.15	3.02	2.73	2.88	3.24
Auckland	3.43	3.34	3.26	3.36	3.47
Waikato	3.44	3.14	3.12	3.25	3.35
Bay of Plenty	3.47	3.13	3.21	3.21	3.38
Gisborne	3.34	3.07	3.23	2.92	2.76
Hawke's Bay	3.33	3.21	3.12	3.33	3.53
Taranaki	3.18	3.68	3.37	3.41	3.21
Manawatū-Whanganui	3.09	3.13	2.99	3.21	3.16
Wellington	3.32	3.11	3.08	3.13	3.31
South Island					
Nelson	3.33	3.42	3.01	2.91	3.20
Tasman	3.24	3.06	3.22	3.04	3.36
Marlborough	3.17	3.19	3.49	3.20	3.53
Canterbury	3.35	3.16	3.16	3.25	3.48
West Coast	3.26	3.20	2.49	3.13	3.22
Otago	3.36	3.30	3.10	3.11	3.47
Southland	3.39	3.40	3.29	3.04	3.51
Overall	3.37	3.22	3.14	3.25	3.4

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

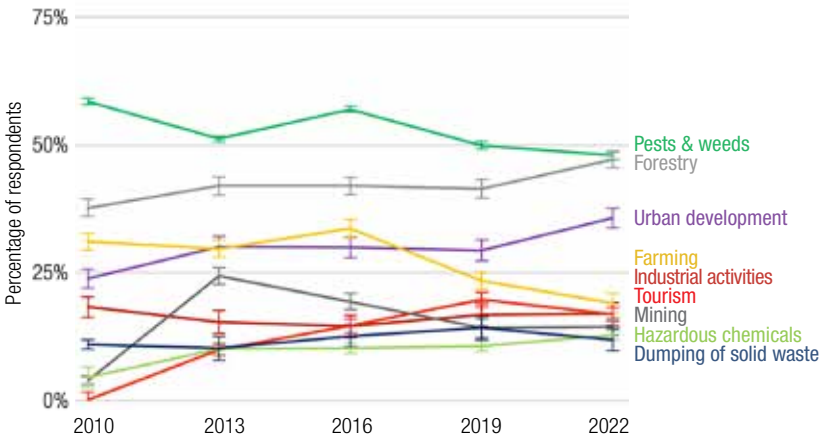

Figure 4.27 Trends in perceived pressures on native bush and forests, 2010–2022.

Notes: Respondents could choose up to three pressures. Error bars are 95% confidence bands around percent of respondents.

4.9 PROTECTED NATURAL AREAS

4.9.1 Perceptions of State, Pressures, and Management

Most respondents think protected natural areas are in 'good' condition and quality of management is 'adequate' to 'good'. A similar proportion of respondents (~24%) think protected natural areas are in 'very good' or 'adequate' condition and fewer than 10% of respondents think protected natural areas are in 'bad' to 'very bad' condition (Figure 4.28). On average, respondents in Marlborough are the most positive about the condition of their protected natural areas and respondents in Gisborne are the least positive about the condition of their protected natural areas compared with respondents in other regions (Table 4.16). Roughly 16% of respondents think quality of management of protected natural areas is 'very good', but ~11% of respondents think protected natural areas are being managed 'badly' to 'very badly' and 8% of respondents are unsure how well the domain is being managed (Figure 4.29). Similar to condition, respondents in Marlborough scored quality of management of their protected natural areas the highest and respondents in Gisborne scored quality of management of their protected natural areas the lowest compared with respondents in other regions (Table 4.17).

Most respondents (45%) think pests and weeds are among the top three pressures on protected natural areas followed by 26.9% and 26.1% of respondents who think tourism and urban development are among the top three pressures on protected natural areas, respectively (Table 4.18).

4.9.2 Summary

Protected natural areas (e.g., national parks, marine protected areas) are found across New Zealand and are often put under protection in response to declining conditions and/or increasing pressures to preserve rare ecosystems, threatened species, and areas of cultural significance (MfE & StatsNZ, 2022). These areas are also usually managed more restrictively to improve conditions and/or reduce pressures. For example, marine protected areas have management requirements that reduce fishing and usage pressures on the marine environments (MfE & StatsNZ, 2022). This level of management is reflected in the relatively positive perceived condition and quality of management by survey respondents. Respondents across the country are also aware that pests and weeds are a major source of pressure on this environmental domain.

Lake Pukaki, Mount Cook/Aoraki

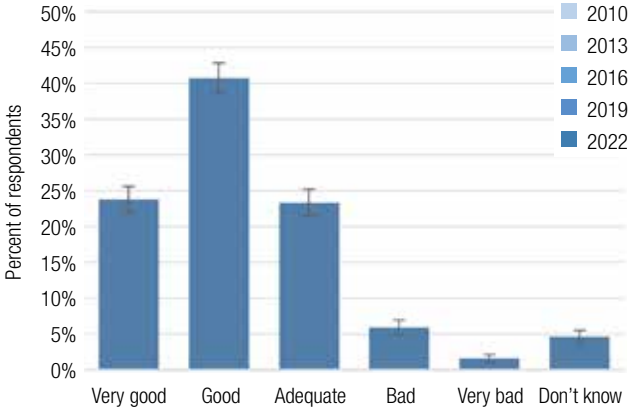

Figure 4.28 Perceived state of protected natural areas, 2022.

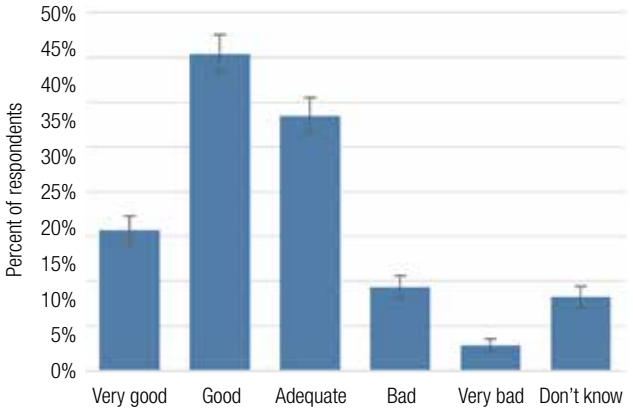

Figure 4.29 Perceived quality of management of protected natural areas, 2010–2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.16 Average perceived state of protected natural areas in 2022, by region.

		2022
North Island	Northland	3.86
	Auckland	3.84
	Waikato	3.78
	Bay of Plenty	3.93
	Gisborne	3.07
	Hawke's Bay	3.87
	Taranaki	3.78
	Manawatū-Whanganui	3.68
	Wellington	3.89
South Island	Nelson	3.85
	Tasman	3.78
	Marlborough	3.95
	Canterbury	3.88
	West Coast	3.48
	Otago	3.72
	Southland	3.94
Overall		3.83

Table 4.17 Average perceived quality of management of protected natural areas, by region, 2022.

		2022
North Island	Northland	3.46
	Auckland	3.62
	Waikato	3.47
	Bay of Plenty	3.61
	Gisborne	2.77
	Hawke's Bay	3.57
	Taranaki	3.37
	Manawatū-Whanganui	3.31
	Wellington	3.57
South Island	Nelson	3.38
	Tasman	3.63
	Marlborough	3.72
	Canterbury	3.73
	West Coast	3.11
	Otago	3.50
	Southland	3.68
Overall		3.56

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

Table 4.18 Perceived pressures on protected natural areas, 2022.

Pressures	% of respondents
Pests and weeds	44.6
Tourism	26.9
Urban development	26.1
Industrial activities	17.9
Forestry	16.9
Dumping of solid waste	15.4
Hazardous chemicals	13.5
Farming	12.7
Sewage and stormwater	12.7
Mining	11.2
Household waste and emissions	9.7
Motor vehicles and transport	8.0
Commercial fishing	4.9
Recreational fishing	3.5
Other	2.7

Note: Respondents could choose up to three pressures.

4.10 TRENDS IN THE NATURAL ENVIRONMENT IN TOWNS AND CITIES DOMAIN

4.10.1 Trends in Perceptions of State, Pressures, and Management

Most respondents think natural environments in towns and cities are in 'adequate' condition and have been 'adequately' managed over the last few years, on average. The perceived condition of natural environments in towns and cities was relatively stable from 2010 to 2016, but improved in 2019 in comparison to 2013, but not compared with the 2016 average (Figure 4.30)[25]. However, perceived conditions in 2022 are much improved compared with 2010, 2013, and 2016, but not 2019. Trends in average perceived condition of natural environments in towns and cities in Gisborne and Nelson did not follow the overall trend. For example, respondents in Gisborne think the condition of natural environments in their towns and cities in 2022 are significantly worse than in any survey year prior (Table 4.19).

The perceived quality of management of natural environments in towns and cities was also stable for most of the time series, improving slightly in 2019 (Figure 4.31)[26]. However, respondents in Gisborne, Nelson, and West Coast think the quality of management of natural environments in their towns and cities are worse in 2022 than in 2010 (Table 4.20). Perceived pressures on natural environments are dominated by urban development (51%), household waste and emissions (41%), and motor vehicles and transport (36%; Table 4.21).

4.10.2 Summary

The majority of New Zealanders live in urban areas that cover less than 1% of the country's land area. Access to green spaces in urban areas is important for well-being and health, but that access is not evenly distributed (MfE & StatsNZ, 2022). On average, survey respondents think the natural environment in their towns and cities is in adequate condition and has improved slowly over the last few years. However, those in Gisborne and Nelson are less positive about the state and management of green spaces and water in their urban areas.

Urban areas have a significant impact on the surrounding rivers and lakes. More nutrients, sediments, pathogens, and heavy metals are found in catchments dominated by urban land cover compared with catchments dominated by other land types. These pollutants lead to algal blooms, poor water clarity, and fewer safe, swimmable waterways near and downstream of urban centres (MfE & StatsNZ, 2020). Most survey respondents also recognise the impacts that urban development and urban life (e.g., household waste and motor vehicles) have on the quality of the natural environment.

DENIZUNLUSU

Neighbourhood in Pokeno, Auckland

25 *See Appendix 5, Table A5.6 for full Bonferroni pairwise comparison results.*

26 *See Appendix 5, Table A5.12 for full Bonferroni pairwise comparison results.*

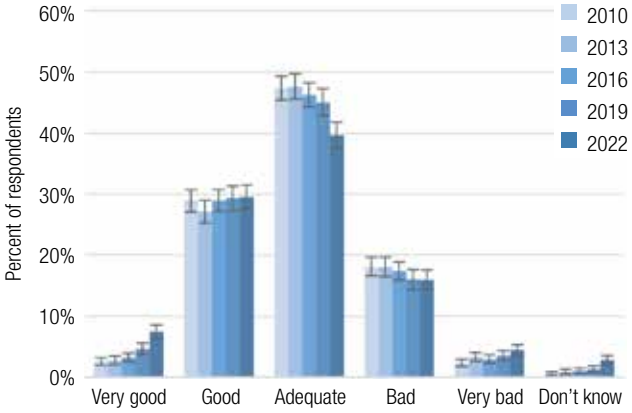

Figure 4.30 Perceived state of the natural environment in towns and cities, 2010–2022.

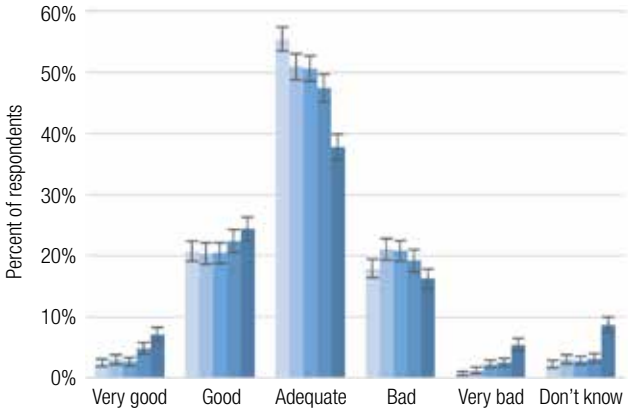

Figure 4.31 Perceived quality of management of the natural environment in towns and cities, 2010–2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.19 Average perceived state of natural environments in towns and cities, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	3.16	2.85	2.83	3.00	3.04
Auckland	3.12	3.17	3.19	3.24	3.30
Waikato	3.04	2.94	3.09	3.06	3.01
Bay of Plenty	3.15	3.06	3.15	3.09	3.11
Gisborne	3.11	2.82	3.06	3.24	2.54
Hawke's Bay	3.15	2.98	3.05	3.14	3.19
Taranaki	2.98	3.16	3.15	2.94	3.30
Manawatū-Whanganui	3.14	2.93	3.06	3.23	3.16
Wellington	3.20	3.14	3.12	3.06	3.28
South Island					
Nelson	3.08	2.89	3.03	2.75	2.98
Tasman	2.87	3.01	2.98	2.36	3.32
Marlborough	3.05	3.23	3.00	3.05	3.40
Canterbury	3.13	3.00	3.09	3.18	3.19
West Coast	2.91	3.43	2.92	2.89	3.10
Otago	2.99	3.13	3.21	3.15	3.15
Southland	3.07	3.04	3.18	3.08	3.17
Overall	3.11	3.08	3.12	3.16	3.20

Table 4.20 Average perceived quality of management of natural environments in towns and cities, by region, 2010–2022.

	2010	2013	2016	2019	2022
North Island					
Northland	2.95	2.80	2.69	2.69	2.93
Auckland	3.08	3.15	3.06	3.19	3.23
Waikato	2.98	2.90	2.97	3.05	3.00
Bay of Plenty	3.07	2.88	2.92	3.04	2.95
Gisborne	3.20	2.91	2.88	2.84	2.60
Hawke's Bay	3.05	2.87	3.00	2.87	3.22
Taranaki	2.93	3.23	2.98	3.19	3.09
Manawatū-Whanganui	3.02	2.94	2.96	3.03	3.10
Wellington	3.18	3.03	3.01	3.03	3.04
South Island					
Nelson	3.26	2.92	3.01	2.77	2.94
Tasman	3.04	2.79	3.01	2.88	3.04
Marlborough	2.97	2.92	3.24	2.86	3.31
Canterbury	3.09	3.03	3.05	3.08	3.22
West Coast	2.94	3.28	2.84	3.11	2.67
Otago	2.97	3.08	2.99	3.04	3.12
Southland	3.12	2.98	3.07	2.84	3.16
Overall	3.06	3.03	3.01	3.08	3.13

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

Table 4.21 Perceived pressures on natural environments in towns and cities, 2022.

Pressures	% of respondents
Urban development	51.2
Household waste and emissions	41.3
Motor vehicles and transport	36.2
Industrial activities	30.7
Sewage and stormwater	27.8
Dumping of solid waste	21.1
Hazardous chemicals	16.3
Pests and weeds	13.4
Tourism	8.3
Farming	3.5
Mining	3.4
Other	2.6
Forestry	2.6
Recreational fishing	2.1
Commercial fishing	1.8

Note: Respondents could choose up to three pressures.

4.11 MARINE PLANTS AND ANIMALS

4.11.1 Perceptions of State, Pressures, and Management

Marine plants and animals are perceived to be in 'adequate' to 'good' condition and managed 'adequately to 'good' (Figure 4.32 and Figure 4.33). A similar proportion of respondents think the condition and quality of management of marine plants and animals are 'bad' to 'very bad' while 8% of respondents are unsure about the condition and 12% are unsure about the quality of management. Respondents in Gisborne scored the condition and quality of management of their marine plants and animals the lowest while respondents in Auckland scored the condition and quality of management of their marine plants and animals the highest among all regions (Table 4.22 and Table 4.23).

Most respondents think commercial fishing, sewage, and stormwater are among the top three pressures on marine plants and animals to (Table 4.24). At least 20% of respondents also think hazardous chemicals (28.3%), dumping of solid waste (21.9%) and pests and weeds (21%) are among the top three pressures on marine plants and animals.

4.11.2 Summary

Marine plants and animals along the 15,000 km of coastline and in the over 4 million km2 EEZ are under complex pressures and in mixed condition. Despite an estimated 17,000 species – accounting for 30% of New Zealand's biodiversity – having been recorded in the EEZ, only 642 are under quota management and a few hundred more have been studied and assessed for risk and threats. Among the assessed species, most fish stocks are in good condition, but 9% are collapsed stocks and most non-fished assessed native species are at risk or threatened (MfE & StatsNZ, 2019). However, survey respondents think marine plants and animals are in better condition than the biophysical evidence would suggest. Respondents are aware, though, of some of the pressures on marine plants and animals, including commercial fishing, sewage, and stormwater.

MARTYN DE JONG

*Yellow-Eyed Penguin/Hoiho (*Megadyptes antipodes*), Otago*

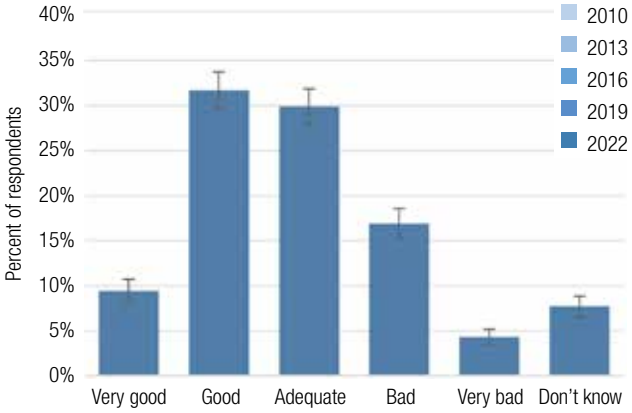

Figure 4.32 Perceived state of marine plants and animals, 2022.

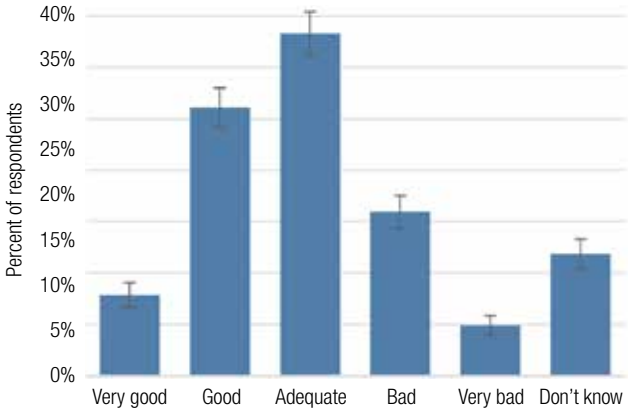

Figure 4.33 Perceived quality of management of marine plants and animals, 2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.22 Average perceived state of marine plants and animals, by region, 2010–2022.

		2022
North Island	Northland	3.13
	Auckland	3.42
	Waikato	3.14
	Bay of Plenty	3.23
	Gisborne	2.58
	Hawke's Bay	3.17
	Taranaki	3.31
	Manawatū-Whanganui	3.09
	Wellington	3.21
South Island	Nelson	3.04
	Tasman	3.15
	Marlborough	3.37
	Canterbury	3.28
	West Coast	3.15
	Otago	3.07
	Southland	3.29
Overall		3.27

Table 4.23 Average perceived quality of management of marine plants and animals, by region, 2010–2022.

		2022
North Island	Northland	3.09
	Auckland	3.27
	Waikato	3.05
	Bay of Plenty	3.11
	Gisborne	2.67
	Hawke's Bay	3.18
	Taranaki	3.24
	Manawatū-Whanganui	3.09
	Wellington	3.17
South Island	Nelson	3.02
	Tasman	3.17
	Marlborough	3.20
	Canterbury	3.26
	West Coast	2.95
	Otago	3.08
	Southland	3.20
Overall		3.18

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

Table 4.24 Perceived pressures on protected natural areas, 2022.

Pressures	% of respondents
Sewage and stormwater	47.7
Commercial fishing	47.4
Hazardous chemicals	28.3
Dumping of solid waste	21.9
Pests and weeds	21.0
Industrial activities	19.2
Household waste and emissions	14.8
Recreational fishing	14.3
Urban development	10.0
Farming	9.3
Tourism	6.7
Forestry	5.8
Mining	4.3
Motor vehicles and transport	3.2
Other	1.6

Note: Respondents could choose up to three pressures.

4.12 TERRESTRIAL (LAND AND FRESHWATER) PLANTS AND ANIMALS

4.12.1 Perceptions of State, Pressures, and Management

Most respondents perceived terrestrial plants and animals to be in 'adequate' to 'good' condition and the quality of management to be 'adequate' to 'good' (Figure 4.34 and Figure 4.35). A similar proportion of respondents (20%) also think the condition and quality of management of the terrestrial domain are 'bad' to 'very bad'. Respondents in Gisborne and Nelson scored the condition of their terrestrial plants and animals less than 'adequate' on average (Table 4.25) while respondents in Gisborne and the West Coast scored the quality of management of their terrestrial plants and animals less than 'adequate' on average (Table 4.26).

Most respondents (39%) think pests and weeds is among the top three pressures on terrestrial plants and animals while 30% of respondents think sewage and stormwater is among the top three pressures (Table 4.27). A similar proportion of respondents also think farming (24.9%), urban development (24.1%), hazardous chemicals (23.8%), industrial activities (23%) and dumping of solid waste (21.8%) are among the top three pressures of terrestrial plants and animals.

4.12.2 Summary

Terrestrial plants and animals are in relatively poor condition and continue to face pressures from by non-native plants and animals, climate change, land development, and legacy habitat degradation. Among the assessed terrestrial species, most native freshwater fish, terrestrial birds, native birds, bats, and reptiles are either threatened or at risk of being threatened with extinction (MfE & StatsNZ, 2020, 2022). Among ecosystems classified as rare, 63% are threatened with collapse (MfE & StatsNZ, 2022). However, respondents have consistently perceived terrestrial plants and animals to be in adequate condition, with some heterogeneity across regions (see Table 4.27). Respondents are aware of some of the known pressures including pests, weeds, and land use.

VANESSA JONES

*Tuatara (*Sphenodon punctatus*)*

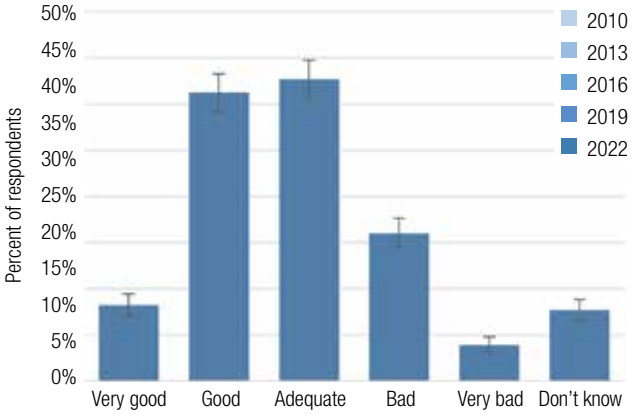

Figure 4.34 Perceived state of terrestrial plants and animals, 2022.

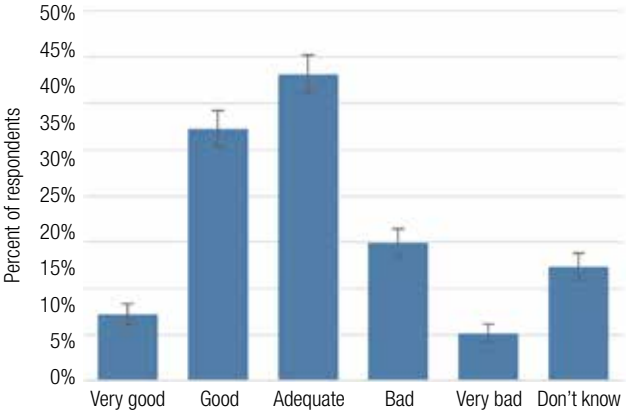

Figure 4.35 Perceived quality of management of terrestrial plants and animals, 2022.

Note for both figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 4.25 Average perceived state of terrestrial plants and animals, by region, 2022

		2022
North Island	Northland	3.12
	Auckland	3.45
	Waikato	3.14
	Bay of Plenty	3.23
	Gisborne	2.47
	Hawke's Bay	3.08
	Taranaki	3.30
	Manawatū-Whanganui	3.13
	Wellington	3.15
South Island	Nelson	2.82
	Tasman	3.00
	Marlborough	3.44
	Canterbury	3.27
	West Coast	3.15
	Otago	3.03
	Southland	3.15
Overall		3.26

Table 4.26 Average perceived quality of management of terrestrial plants and animals, by region, 2022.

		2022
North Island	Northland	3.08
	Auckland	3.28
	Waikato	3.04
	Bay of Plenty	3.11
	Gisborne	2.75
	Hawke's Bay	3.16
	Taranaki	3.25
	Manawatū-Whanganui	3.15
	Wellington	3.20
South Island	Nelson	3.04
	Tasman	3.13
	Marlborough	3.18
	Canterbury	3.30
	West Coast	2.77
	Otago	3.09
	Southland	3.16
Overall		3.19

Note for both tables: Scale: 1 = very bad, 2 = bad, 3 = adequate, 4 = good, 5 = very good.

Table 4.27 Perceived pressures on terrestrial plants and animals, 2022.

Pressures	% of respondents
Pests and weeds	39.0
Sewage and stormwater	29.8
Farming	24.9
Urban development	24.1
Hazardous chemicals	23.8
Industrial activities	23.0
Dumping of solid waste	21.8
Household waste and emissions	16.1
Forestry	15.5
Mining	8.2
Tourism	6.8
Commercial fishing	6.6
Motor vehicles and transport	6.7
Recreational fishing	5.2
Other	2.0

Note: Respondents could choose up to three pressures.

Te Matua Ngahere, Waipoua Forest, Northland
WILDERNESS PHOTOGRAPHY

View overlooking Queenstown
MICHAEL AMADEUS

05 PARTICIPATION IN ENVIRONMENTAL ACTIVITIES

5.1 THE 2022 SURVEY

Figure 5.1 shows respondents' levels of participation in 15 environment-related activities during the preceding 12 months. Recycling is the most common activity (79%), followed by growing one's own vegetables (56%), using less electricity (49%), composting (47%), and buying environmentally friendly products (46%). Taking part in hearings or consent processes about the environment (5%), participating in an environmental organisation (6%), and being an active member of a club or group that restores and/or replants natural environments (5%) are the least common activities.

The rates of participation were evaluated against gender, age group, education, and ethnicity (Table 5.1). Some of the notable findings are:

- Males and those younger than 44 years are more likely to have visited a national park, to have used public transport, and to have participated in the environmental consent process or hearings. Males were also more likely than females or gender diverse people to have visited a marine reserve.
- Females or gender diverse people and those 44 years old and older are more likely to have recycled, to have grown their own vegetables, to have reduced their electricity and freshwater use, to have composted, and to have bought environmentally friendly products. Those 44 years old and older are also more likely than younger people to have been involved in an environmental project.
- Those with tertiary qualification are more likely than those without a qualification or a secondary/vocational qualification to have participated in nearly all activities except recycling, growing their own vegetables, and reducing their electricity use.
- Those who identify as Māori are more likely to have reduced their electricity and freshwater use, bought environmentally friendly products, to have obtained information about the environment, and to have participated in an environmental NGO, restoration group, or hearing/consent process.

5.2 2010–2022 SURVEYS

Participation in environmental activities has been monitored since 2000 and dropped significantly in 2022 compared with 2019. Indeed, participation rates for all activities are significantly below their 2010 rates (Figures 5.2 and 5.3)[27].

Recycling household waste still remains the most common activity, despite 10% fewer respondents recycling in 2022 than in 2019 and 14% fewer respondents recycling in 2022 than in 2010. In previous years, at least 50% of respondents grew their own vegetables, reduced electricity use, composted household waste, bought environmentally friendly products, reduced freshwater use, visited a national park, commuted using public transport, or obtained environmental information. However, by 2022 fewer than half of respondents bought environmentally friendly products, reduced freshwater use, visited a national park, commuted using public transport or obtained environmental information. The largest drop in participation in these activities occurred between the 2019 and 2022 surveys.

DAN FREEMAN

Auckland cycleway

27 *See Appendix 5, Table A5.19 for full regression results.*

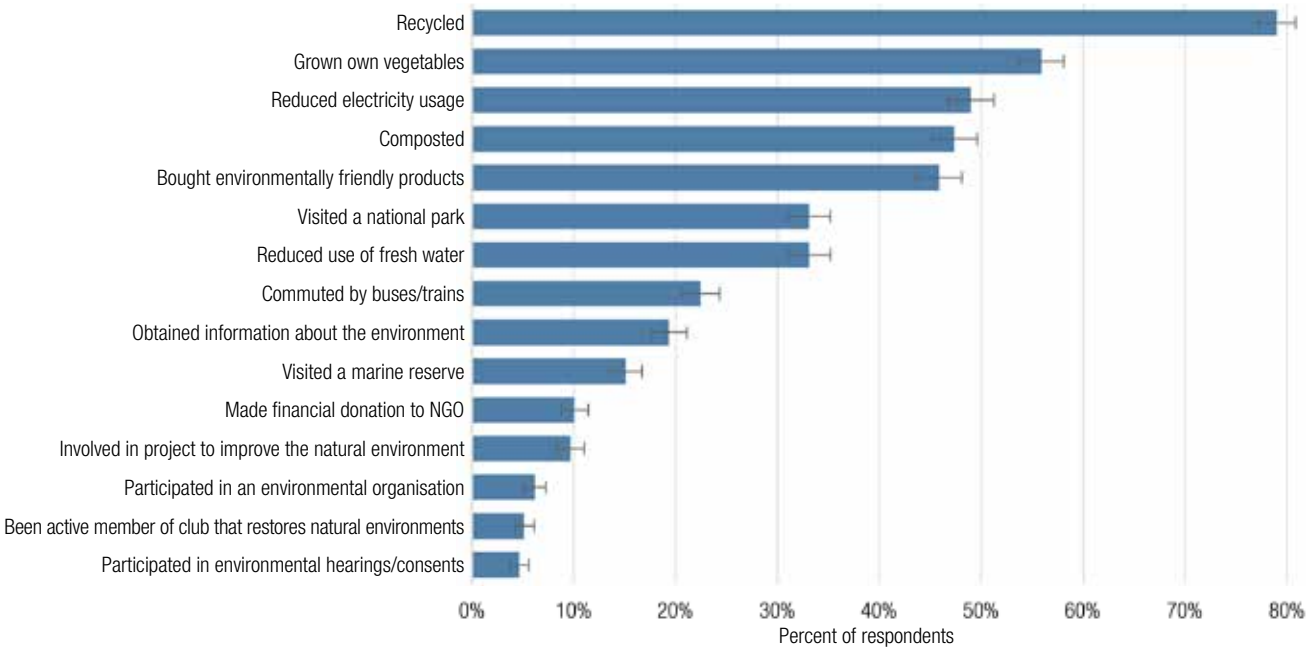

Figure 5.1 Proportion of 2022 survey respondents who participated in environmental activities.

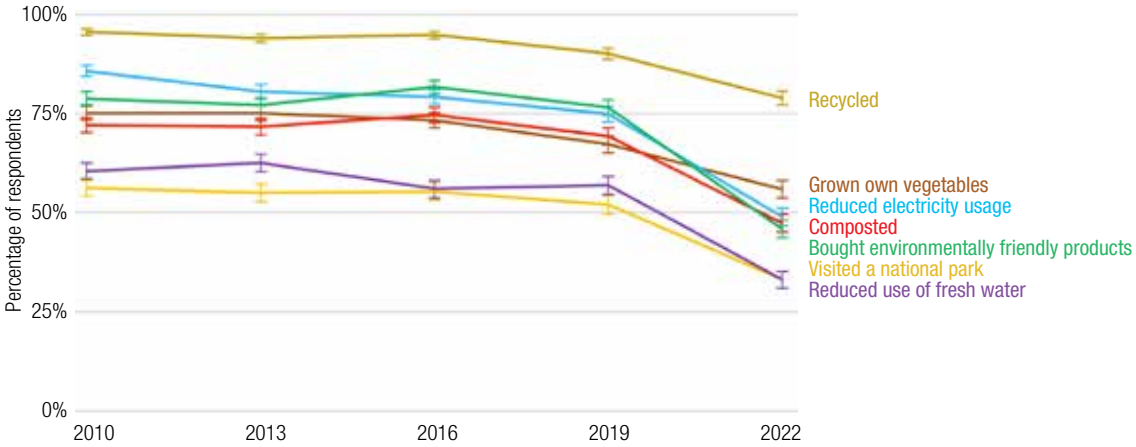

Figure 5.2 Trends in participation in environmental activities, 2010–2022.

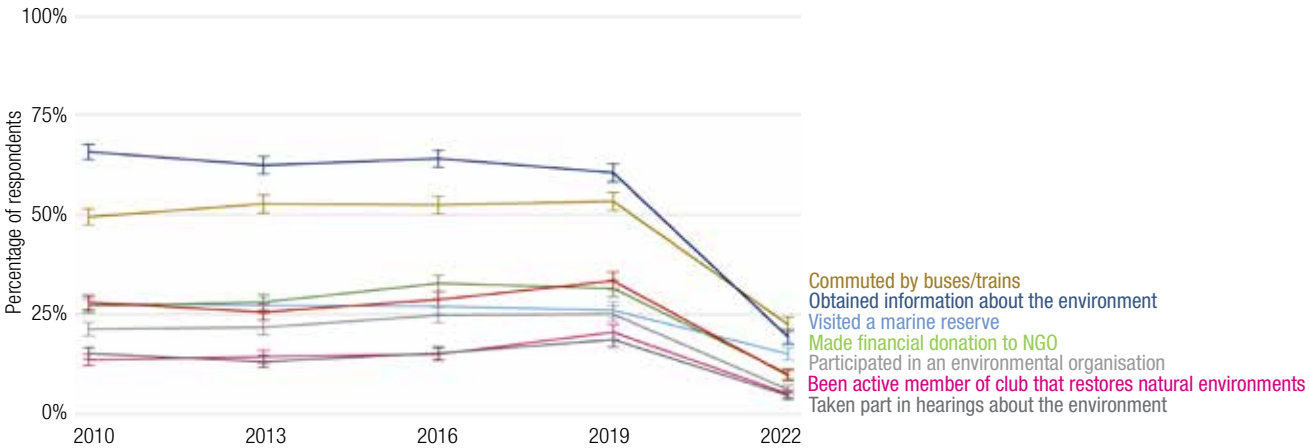

Figure 5.3 Trends in reported participation in environmental activities, 2010–2022.

Note for all figures: Error bars on Figures are 95% confidence bands around percent of respondents.

Table 5.1 Probability of participating in an activity in 2022, by demographic characteristics. Ranking for EPI and each resource ranges from 1 (best) to 180 (worst). Values in green are significantly larger than their alternative demographic (e.g., male vs. female or gender diverse) (), values in red are significantly smaller than their alternative demographic (), and values in grey are not significantly different from each other ().

	Male	Female or gender diverse	Younger than 44 years old	44 years old+	No qualification	Formal qualification	Māori	Other ethnicities	**Proportion of activity in sample**
Recycled	77.2	82.8***	72	87.4***	80.1	80.8	77.9	80.7	**91**
Grown own vegetables	54.6	62***	46.9	68.8***	58.1	59.4	63.4	57.7	**70**
Reduced electricity usage	46.9	54.3**	44.7	56.2***	50.2	52.1	54.7*	50.1	**75.2**
Composted	46.3	52.2***	37.1	60.3***	47.3	54***	53.7	48.6	**67**
Bought environmentally friendly products	39.3	54.9***	43.3	51***	44.4	54.2***	53.9***	46.3	**72**
Reduced use of fresh water	29.3	34.5**	26.2	37.3***	30.4	35.6*	39.2***	30.8	**54**
Visited a national park	36.1***	30.2	35.1**	31.1	28.7	43***	33.7	32.9	**50.4**
Commuted by buses/trains	22.4**	17.9	22.4***	17.7	16.4	28.2***	23	19.5	**46**
Obtained information about the environment	19.5	18.3	19.9	18	15.3	27.3***	23.4**	18.2	**54.4**
Visited a marine reserve	16.5**	11.3	14.3	13.4	12.3	17.4***	18	13.1	**25**
Made financial donation to NGO	10.5	9.2	8.7	10.9	8.3	13.6***	10.2	9.8	**26**
Involved in project to improve the natural environment	9.9	8.5	7.9	10.4**	7.5	13.5***	12.9	8.6	**25**
Participated in an environmental organisation	6.4	5.6	5.7	6.2	4.6	9.3***	11.7***	5.1	**20**
Been active member of club that restores natural environments	5.7	4.2	4.4	5.4	3.9	7.4***	8.9***	4.3	**14**
Participated in environmental hearings/consents	5.1*	3.5	5.2***	3.4	3.4	6.2***	8***	3.7	**13.3**
Proportion of demographic in sample	**49.1**	**50.9**	**46**	**54**	**11**	**89**	**17.2**	**82.8**	**100**

Notes: Probability of participating in an environmental activity (row) given gender, age group, schooling level and ethnicity (columns). Estimated using a multivariate logit regression with demographic weights and standard errors clustered at the regional council level. Marginal effects are reported in Tables A5.18 in Appendix 5.

Hooker Valley Track, Aoraki/Mt Cook National Park

06

MAJOR ENVIRONMENTAL ISSUES FACING NEW ZEALAND AND THE WORLD

Respondents were asked what they think are the most important environmental issues facing New Zealand and the world today in two open-ended questions. As in previous reports, the qualitative responses were grouped by themes, and care was taken to limit interpolation of individual responses. The majority of responses were grouped into direct or indirect environmental issue or pressure themes, but some respondents thought other non-environmental issues were more important to them. These latter issues were grouped together.

6.1 THE 2022 SURVEY

Climate change is the most important environmental issue facing New Zealand and the world according to 20.5% and 41.9% of respondents, respectively (Tables 6.1 and 6.2). Respondents also think freshwater (18.4%), sanitation (15.5%), and pollution (10.5%) are important environmental issues facing New Zealand in 2022, while environmental pressures from war/conflict (20%) and pollution (12%) are important environmental issues facing the world. Issues captured in the 'other environmental topics' category included packaging, disinterest in helping the environment, erosion, historic contamination, and natural disasters.

6.2 2010–2022 SURVEYS

Topics that respondents think are the most important issues facing New Zealand and the world have changed since 2010. While climate change has consistently been identified as the most important issue facing the world each year since the 2010 wave of the survey, freshwater was cited by the most respondents as the most important issue facing New Zealand until the 2022 wave of the survey, when it fell to second place (Table 6.1). Waste, sewage and sanitation was the third more commonly cited issue facing New Zealand in 2019 and 2022, while pollution was third in 2013 and 2016. Environmental pressures from war/conflict has been the second-most cited issue facing the world since 2016 (Table 6.2). Pollution is also the third most commonly cited issue identified by respondents facing the world since 2010.

KRISTINE ZIPFEL

School Strike 4 Climate Change, 24 May 2019, Wellington

Table 6.1 Most important environmental issues facing New Zealand according to survey respondents, 2010–2022.

	2010	2013	2016	2019	2022
Climate change, GHG, carbon	14.2	7.9	10.5	18.6	20.5
Freshwater issues	31.8	27.7	32.6	27.6	18.4
Waste, sewage, sanitation	9.4	11.4	11.8	12.4	15.5
Pollution	21.1	13.8	13.4	11.7	10.5
Urbanisation, development, land use	7.6	7.4	8.5	3.9	8.0
Pressures from over population	13.3	9.2	9.5	8.1	7.4
Protection/conservation of the environment	13.3	13.2	10.4	8.4	7.2
Emissions, smog (from vehicles)	4.7	5.2	5.3	2.4	6.8
Marine and coastal environments	4.5	7.0	7.2	5.3	6.4
Environmental regulation and politics	8.7	7.2	5.9	3.6	6.0
Agriculture/farming	8.5	17.1	19.3	5.3	5.8
Environmental pressures from acts of war/conflict	4.4	3.6	4.0	6.7	5.4
Sustainable management of resources	10.1	8.3	6.6	4.1	4.8
Forestry, logging, deforestation	4.4	4.3	3.3	3.8	4.8
Air quality	9.2	10.2	9.7	4.8	3.7
Energy, transportation, fuel	4.4	10.1	6.1	3.9	2.9
Social issues (poverty, famine, inequality)	3.8	3.1	3.3	2.9	2.8
Pests, weeds, disease	2.6	2.8	3.2	4.6	2.4
Poison, pesticides, toxins	2.8	3.4	2.6	4.0	2.3
Mining, large industry	5.0	8.5	4.1	1.6	2.3
Tourism	1.1	0.6	0.9	1.1	0.8
Extinction, habitat loss and degradation	0.6	0.2	0.6	0.7	0.5
Other environmental topics	10.5	8.0	7.8	6.5	5.0
Other non-environmental topics	3.7	2.6	4.1	5.9	6.2
Unsure	2.1	1.3	1.8	2.6	6.5
Number of respondents	1,442	1,698	1,801	1,580	1,870

Table 6.2 Most important environmental issues facing the world according to respondents, 2010–2022.

	2010	2013	2016	2019	2022
Climate change, GHG, carbon	30.7	27.7	36.9	38.7	41.9
Freshwater issues	13.1	16.6	19.9	16.0	20.0
Waste, sewage, sanitation	18.9	18.4	13.6	15.3	12.0
Pollution	4.8	6.1	6.9	10.3	9.1
Urbanisation, development, land use	15.7	16.6	15.5	12.3	8.8
Pressures from over population	4.5	5.7	5.5	1.9	5.7
Protection/conservation of the environment	6.9	10.3	7.3	5.1	5.5
Emissions, smog (from vehicles)	21.7	14.9	14.6	9.8	4.0
Marine and coastal environments	6.2	8.0	5.4	4.3	3.4
Environmental regulation and politics	11.0	9.9	7.6	5.9	3.3
Agriculture/farming	2.3	3.5	4.1	3.4	3.2
Environmental pressures from acts of war/conflict	3.8	3.8	2.7	2.6	2.8
Sustainable management of resources	4.5	7.2	4.8	3.7	2.7
Forestry, logging, deforestation	3.8	3.9	3.1	2.0	2.7
Air quality	5.1	6.0	5.0	4.4	2.4
Energy, transportation, fuel	5.7	4.5	4.8	2.2	2.1
Social issues (poverty, famine, inequality)	6.1	5.6	4.5	1.9	2.1
Pests, weeds, disease	1.6	1.9	2.2	1.1	1.1
Poison, pesticides, toxins	1.5	1.4	0.9	1.1	0.7
Mining, large industry	0.6	0.3	0.1	0.2	0.3
Tourism	0.1	0.4	0.2	0.4	0.1
Extinction, habitat loss and degradation	0.0	0.0	0.0	0.1	0.1
Other environmental topics	5.3	6.5	4.6	3.2	2.6
Other non-environmental topics	2.6	2.7	2.3	6.0	8.0
Unsure	1.7	1.7	2.2	2.8	3.6
Number of respondents	1,430	1,678	1,797	1,558	1,854

Notes for both Tables: Respondents wrote-in the most important environmental issue(s) that they think New Zealand Aotearoa is facing. Those qualitative responses were coded post-survey into the above themes. Percentages do not sum to 100% because some respondents mentioned more than one environmental issue.

Landslide in Ruby Bay Nelson, 2022
ANNETTE LE CREN

*Kererū (*Hemiphaga novaeseelandiae*)*

07

PERCEPTIONS OF HOW WELL FARMS ARE DOING ENVIRONMENTALLY

Respondents were asked how well they think farms in their region are doing environmentally and how the environmental performance of farms has changed over the last 3 years. All responses were recorded on a 5-point Likert scale but have been aggregated and presented as the percentage of respondents who were positive (e.g., said 'better' or 'much better') about the environmental performance of farms.

7.1 ENVIRONMENTAL PERFORMANCE OF FARMS

Across the country, 40% of respondents think the environmental performance of farms in their regions is good or very good (henceforth referred to as 'positive'). Respondents in Taranaki, Nelson, and West Coast are the most positive about the environmental performance of farms in their regions. However, only 15% of respondents in Gisborne feel the same way (Figure 7.1). Comparatively, respondents in Gisborne, Wellington, and Otago are less positive and respondents in Nelson are more positive than respondents in other regions about the environmental performance of the farms in their regions[28].

7.2 DOING THEIR PART FOR BIODIVERSITY, WATER QUALITY, AND CLIMATE CHANGE

Respondents are less positive about whether farms in their regions are doing their part for water quality (Figures 7.2), climate change (Figure 7.3), and biodiversity (Figure 7.4). Overall, 33% of respondents think farms are doing their part for water quality, 28% think farms are doing their part for climate change, and 29% think farms are doing their part for biodiversity. Respondents in Hawke's Bay, Wairarapa, West Coast and Southland are the most positive about how well farms in their regions are doing for water quality, climate change, and biodiversity. At least one-quarter of respondents in Auckland, Manawatū-Whanganui, and Canterbury think that farms in their regions are doing their part for water quality, climate change, and biodiversity. Respondents in Gisborne are the least positive about how well their farms are managing water quality, climate change, or biodiversity. There is also a large extent of uncertainty, with 33% of all respondents unsure how well farms are doing for biodiversity, 24% are unsure how well farms are doing for water quality, and 27% are unsure how well farms are doing for climate change.

Comparatively, respondents in Gisborne and Wellington are less positive and respondents in Southland are more positive than respondents in other regions about how well farms in their regions are doing their part for water quality[29]. Respondents in West Coast and Southland are more positive than respondents in other regions about how well farms in their region are doing their part for climate change[30]. Respondents in Waikato, Gisborne, Wellington and Otago are less positive and respondents in Manawatū-Whanganui are more positive than respondents in other regions about how well farms in their regions are doing their part for biodiversity[31].

7.3 CHANGES IN ENVIRONMENTAL PERFORMANCE OVER THE LAST 3 YEARS

Respondents also reflected on the extent to which the environmental performance of farms in their regions has improved over the last few years (Figure 7.5). Across the country, 42% of respondents think that farms in their regions are doing better or much better environmentally than they were 3 years ago. Respondents in Hawke's Bay, West Coast, and Southland are the most positive about improvements farms in their regions have been making for the environment, while those in Northland and Gisborne are the least positive. Comparatively, respondents in Southland are more positive than respondents in other regions about the changes in environmental performance of the farms in their region[32].

28 *25.9% fewer respondents are positive (p<.01) in Gisborne, 10.5% fewer are positive (p<.01) in Wellington, 9% fewer are positive (p<.09) in Otago and 21.2% more are positive (p<.05) in Nelson than respondents in other regions.*

29 *16.8% fewer respondents are positive (p<.09) in Gisborne, 15.1% fewer are positive (p<.00) in Wellington and 8.5% more are positive (p<.01) in Southland than respondents in other regions.*

30 *23.6% more respondents are positive (p<.04) in West Coast and 5.5% more are positive (p<.09) in Southland than respondents in other regions.*

31 *17.9% fewer are respondents are positive (p<.07) in Gisborne, 5.8% fewer respondents are positive (p<.05) in Waikato, 6.3% fewer respondents are positive (p<.08) in Wellington, 10.2% fewer respondents are positive (p<.04) in Otago, and 10.7% more respondents are positive (p<.02) in Manawatū-Whanganui than respondents in other regions.*

32 *11.2% more respondents are positive (p<.00) in Southland than respondents in other regions.*

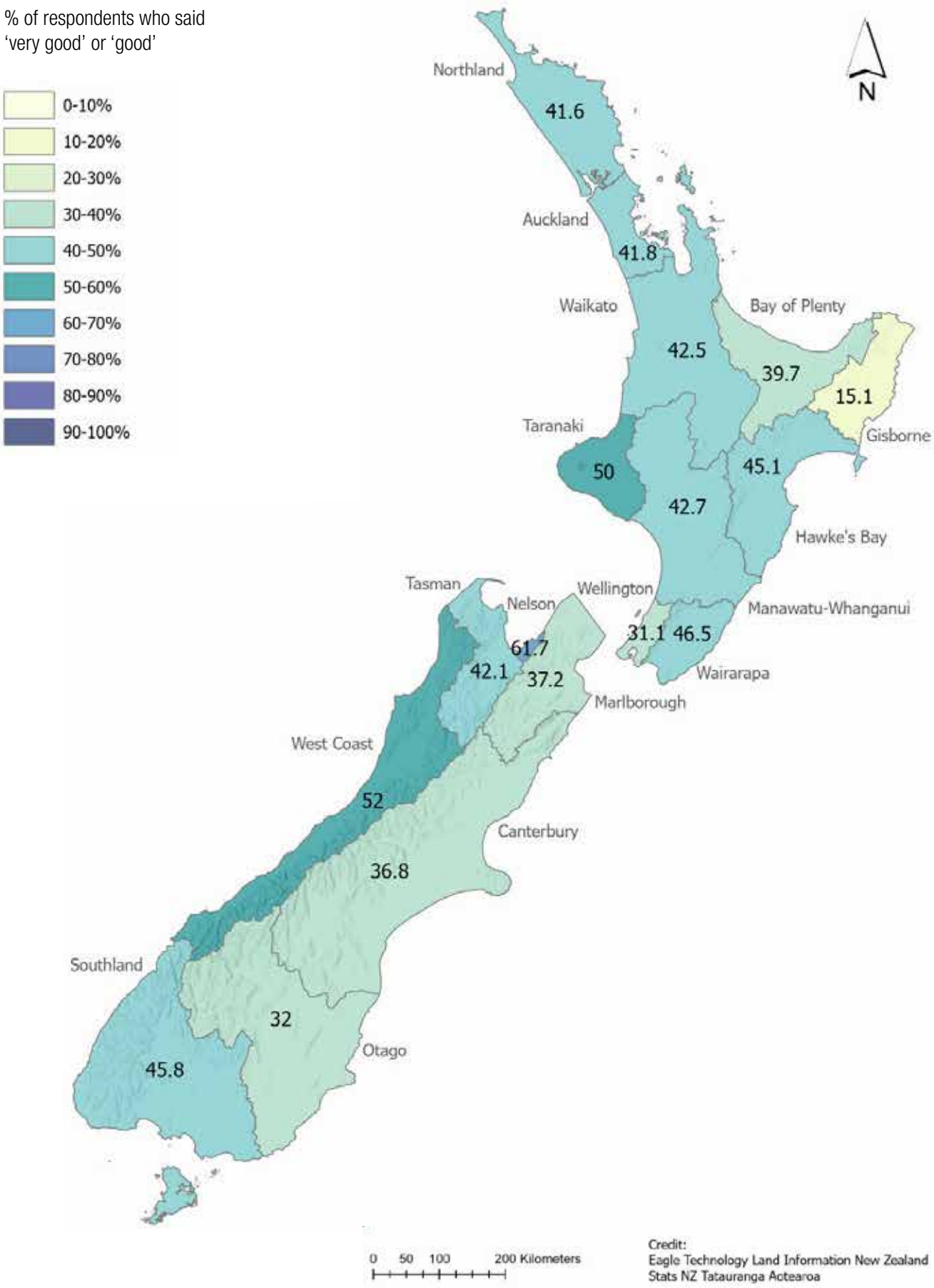

Figure 7.1 Proportion of respondents who said they would describe the environmental performance of the farms in their region as 'very good' or 'good'.

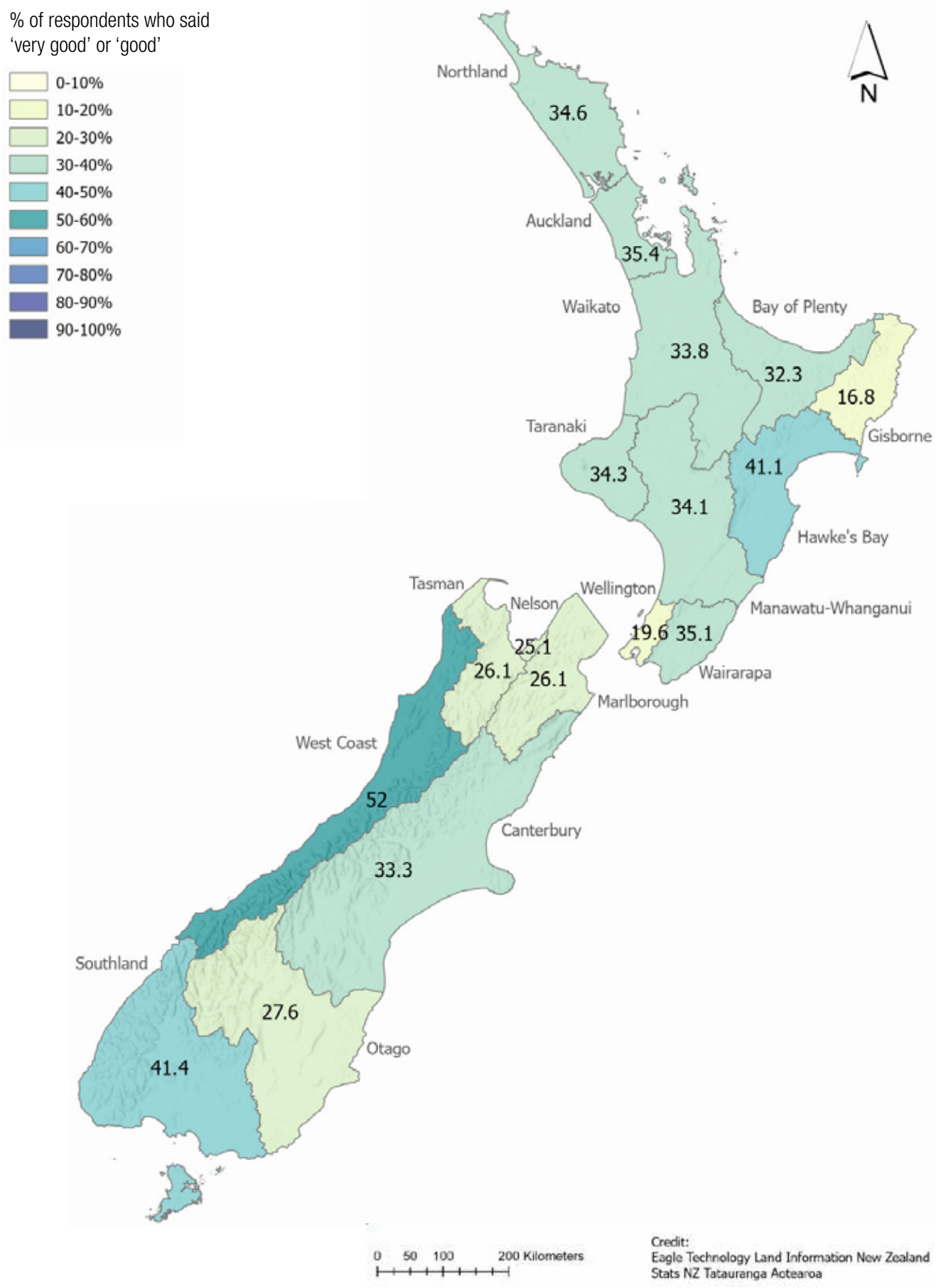

Figure 7.2 Proportion of respondents who said the farms in their region are 'very good' or 'good' at doing their part for water quality.

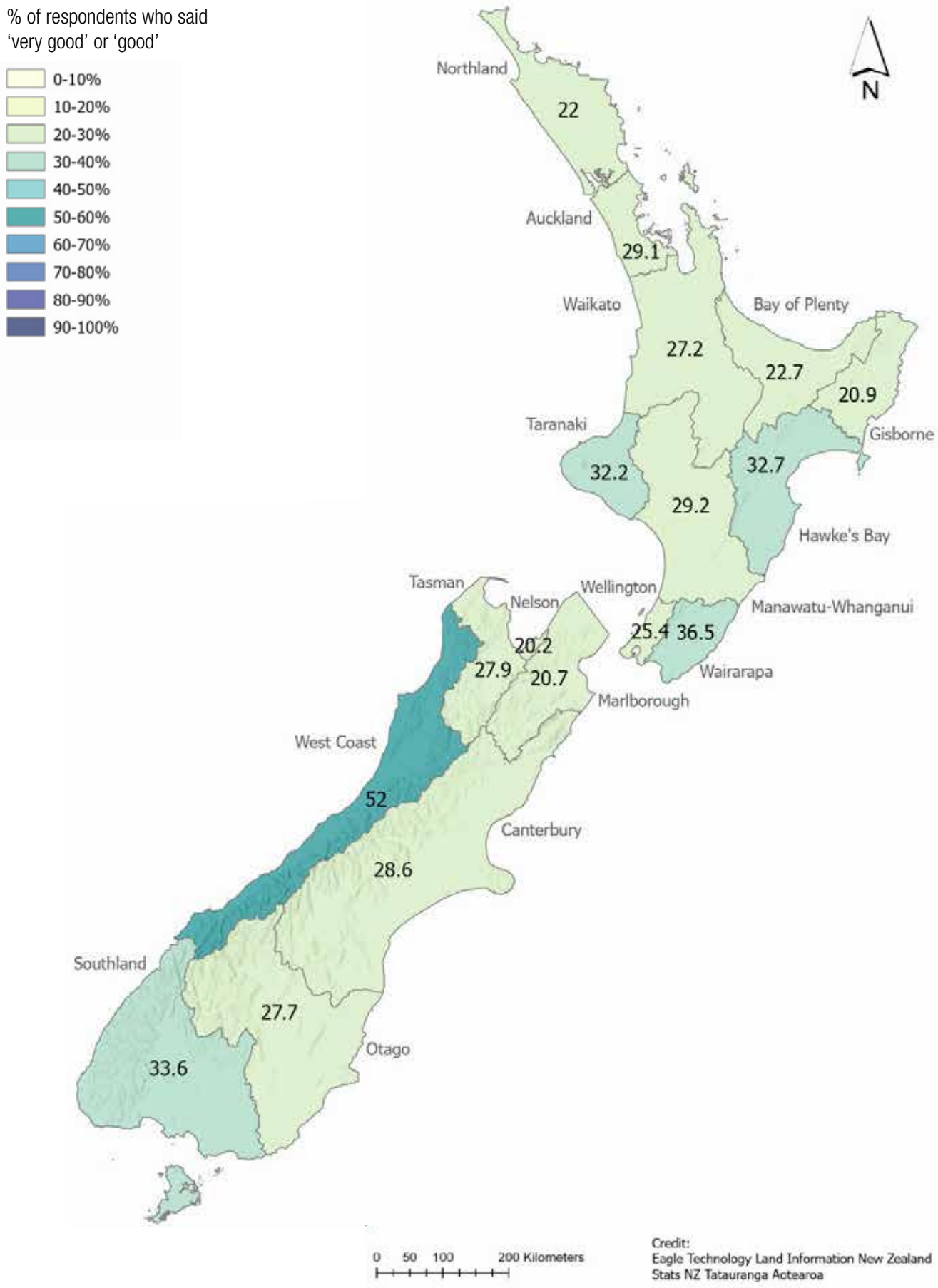

Figure 7.3 Proportion of respondents who said the farms in their region are 'very good' or 'good' at doing their part for climate change.

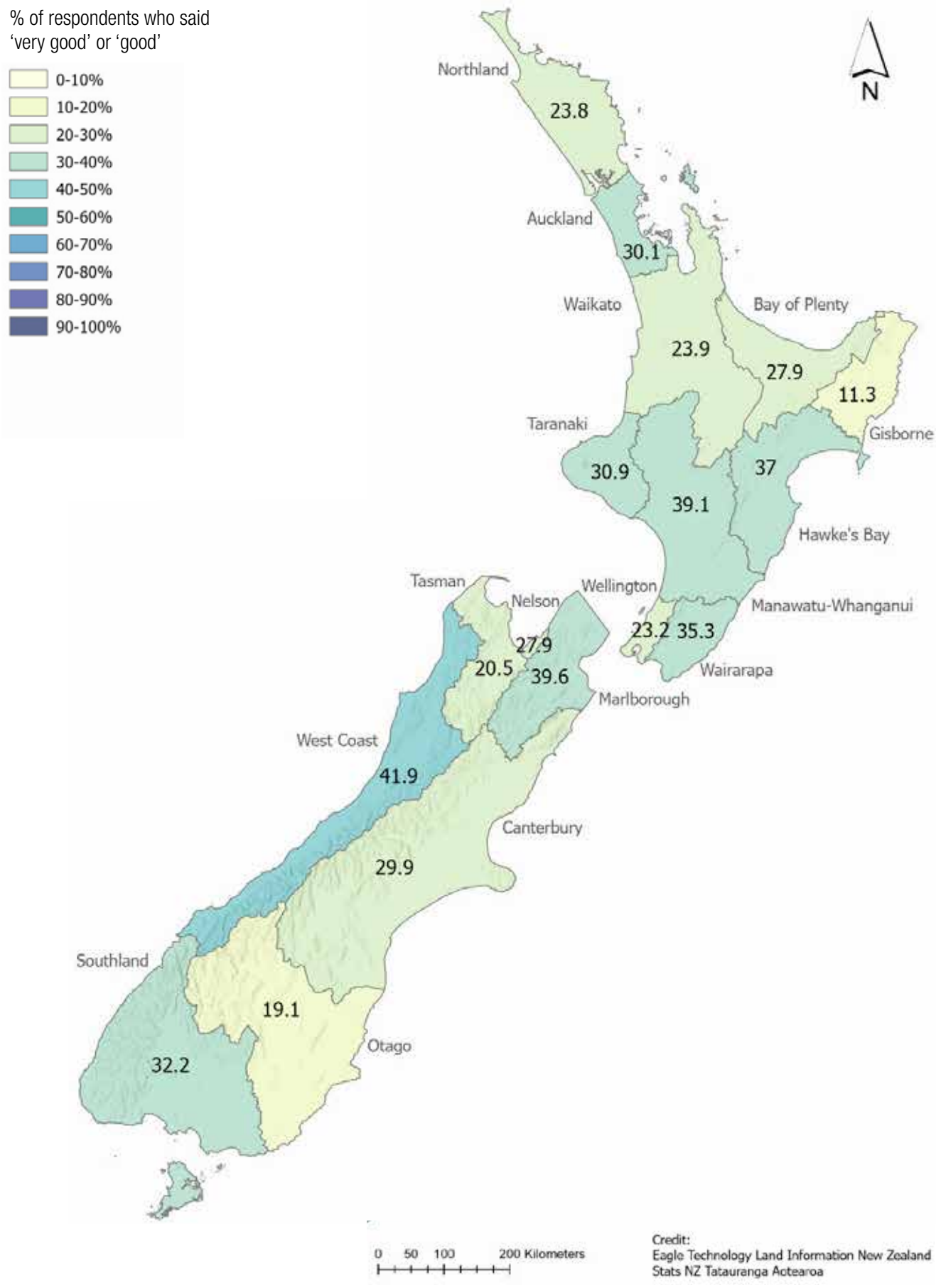

Figure 7.4 Proportion of respondents who said the farms in their region are 'very good' or 'good' at doing their part for biosecurity.

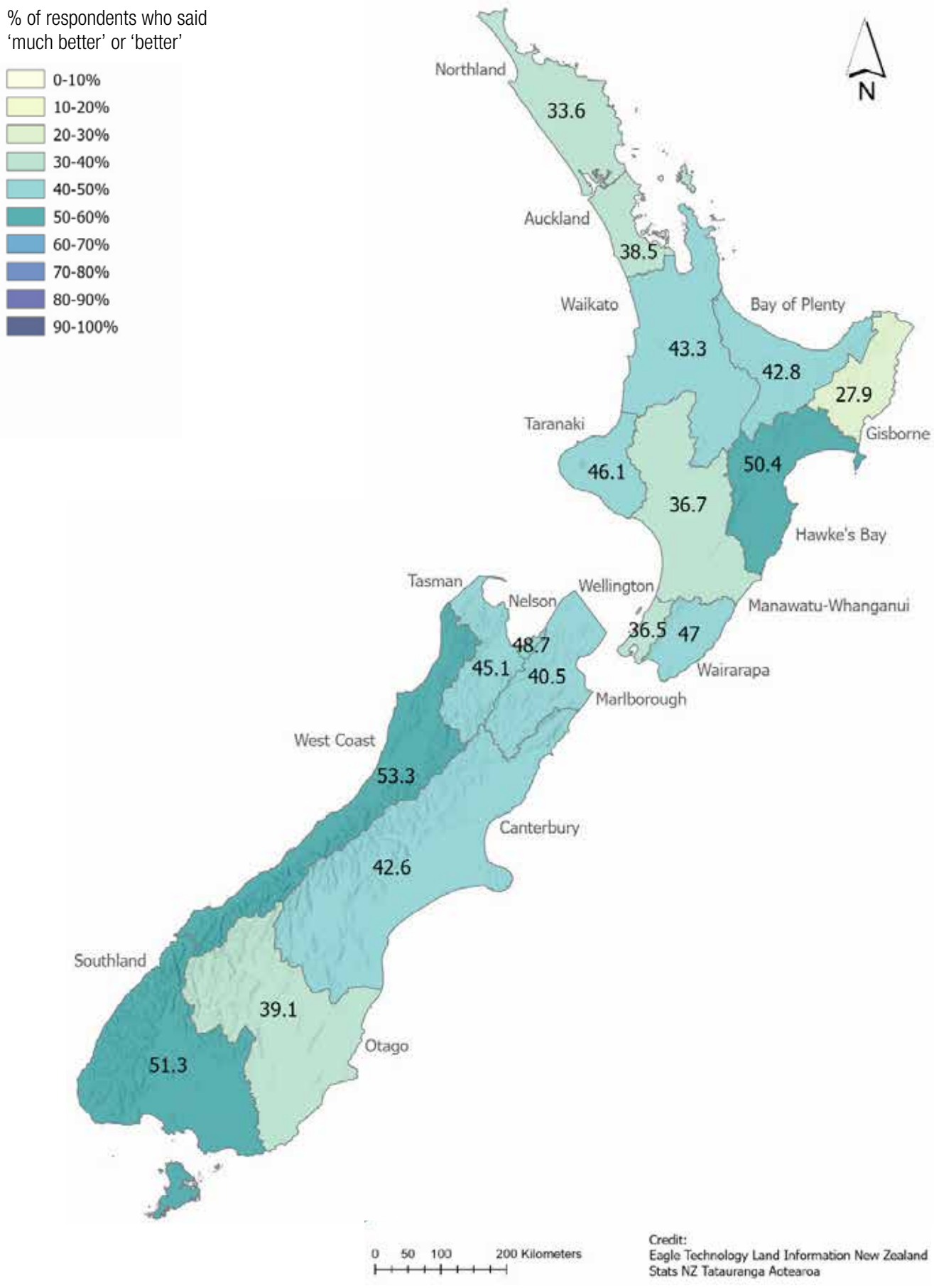

Figure 7.5 Percentage of respondents who said the environmental performance of the farms in their region has been doing 'much better' or 'better' over the last 3 years.

7.4 SUMMARY

Respondents have mixed perceptions of how well farms in their regions are doing their part for the environment. At least half of respondents across all regions think the overall environmental performance of farms in their regions is at least adequate, and at least half of respondents in Taranaki, Nelson, and West Coast think the environmental performance of farms in their regions is good or very good. At least half of respondents in Hawke's Bay, West Coast, and Southland also think the environmental performance of farms in their regions is better or much better than 3 years ago. However, 21% of respondents in Auckland, 32% in Wellington, and 24% in Tasman don't know how to describe the environmental performance of the farms in their regions.

Respondents are less positive about how well farms in their regions are doing their part for water quality, climate change, and biodiversity, specifically. On average, less than 33% of respondents think farms in their regions are good to very good at doing their part for these environmental dimensions. Respondents in West Coast are the most positive. Respondents in Gisborne are both the least positive about how well farms in their region are doing their part for the environment and scored the condition and management of rivers, lakes, and terrestrial plants and animals in their region in 2022 among the lowest in the country (See Sections 4.6 and 4.12).

Respondents are more positive about how well farms are doing their part for water quality than they are about climate change and biodiversity. At least half of respondents in 15 regions think farms in their regions are doing at least adequately for water quality, in 11 regions they think farms are doing at least adequately for climate change, and in 11 regions they think farms are doing at least adequately for biodiversity.

Respondents expressed uncertainty about how well farms in their regions are doing for water quality, climate change, and biodiversity. At least 25% of respondents in the majority of regions (67%) do not know how well farms in their region are doing for climate change, and in all regions (except West Coast) do not know how well farms in their regions are doing their part for biodiversity. Wellingtonians are the most uncertain: 40% don't know about water quality and climate change and 45% don't know about biodiversity.adequately for water quality, in 11 regions think farms are doing at least adequately for climate change, and in 11 regions think farms are doing at least adequately for biodiversity.

Respondents are also very uncertain about how well farms in their regions are doing for water quality, climate change, and biodiversity. At least 25% of respondents in the majority of regions (67%) do not know how well farms in their region are doing for climate change, and in all regions (except the West Coast) do not know how well farms in their regions are doing their part for biodiversity. Wellingtonians are the most uncertain: 40% don't know about water quality and climate change and 45% don't know about biosecurity.

MANAAKI WHENUA

Nigel Greenwood, Chairperson of Quorum Sense, digs for worms in the soil in Southbridge, Canterbury

Above Fiordland National Park
SAMUEL FERRARA

08 DISCUSSION OF PRESSURE-STATE-RESPONSE

This section discusses the PSR results from the 2022 survey and time series trends for available environmental domains. There were several changes to the environmental domains in the 2022 survey, which are discussed in detail in Section 2 and reiterated below.

- Four environmental domains – marine environments, marine plants and animals, protected natural areas and terrestrial plants and animals – do not have time series.
- Natural environments in towns and cities domain does not have time series for pressures on the domain because it was not included in previous surveys.

8.1 PRESSURES ON ENVIRONMENTAL DOMAINS

Since 2010, the average proportion of respondents who think sewage, stormwater, urban development and hazardous chemicals are among the top three pressures on any environmental domain has increased while the average proportion of respondents who think farming is among the top three pressures on any environmental domain peaked in 2016 and has since declined. Also, the average proportion of respondents who think forestry, mining, or recreational fishing are among the top three pressures on any environmental domain declined in 2013 and has not increased since (Figure 8.1).

Respondents to the 2022 survey wave also identified pressures that are perceived to be among the top three pressures on multiple environmental domains:

- Sewage and stormwater were in the top three pressures for five environmental domains.
- Pests and weeds were in the top three pressures for four environmental domains.
- Urban was in the top three pressures for four environmental domains.
- Hazardous chemicals was in the top three pressures for four environmental domains.
- Farming was in the top three pressures for two environmental domains.
- Motor vehicles was in the top three pressures for two environmental domains.
- Household waste and emissions was in the top three pressures for two environmental domains.
- Commercial fishing was in the top three pressures for two environmental domains.

Review of the empirical pressures on the environmental domains shows several overlapping sources, including development, invasive species, and land conversion. Marine environments, marine plants and animals, coastal waters and beaches, rivers and lakes, wetlands, terrestrial plants and animals, and natural environments in towns and cities are negatively affected by human-induced and -created pollution from development, land use, and the everyday life of communities (MfE & StatsNZ, 2022). Survey respondents have also increasingly perceived human-related pressures on marine, freshwater, and terrestrial environments, including sewage and stormwater, dumping of solid waste, hazardous chemicals, and urban development over the various surveys.

Interestingly, respondents also think these pressures (i.e., sewage and stormwater) are negatively affecting air quality (Section 4.3). However, Our Air and Environment Aotearoa only make mention of pressures on air quality from vehicle emissions, manufacturing and industry, wood burning for homes, and dust from unsealed roads, which all increase particulate matter in the air (MfE & StatsNZ, 2021a, 2022). Pressures from pests, weeds, and non-native species on rivers, lakes and native bush and forests, are also increasingly perceived by respondents over time. In addition to these environmental domains, marine environments, plants, and animals are also plagued by non-native species displacing native species, destroying habitats, and adapting better to climate change (MfE & StatsNZ, 2019).

Climate change and greenhouse gasses in the atmosphere are pressures on environmental domains and exacerbate many of the other pressures, such as invasive species (MfE & StatsNZ, 2022). Two open-ended questions in the survey asked respondents what they considered to be the most important environmental issues facing New Zealand and the world (Section 6). Climate change has been identified as the most important issue facing the world since 2010. Freshwater issues were identified as the most important issue facing New Zealand until 2022, when more respondents thought climate change was the most important issue.

8.2 STATE OF ENVIRONMENTAL DOMAINS

The perceived condition of environmental domains, ranked in order from best to worst in the 2022 survey, are: air (mean score of 3.91), protected natural areas (3.84), native bush and forests (3.59), marine environments (3.32), coastal waters and beaches (3.30), marine plants and animals (3.24), terrestrial plants and animals (3.21), natural environments in towns and cities (3.19), wetlands (3.12) and rivers and lakes (2.89). Since 2010, the average perceived condition of air and natural environments in towns and cities has significantly improved. The average perceived condition of rivers and lakes, wetlands, native bush and forests, and coastal areas are not significantly different from their 2010 averages, but the perceived condition of rivers and lakes, wetlands, and native bush and forests is on an upward trend since 2016. (Figure 8.2).

Based on the available biophysical evidence, the condition of marine environments, marine plants and animals, and

coastal areas is worsening due to increasing pressures from human-induced pressures (MfE & StatsNZ, 2019). This is in direct contrast to survey respondents' perception of conditions of coastal areas improving over time (Section 4.5). Marine animals in the quota systems are better managed and show better conditions, but only account for a small proportion of the flora and fauna. The majority of non-managed marine invertebrates, seabirds, shorebirds, mammals, and shellfish assessed are threatened or at risk of being threatened. Coastal plants, animals, and ecosystems are also in very poor condition, showing direct impacts from plastic pollution, sewage, nutrient runoff, and sedimentation. The condition of marine environments is the least understood of the marine domains because of the difficulty and cost of monitoring (MfE & StatsNZ, 2019). This lack of monitoring and management of the marine domains could account for the disconnect between the state of the environment and survey participants' perceptions of conditions.

Freshwater quality and the condition of terrestrial plants and animals are interconnected. Across the country, 64% of rivers have excessive phosphorus, 69% have excessive nitrogen, 37% have high turbidity, 9% have poor water clarity, and 17% had MCI scores indicating severe organic or nutrient pollution. While 51.8% of lakes are mesotrophic (average), 46% lakes are eutrophic or supertrophic, These poor water quality conditions are reflected in the state of plants and animals dependent on these habitats: 76% of native freshwater fish, 25% of native freshwater invertebrates, 33% of native freshwater plants, 46% of vascular plants, 74% of terrestrial birds, 66% of native birds, and 94% of reptiles are either threatened or at risk of being threatened with extinction (MfE & StatsNZ, 2020). These biophysical conditions do not appear to be reflected in perceptions of condition of rivers, lakes and terrestrial plants and animals (Sections 4.6 and 4.12). However, since 2012, trends in some nutrients and water clarity indicators improved at a majority of urban river sites, and E. coli concentrations improved at 37% of sites (MfE & StatsNZ, 2020). As 87% of the population live in towns and cities, these localised improvements could explain these trends in the perceived condition of rivers and lakes.

Overall air quality has improved over the last 10 years, but particulate matter and sulphur dioxide concentrations have not improved at the majority of sites, mainly due to an increased number of motor vehicles on the road (MfE & StatsNZ, 2021a). Survey respondents have picked up on the overall improvement in air quality (Section 4.3).

Increased vehicle usage also leads to additional pollutants, such as heavy metals, sediments, and nutrients leaching onto roadways and into riverways. For example, zinc concentrations exceeded limits at the majority of river and lake sites in Auckland and Wellington between 2015 and 2017. Rivers in catchments dominated by urban land cover contained 23 times higher nitrate-nitrogen levels, 26 times higher E. coli levels, 4 times higher dissolved reactive phosphorus levels, and 3 times higher turbidity levels than in native land cover. However, turbidity, nitrate-nitrogen, DRP, and ammoniacal nitrogen trends improved at a majority of rivers in catchments dominated by urban land cover (MfE & StatsNZ, 2020).

There have also been significant quantities of land converted from wetlands and native bush and forests to agriculture, exotic forestry, and urban development. Of the remaining wetlands, 60% are estimated to be in a moderately to severely degraded state (MfE & StatsNZ, 2022). Despite the mixed biophysical condition of natural environments in towns and cities, wetlands, and native bush and forests, survey respondents think the conditions of all three domains are improving over time (Sections 4.7, 4.8 and 4.10).

8.3 RESPONSE TO PRESSURES ON ENVIRONMENTAL DOMAINS

The perceived quality of management, ranked in order from best to worst condition in the 2022 survey wave, is: protected natural areas (mean score of 3.56), air (3.51), native bush and forests(3.40), terrestrial plants and animals (3.19), marine plants and animals (3.18), marine environments (3.17), coastal waters and beaches (3.13), natural environments in towns and cities (3.13), wetlands (3.10), and rivers and lakes (2.94). Since 2010, the average perceived management of air, natural environments in towns and cities and coastal areas have significantly improved. The average perceived quality of management of rivers, lakes, and native bush and forests is not significantly different from the 2010 averages, but the management of all these domains has been on an upward trend since 2016. However, the perceived management of wetlands has declined since 2010 and has been stagnant in the last few survey waves (Figure 8.3).

Trends in perceptions of the condition and quality of management have mirrored each other for air, rivers and lakes, and native bush and forests since 2010 (Figure 8.2 and Figure 8.3). Trends in perceptions of the condition and quality of management of natural environments in towns and cities, and coastal areas have headed in similar directions in recent years. However, the perceived condition of wetlands is increasing while the perceived quality of management of wetlands has remained unchanged since 2016.

There is also overlap in management decisions and the impacts of these decisions on multiple environmental domains. Changes in the environmental efficiency of motor vehicles have improved air quality on a per car basis. However, over this same time period, there has been an increase in the number of vehicles in use, which has increased overall emissions (MfE & StatsNZ, 2021a).

One way to improve urban air quality is through increased tree canopy. Several city councils are either in the process of completing, or have recently completed, urban greenspace projects to increase urban tree cover (e.g., Predator Free Hawke's Bay). These projects were designed to improve

access to green space to improve well-being, but increased tree cover also improves ground temperatures and air quality in these urban centres. It is possible that these activities also contributed to the decline in modelled premature deaths, total hospital admissions, and air restrictive days in New Zealand due to human generated PM_{10} between 2006 and 2016 (MfE & StatsNZ, 2021a).

Land-use change has not always resulted in positive environmental conditions. Wetlands, native forests, and land surrounding urban areas are continuing to be converted to agriculture, urban development, and exotic forestry. These conversions lead to increased pressures on the surrounding environments through fragmentation and loss of habitats for terrestrial plants and animals in addition to loss of the quantity and quality of wetlands and native bush and forest domains (MfE & StatsNZ, 2021b).

Marine domains are in the worst condition according to science, but survey respondents think management of coastal areas has either remained about the same or improved slightly over time (Section 4.5, 4.4 and 4.11). Some marine fisheries are managed under a quota system, but 9% of these species stocks are considered collapsed and 32% have not been scientifically assessed for their current state. Also, while the number of trawlers and dredges has declined over the last 20 years, this is due more to economic pressures than to management decisions to reduce damage to marine environments. Marine domains are also negatively affected by management decisions about sewage discharge, rubbish and recycling, and activities on beaches (MfE & StatsNZ 2019).

Storm surge along New Zealand coast.

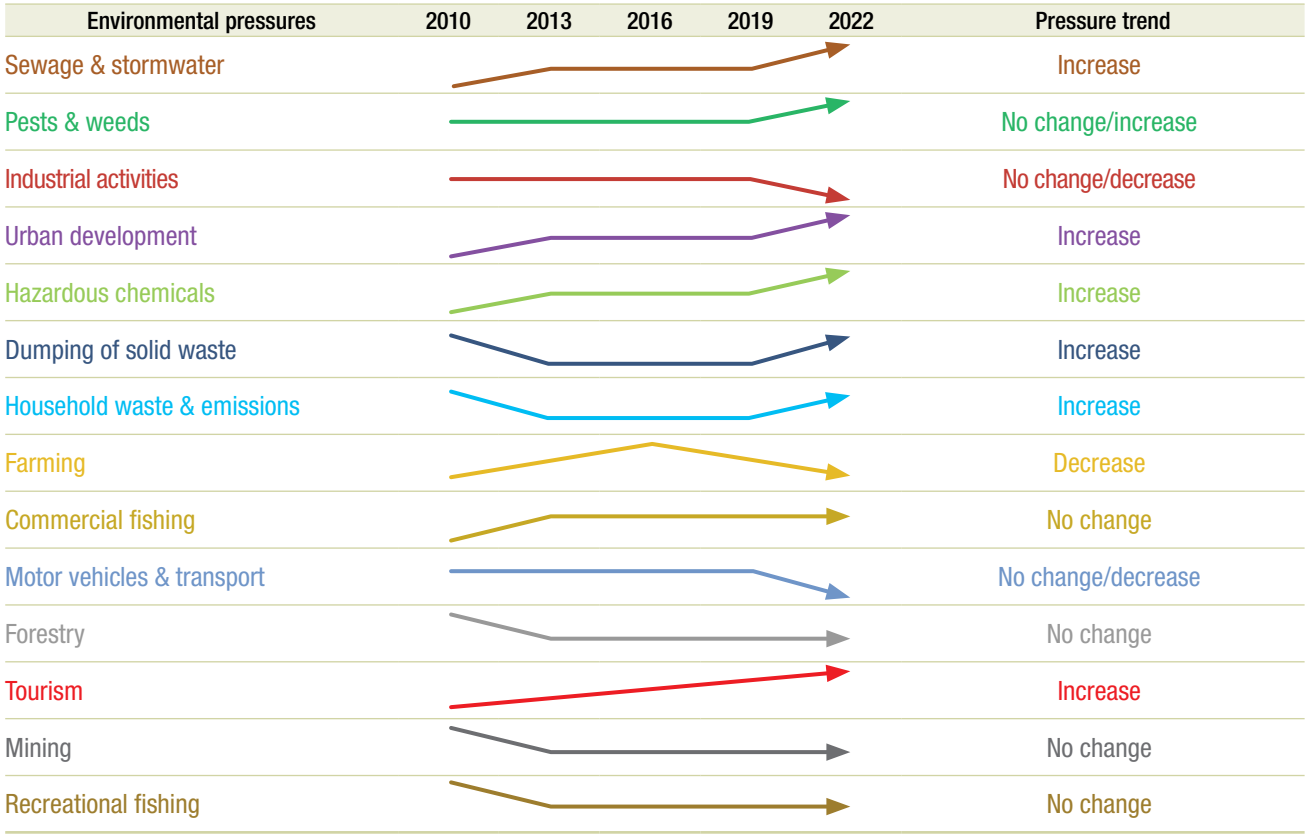

Figure 8.1 Direction in trends in average proportion of respondents who perceive pressures on all environmental domains, 2010–2022.

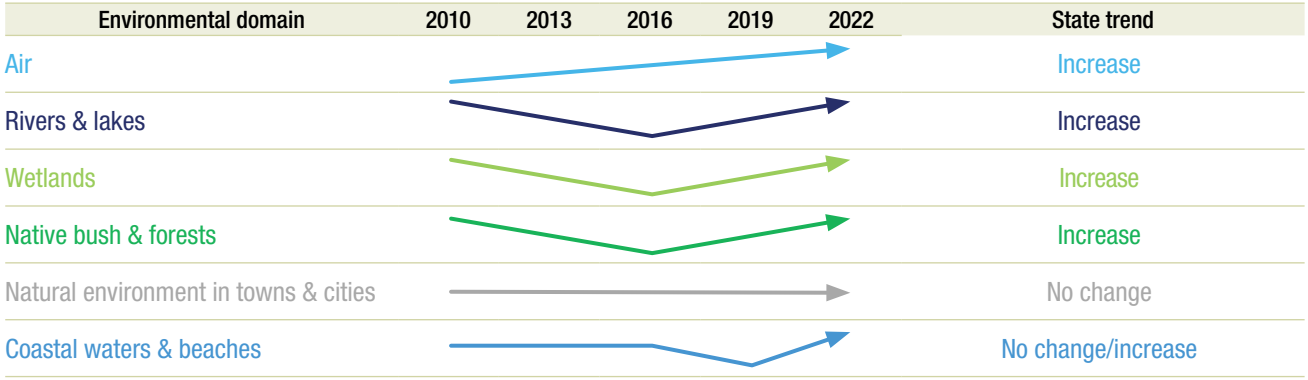

Figure 8.2 Direction of trends in average perceived state of environmental domains, 2010–2022.

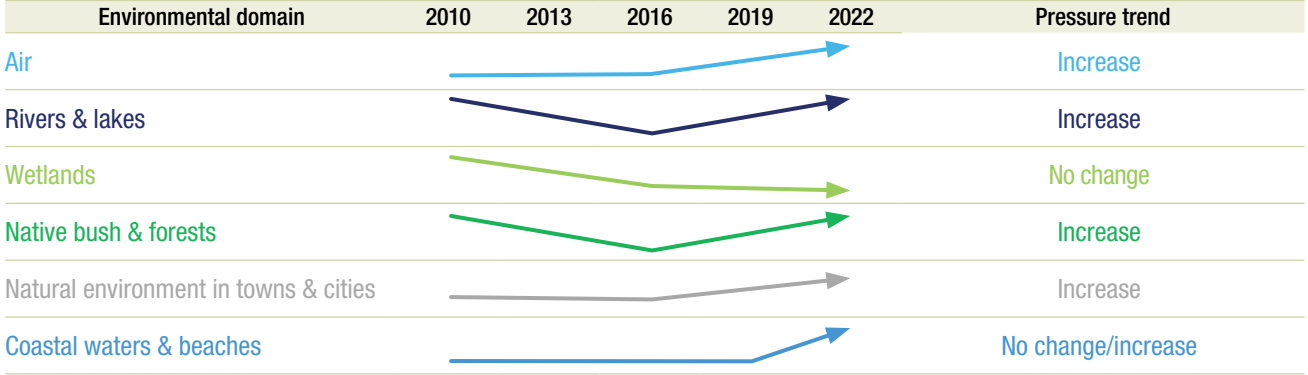

Figure 8.3 Direction in trends in average perceived response to pressures on environmental domains, 2010–2022.

*Stoat (*Mustela erminea*)*

Braided river near Lake Tekapo/Takapō
JORDON HEATH

09

GENERAL DISCUSSION AND CONCLUSIONS

The New Zealand Environmental Perceptions Survey (EPS) was established in 2000 by researchers at Lincoln University (see Hughey *et al.*, 2001) and is based on the Pressure-State-Response (PSR framework for environmental reporting (OECD, 1996; Ministry for the Environment, 1997). This report overviews results from the 10th EPS and compares these results to the 2010, 2013, 2016, and 2019 waves of the survey to describe trends over time. The main findings and implications from the 2022 survey are discussed in this section. The PSR findings were discussed in detail in the previous section.

The overall biophysical state of the environment diverges from perceptions of the environment for some environmental domains. Over the last 10 years, New Zealand's Environmental Performance Index (EPI) dropped from 8th to 26th place (Wolf *et al.*, 2022a). Survey respondents also thought the overall state of the environment declined between 2010 and 2016. However, respondents think the overall state of the environment has been improving since 2016 and is similar to its 2010 state. This U-shape trend in perceptions is mirrored in the perceived state of most environmental domains from 2010 to 2022.

Differences between public perceptions of the environment and the true state of the environment vary across the environmental domains. Perceptions of condition, management, and pressures on air mirror the known biophysical condition, trends, and pressures. In contrast, respondents' perceptions of marine domains are disconnected from the true state: Respondents thought the condition and management of coastal waters and beaches has either remained static or improved, in contrast to empirical trends showing poor conditions and increasing pressures from land-based activities and climate change. Respondents also think marine environment, plants and animals are in better condition and better managed than the biophysical evidence would suggest. Respondents are also relatively unaware of the condition of wetlands and some terrestrial plants and animals, possibly due to limited connection with either domain.

Gaps in understanding of biophysical conditions could explain the differences between perceptions and actual conditions of some environmental domains (e.g., marine plants and animals). Improved communication of known conditions, management practices, and pressures could also help align perceptions with reality. For example, the use of the swimmable targets communicated in notices across the country's larger rivers has translated into better public awareness of the true conditions of rivers and lakes. A third possible solution to the misalignment between perceptions and biophysical research is improving the visibility of, and physical connection with, the environmental domain in question. For example, as the proportion of the population living in urban environments increases, the impact of urban life on the natural environment also appears to be more salient. This improving understanding translates into perceptions of the condition of natural environments in towns and cities being better aligned with the known condition.

Participation in pro-environmental activities declined from 2019 and is significantly below 2010 averages. The drop in participation across all activities in 2022 suggests exogenous pressure may have influenced respondents' ability to participate. For example, between December 2020 and December 2021, the average cost of living increased by 5.2% compared to 1–2% per year between 2010 and 2020 (StatsNZ, 2022a). Well-being also declined: Between 2018 and 2021, the proportion of people with poor mental health increased from 22% to 28% (StatsNZ, 2022d), likely as a result of the Covid-19 pandemic. These and other stressors contribute to a decreased financial and physical ability and willingness to participate in environmental activities.

Climate change, greenhouse gases, and carbon are the most frequently cited challenges facing New Zealand and the world in 2022 according to respondents. Freshwater issues, waste, sewage, and sanitation, and pollution are the second to fourth most important challenges facing New Zealand in 2022 and have been among the top five since 2013. These perceived challenges echo many of the key pressures and areas of future concern identified by Environment Aotearoa (MfE & StatsNZ, 2022).

Respondents in 2013 and 2016 thought farming and agriculture was the second most important issue facing New Zealand, but the proportion of respondents identifying this issue dropped to 5% in 2019 and 5.7% in 2022. Farming was identified as the largest pressure on rivers, lakes, wetlands, and terrestrial plants and animals until 2019, when the proportion of respondents choosing this pressure dropped. Since 2016, respondents have identified sewage and stormwater as a more important pressure than farming on these environmental domains.

Respondents have mixed perceptions of how well farms in their regions are doing their part for the environment. At least half of respondents across all regions think the overall environmental performance of farms in their regions is at least adequate, and at least half of respondents in Taranaki, Nelson, and West Coast think that the environmental performance of farms in their regions is good or very good. Respondents are less optimistic about how well farms in their regions are doing their part for water quality, climate change, and biodiversity: on average, less than 33% of respondents think farms in their regions are good to very good at doing their part for these environmental dimensions. Respondents are also very uncertain how well farms in their regions are doing for water quality, climate change, and biodiversity.

*Bottlenose dolphin/Terehu (*Tursiops truncatus*)*
THOMAS FIELDS

10

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Marine environment
NICK GROBLER

11 APPENDICES

11.1 APPENDIX 1 – ENVIRONMENTAL PERFORMANCE INDEX

According to the EPI, New Zealand ranks 26th among 180 countries for overall environmental performance, has the 4th best air quality, has lost the least amount of wetlands (proportional change) and nearly all of its marine Economic Exclusive Zone under some form of protection. New Zealand also ranks 66th for terrestrial biome protection, ahead of every country used for comparison except the UK. However, New Zealand's drinking-water and sanitation rank in the 20s and behind nearly every country with a higher EPI. New Zealand's fisheries (fishing stock and trawling) also lag nearly all comparison countries (Wolf *et al.* 2022a).

Table A1.1 Environmental Performance Index (EPI) and individual resources ranking from the 2022 EPI for United Kingdom, Finland, Sweden, Iceland, Australia and Norway. Rankings better than New Zealand's are in green (), rankings worse than New Zealand's are in red (), and rankings similar to New Zealand's are in grey ().

	UK	Finland	Sweden	Iceland	Australia	Norway
Ranking	**2**	**3**	**5**	**10**	**17**	**20**
Pop. density (pop./km^2)	275.91	16.50	23.09	3.59	3.33	16.65
Air quality	14	3	2	1	6	5
Species Habitat Index	43	139	129	1	71	38
Biodiversity Habitat Index	140	26	28	4	40	6
Protected Area Rep. Index	40	114	79	38	55	6
Terrestrial biome protection	51	104	113	84	68	83
Tree canopy loss	109	145	140	-	161	93
Wetland loss	64	115	1	52	61	58
Marine Protected Area	1	1	1	75	1	43
Ocean plastic pollution	99	40	45	16	73	28
Fish stock	51	9	86	67	85	47
Trawling	54	-	55	61	46	72
Safe drinking-water	1	1	12	1	27	1
Sanitation access	1	1	15	1	19	1
Wastewater treatment	6	1	1	66	11	31

Table A1.2 Environmental Performance Index (EPI) and individual resources ranking from the 2022 EPI for Ireland, New Zealand, United States of America, Canada, Chile and China. Rankings better than New Zealand's are in green (), rankings worse than New Zealand's are in red (), and rankings similar to New Zealand's are in grey ().

	Ireland	NZ	USA	Canada	Chile	China
Ranking	**24**	**26**	**43**	**49**	**65**	**160**
Pop. density (pop./km^2)	71.20	18.26	35.07	3.82	25.19	149.16
Air quality	7	4	16	8	50	157
Species Habitat Index	15	101	93	101	68	126
Biodiversity Habitat Index	113	129	74	1	16	90
Protected Area Rep. Index	62	104	141	103	92	172
Terrestrial biome protection	81	66	125	111	116	172
Tree canopy loss	133	107	117	84	99	74
Wetland loss	107	1	79	1	75	120
Marine Protected Area	52	1	1	39	1	89
Ocean plastic pollution	53	50	127	86	72	134
Fish stock	64	103	62	78	-	65
Trawling	29	83	51	62	2	87
Safe drinking-water	1	29	23	22	32	45
Sanitation access	23	27	35	31	51	63
Wastewater treatment	18	21	35	30	24	80

Notes for both Tables: Data and methodology can be found at https://epi.yale.edu/epi-results/2022/component/epi. Ranking for EPI and each resource ranges from 1 (best) to 180 (worst).

11.2 APPENDIX 2 – 2022 QUESTIONNAIRE

Q1. The overall state of the natural environment in New Zealand is...

- Very good (1)
- Good (2)
- Adequate (3)
- Bad (4)
- Very bad (5)
- Don't know (6)

Q2. The condition of New Zealand's _____ is:

	Very good (1)	Good (2)	Adequate (3)	Bad (4)	Very bad (5)	Don't know (6)
Air						
Marine environment						
Coastal waters and beaches						
Rivers and lakes						
Wetlands						
Native bush and forests						
Protected natural areas (e.g., national parks and marine reserves)						
Natural environment in towns and cites						
Marine plants and animals						
Terrestrial (land and freshwater) plants and animals						

Q3. Current management of New Zealand's _____ is:

	Very good (1)	Good (2)	Adequate (3)	Bad (4)	Very bad (5)	Don't know (6)
Air						
Marine environment						
Coastal waters and beaches						
Rivers and lakes						
Wetlands						
Native bush and forests						
Protected natural areas (e.g., national parks and marine reserves)						
Natural environment in towns and cites						
Marine plants and animals						
Terrestrial (land and freshwater) plants and animals						

Q4.1 What are the main causes of damage, if any, to New Zealand's air? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.2 What are the main causes of damage, if any, to New Zealand's marine environment? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.3 What are the main causes of damage, if any, to New Zealand's coastal waters and beaches? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.4 What are the main causes of damage, if any, to New Zealand's rivers and lakes? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)

- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.5 What are the main causes of damage, if any, to New Zealand's wetlands? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.6 What are the main causes of damage, if any, to New Zealand's native bush and forests? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.7 What are the main causes of damage, if any, to New Zealand's protected natural areas (e.g., national parks and marine reserves)? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.8 What are the main causes of damage, if any, to New Zealand's natural environment in towns and cities? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.9 What are the main causes of damage, if any, to New Zealand's marine plants and animals? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q4.10 What are the main causes of damage, if any, to New Zealand's terrestrial (land and freshwater) plants and animals? Tick up to 3.

- Motor vehicles and transport (1)
- Household waste and emissions (2)
- Industrial activities (3)
- Pests and weeds (4)
- Farming (5)
- Forestry (6)
- Urban development 7)
- Mining (8)
- Sewage and stormwater (9)
- Tourism (10)
- Commercial fishing (11)
- Recreational fishing (12)
- Dumping of solid waste (13)
- Hazardous chemicals (14)
- Other (15)

Q5. In the past 12 months, have you undertaken any of the following activities? Tick all that apply.

- Reduced, or limited your use of electricity
- Reduced, or limited your use of fresh water
- Visited a marine reserve
- Visited a national park
- Bought products that are marketed as environmentally friendly
- Recycled household waste
- Composted garden and/or household waste

- Grown some of your own vegetables
- Been involved in a project to improve the natural environment
- Obtained information about the environment from any source
- Taken part in hearings or consent processes about the environment
- Participated in an environmental organisation
- Commuted by buses or trains
- Been an active member of a club or group that restores and/or replants natural environments
- Made a financial donation to a non-government environmental organisation

Q6. What do you think is the most important environmental issue facing New Zealand today (Open response)?

- _____

Q7. Why did you choose this issue (Open response)?

- _____

Q8. What do you think is the most important environmental issue facing the world today (Open response)?

- _____

Q9. Why did you choose this issue (Open response)?

- _____

Q10. How would you describe the environmental performance of farms in your region?

- Very good (1)
- Good (2)
- Adequate (3)
- Bad (4)
- Very bad (5)
- Don't know (6)

Q11. How well are farms in your region doing their part for water quality?

- Very good (1)
- Good (2)
- Adequate (3)
- Bad (4)
- Very bad (5)
- Don't know (6)

Q12. How well are farms in your region doing their part for climate change?

- Very good (1)
- Good (2)
- Adequate (3)
- Bad (4)
- Very bad (5)
- Don't know (6)

Q13. How well are farms in your region doing their part for biodiversity?

- Very good (1)
- Good (2)
- Adequate (3)
- Bad (4)
- Very bad (5)
- Don't know (6)

Q14. Farm environmental performance in my region over the last 3 years has gotten:

- Much better (1)
- Better (2)
- Neither better or worse (3)
- Worse (4)
- Much worse (5)

Q15. Are you...

- Male (1)
- Female (2)
- Another gender (3)

Q16. Which of these age groups are you in?

- Under 18 years (0)
- 18–24 years (1)
- 25–34 years (2)
- 35–44 years (3)
- 45–54 years (4)
- 55–64 years (5)
- 65–74 years (6)
- 75 years or over (7)
- Prefer not to say (8)

Q17. Are you currently in paid employment?

- Yes (1)
- No (2)

Q18. What is your current occupation?

- Business Manager/Executive (1)
- Business Proprietor/Self-employed (2)
- Clerical/Sales Employee (3)
- Farm Owner/manager (4)
- Home-maker (not otherwise employed) (5)
- Labourer/Agricultural or Domestic Worker (6)
- Professional/Senior Government Official (7)
- Retired/Superannuitant (8)
- Student (9)
- Teacher/Nurse/Police or other trained service worker (10)
- Technical/mechanical/Skilled Worker (11)
- Unemployed/Beneficiary (12)
- Don't know/prefer not to say (13)

Q19. Which of these best describes your household income?

- Less than $20,000 (1)
- Between $20,001 to $30,000 per year (2)
- Between $30,001 to $50,000 per year (3)
- Between $50,001 to $70,000 per year (4)
- Between $70,001 to $100,000 per year (5)
- Between $100,001 and $150,000 per year (6)
- Between $150,001 and $200,000 per year (7)
- More than $200,000 per year (8)
- Don't know/prefer not to say (9)

Q20. Which of these best describes your personal income?

- Less than $20,000 (1)
- Between $20,001 to $30,000 per year (2)
- Between $30,001 to $50,000 per year (3)
- Between $50,001 to $70,000 per year (4)
- Between $70,001 to $100,000 per year (5)
- Between $100,001 and $150,000 per year (6)
- Between $150,001 and $200,000 per year (7)
- More than $200,000 per year (8)
- Don't know/prefer not to say (9)

Q21. Which of these best describes your highest educational qualification?

- No formal school qualification (1)
- NCEA level 1 or school certificate (2)
- Sixth form/UE/NCEA level 2 (3)
- University bursary/7th form/NCEA level 3 (4)
- Vocational qualification (includes trade certificates, diplomas etc) (5)
- Undergraduate (bachelor) degree (6)
- Postgraduate degree (masters' degree or phd) (7)
- Prefer not to say (8)

Q22. Which of these best describes your household? (1557 total responses)

- Single person household (1)
- Couple only (no children/none at home) (2)
- Two parent family, one or two children at home (3)
- Two parent family, three or more children at home (4)
- One parent family, one or two children at home (5)
- One parent family, three or more children at home (6)
- Flatting or boarding - not a family home (7)
- Extended family (8)
- Prefer not to say (9)

Q23. Which of these ethnic groups do you primarily identify with?

- Māori (1)
- NZ European/Pakeha (2)
- Pacific Islander/Pasifika (3)
- Asian (4)
- Indian (5)
- Middle Eastern/Arabic (6)
- Other European (7)
- Other (8)

Q24. In which of these local authority areas are you currently living? (2099 total responses)

- Ashburton District (1)
- Auckland Council (2)
- Buller District (3)
- Carterton District (4)
- Central Hawke's Bay District (5)
- Central Otago District (6)
- Chatham Islands Territory (7)
- Christchurch City (8)
- Clutha District (9)
- Dunedin City (10)
- Far North District (11)
- Gisborne District (12)
- Gore District (13)
- Grey District (14)
- Hamilton City (15)
- Hastings District (16)
- Hauraki District (17)
- Horowhenua District (18)
- Hurunui District(19)
- Hutt City (20)
- Invercargill City (21)
- Kaikoura District (22)
- Kaipara District (23)
- Kapiti Coast District (24)
- Kawerau District (25)
- Mackenzie District (26)
- Manawatu District (27)
- Marlborough District (28)
- Masterton District(29)
- Matamata-Piako District (30)
- Napier City (31)
- Nelson City (32)
- New Plymouth District (33)
- Opotiki District (34)
- Otorohanga District (35)
- Palmerston North City (36)
- Porirua City (37)
- Queenstown-Lakes District (38)
- Rangitikei District (39)
- Rotorua District (40)
- Ruapehu District (41)
- Selwyn District(42)
- South Taranaki District (43)
- South Waikato District (44)
- South Wairarapa District (45)
- Southland District (46)
- Stratford District (47)
- Tararua District (48)
- Tasman District (49)
- Taupo District(50)
- Tauranga City(51)
- Thames-Coromandel District (52)
- Timaru District (53)
- Upper Hutt City (54)
- Waikato District (55)
- Waimakariri District (56)
- Waimate District (57)
- Waipa District (58)
- Wairoa District (59)
- Waitaki District (60)
- Waitomo District (61)
- Wellington City (62)
- Western Bay of Plenty District (63)
- Westland District (64)
- Whakatane District (65)
- Whanganui District (66)
- Whangarei District (67)
- New Zealander living overseas (68)

Q25. In what region are you located?

- Northland (1)
- Auckland (2)
- Waikato (3)
- Bay of Plenty (4)
- Gisborne/Hawkes Bay (5)
- Taranaki (6)
- Manawatu/Whanganui/Palmerston North (7)
- Wairarapa (8)
- Wellington (9)
- Tasman/Nelson/Marlborough (10)
- Canterbury (11)
- West Coast (12)
- Otago (13)
- Southland (14)
- Chatham Islands (15)
- Other/Outside New Zealand (16)

11.3 APPENDIX 3 – RESPONDENT DEMOGRAPHICS, 2010–2022

Table A3.1 Gender %

	2010	2013	2016	2019	2022
Male	48.7	49.4	49.2	49.3	49.0
Female	51.3	50.6	50.8	50.7	50.5
Another gender					0.5
Observations	2,477	2,220	2,468	1,960	2,091

Note: 'Another gender' was added in 2022.

Table A3.2 Age of respondents %

	2010	2013	2016	2019	2022
Under 18 years			0.52	0.70	
18 to 24	12.77	11.26	8.63	12.68	7.18
25 to 34	18.20	18.72	20.85	16.64	22.71
35 to 44	16.63	15.17	14.16	16.74	16.47
45 to 54	17.38	18.78	19.84	17.23	17.51
55 to 64	15.28	19.15	16.49	18.11	15.20
65 to 74	11.30	13.68	14.82	15.57	12.53
75 and over	8.44	3.24	4.69	2.32	8.39
Observations	2,477	2,220	2,467	2,011	2,091

Table A3.3 Ethnicity %

	2010	2013	2016	2019	2022
Māori	15.66	22.67	18.88	13.90	14.32
NZ European	77.55	73.29	76.98	65.03	69.70
Pasifika/Pacific Islander	3.40	5.58	4.72	5.42	3.02
Asian	3.30	7.11	4.15	15.46	9.70
Indian	1.31	4.04	1.91	2.54	4.03
Middle Eastern/Arabic	0.18	0.84	0.29	0.30	0.78
Other European	7.58	11.02	9.68	7.82	6.84
Other		1.11	1.83	3.77	2.79
Observations	2,451	2,168	2,411	1,888	2,058

Table A3.4 Respondent's regional council %

	2010	2013	2016	2019	2022
Northland	4.63	3.14	3.83	4.70	2.73
Auckland	34.96	30.37	29.71	35.97	33.88
Waikato	11.30	7.15	8.06	7.44	12.70
Bay of Plenty	7.09	5.07	5.44	6.23	4.67
Gisborne	0.65	0.71	0.62	0.96	0.95
Hawke's Bay	2.93	2.95	3.41	2.15	3.00
Taranaki	1.18	1.66	1.70	1.70	2.31
Manawatū-Whanganui	4.92	6.41	5.96	4.60	6.03
Wellington	0.94	1.06	1.01	1.43	0.62
Tasman	1.04	0.98	0.86	1.17	0.54
Nelson	0.86	0.81	0.74	1.36	0.85
Marlborough	11.09	14.17	11.46	13.49	10.19
West Coast	1.12	0.67	0.62	0.44	0.58
Canterbury	4.16	5.26	5.55	4.21	3.06
Otago	1.56	1.97	1.75	1.49	8.19
Southland	4.63	3.14	3.83	4.70	2.73
Observations	2,476	2,203	2,462	1,914	2,098

Note: Respondents were recoded into Wairarapa based on their Local Governance Area.

Table A3.5 Education status %

	2010	2013	2016	2019	2022
No formal school qualification	9.33	6.96	7.22	6.89	8.17
High school, with qualification	1.31	1.43	1.28	9.94	
NCEA level1 or school certificate	8.07	6.86	7.27	4.40	10.16
Sixth form/UE/NCEA level 2	7.10	7.28	7.19	3.03	13.80
University bursary/ 7th form/NCEA level 3	5.81	5.49	6.05	2.31	9.14
Trade/technical qualification or something similar	4.59	4.31	4.59	8.34	
Vocational qualification (inc. trade or technical qualification)	14.78	16.13	15.47	8.88	27.84
Undergraduate diploma/certificate	10.48	12.84	11.22	14.57	
Undergraduate (Bachelor) degree	19.68	20.63	19.70	23.29	20.43
Postgraduate degree (Master's degree or PhD)	14.41	14.29	16.85	16.44	8.50
Prefer not to say	4.44	3.77	3.17	1.90	1.95
Observations	2,456	2,188	2,419	1,909	2,084

Note: Educational groups were changed in 2022.

Table A3.6 Employment %

	2010	2013	2016	2019	2022
Currently in paid employment		63.86	63.66	63.15	64.13
Observations		2,158	2,440	1,910	2,090

Table A2.7 Occupation %

	2010	2013	2016	2019	2022
Business Manager/ Executive	7.97	7.24	5.70	6.16	6.54
Farm Owner/Manager	0.93	0.92	1.08	0.81	1.36
Business Proprietor/ Self-employed	9.47	7.55	7.60	10.05	4.69
Clerical/Sales Employee	10.78	9.87	10.88	9.18	14.65
Labourer/Agricultural or Domestic Worker	3.19	2.37	3.27	3.42	6.78
Professional/Senior Government Official	10.22	9.99	11.20	8.92	8.51
Teacher/Nurse/Police or other trained service worker	9.31	12.71	11.90	11.31	8.21
Technical/Mechanical/ Skilled Worker	6.96	9.34	9.00	8.71	9.91
Home-maker (not otherwise employed)	6.30	4.47	5.61	6.03	5.61
Student	8.97	9.24	7.40	2.83	4.14
Retired/Superannuitant	17.18	15.72	15.26	22.18	17.54
Unemployed/Beneficiary	4.49	5.87	6.50	5.97	8.43
Don't know/Prefer not to say	4.24	4.70	4.59	4.42	3.64
Observations	2,190	1,932	2,292	1,085	2,089

Table A3.8 Household income (before tax) %

	2010	2013	2016	2019	2022
Less than $20,000	7.75	6.38	7.74	6.06	5.42
$20,001 to $30,000	11.55	11.27	10.44	10.36	9.73
$30,001 to $50,000	18.60	17.51	14.96	16.77	16.51
$50,001 to $70,000	15.40	15.66	15.36	16.01	15.05
$70,001 to $100,000	17.30	16.13	15.44	14.83	15.96
$100,001 to $150,000	12.06	14.45	13.87	13.01	14.94
$150,001 to $200,000	3.12	4.59	5.19	5.34	5.25
More than $200,000	2.27	1.58	2.84	3.43	3.95
Prefer not to say	11.94	12.44	14.17	14.19	13.19
Observations	2,471	2,158	2,436	1,093	2,087

11.4 APPENDIX 4 – SUMMARY STATISTICS, 2010–2022

Tables A4.1 to A4.21 summarise overall state of the natural environment and perceived state of and perceived quality of management for all 10 environmental domains. Each table includes columns for:

- total observations,
- percent of respondents who choose very good, good, adequate, bad, very bad, and don't know,
- average score across very good, good, adequate, bad, and very bad, and
- standard deviation of the average.

These summary statistics are by survey waves 2010 to 2022 and include a running total.

Tables A4.22 to A4.32 summarise perceived pressures of each of the 10 environmental domains and participation in environmental activities. Each table includes columns for each survey waves from 2010 to 2022 and a total of the percent of respondents who chose that environmental pressure (Tables A4.22 to A4.31) and activity (Table A4.32).

Tables A4.33 to A4.37 summarise perceptions of how well farms are doing environmentally by region. Each table includes columns for:

- total observations,
- percent of respondents who choose very good, good, adequate, bad, very bad, and don't know,
- average score across very good, good, adequate, bad, and very bad, and
- standard deviation of the average.

These summary statistics include a total.

Table A4.1 Overall state of the natural environment in New Zealand, 2010–2022

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,440	6.9%	40.4%	37.2%	13.6%	1.3%	0.6%	3.38	0.85
2013	2,182	7.1%	33.3%	38.1%	17.6%	2.9%	1.1%	3.24	0.93
2016	2,392	6.0%	32.2%	36.0%	20.5%	3.5%	1.8%	3.17	0.95
2019	1,977	9.2%	32.3%	35.1%	18.6%	3.6%	1.1%	3.25	0.99
2022	2,064	10.4%	36.8%	35.4%	13.1%	2.8%	1.4%	3.39	0.94
Total	11,055	7.82%	35.23%	36.42%	16.57%	2.77%	1.20%	3.29	0.93

Table A4.2 Perceived state of air quality, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,448	10.4%	41.2%	36.6%	10.2%	1.3%	0.4%	3.49	0.86
2013	2,200	11.9%	43.5%	34%	8.2%	1.5%	0.8%	3.57	0.86
2016	2,373	15.9%	44.2%	31.4%	7.0%	0.7%	0.7%	3.68	0.85
2019	1,977	17.3%	45.5%	28.4%	7.1%	1.1%	0.7%	3.71	0.87
2022	2,033	25.6%	44.4%	23.8%	4.0%	0.7%	1.5%	3.92	0.85
Total	11,031	15.9%	43.6%	31.2%	7.4%	1.1%	0.8%	3.66	0.87

Table A4.3 Perceived state of marine environment, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	2,026	10.7%	33.9%	32.0%	16.2%	3.5%	3.7%	3.33	0.99
Total	2,026	10.7%	33.9%	32.0%	16.2%	3.5%	3.7%	3.33	0.99

Table A4.4 Perceived state of coastal waters and beaches, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,465	8.7%	37.9%	33.0%	16.4%	2.9%	1.1%	3.34	0.95
2013	2,207	9.0%	34.6%	36.0%	16.4%	2.6%	1.3%	3.31	0.94
2016	2,388	8.7%	35.4%	34.1%	16.9%	3.1%	1.9%	3.30	0.96
2019	1,982	8.8%	32.8%	31.0%	21.4%	4.1%	1.9%	3.21	1.02
2022	2,022	10.3%	33.7%	33.7%	16.8%	3.5%	2.0%	3.31	0.99
Total	11,064	9.1%	35.1%	33.6%	17.4%	3.2%	1.6%	3.30	0.97

Table A4.5 Perceived state of rivers and lakes, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,464	4.8%	27.8%	33.2%	25.4%	6.6%	2.2%	2.99	1.01
2013	2,203	4.6%	21.6%	29.2%	29.8%	12.4%	2.3%	2.76	1.08
2016	2,376	3.4%	20.7%	28.2%	31.1%	13.4%	3.2%	2.68	1.06
2019	1,983	7.3%	23.6%	27.0%	28.1%	11.9%	2.1%	2.86	1.14
2022	2,030	7.4%	24.5%	30.6%	25.2%	9.8%	2.6%	2.94	1.10
Total	11,056	5.4%	23.7%	29.8%	27.9%	10.7%	2.5%	2.85	1.08

Table A4.6 Perceived state of wetlands, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,454	5.5%	32.1%	32.2%	15.1%	5.6%	9.4%	3.19	0.99
2013	2,180	5.3%	26.7%	32.9%	18.7%	6.4%	10.0%	3.07	1.01
2016	2,367	4.0%	24.3%	33.0%	20.4%	7.0%	11.4%	2.98	1.00
2019	1,965	6.3%	26.6%	31.9%	16.9%	7.3%	11.0%	3.09	1.05
2022	2,026	7.7%	26.7%	32.1%	17.4%	5.9%	10.1%	3.14	1.04
Total	10,992	5.7%	27.5%	32.4%	17.7%	6.4%	10.3%	3.09	1.02

Table A4.7 Perceived state of native forest and bush, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,466	17.9%	43.9%	25.2%	9.9%	2.1%	1.1%	3.66	0.95
2013	2,204	14.3%	39.6%	27.0%	14.4%	2.6%	2.1%	3.50	1.00
2016	2,386	12.7%	36.4%	29.6%	16.0%	3.9%	1.4%	3.39	1.03
2019	1,980	13.2%	37.4%	28.8%	15.1%	3.6%	1.9%	3.42	1.02
2022	2,024	16.3%	40.1%	28.0%	9.7%	2.6%	3.3%	3.60	0.97
Total	11,060	15.0%	39.7%	27.6%	12.9%	2.9%	1.9%	3.52	1.00

Table A4.8 Perceived state of protected natural areas, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	2,032	23.8%	40.7%	23.4%	5.9%	1.6%	4.6%	3.83	0.93
Total	2,032	23.8%	40.7%	23.4%	5.9%	1.6%	4.6%	3.83	0.93

Table A4.9 Perceived state of natural environments in towns and cities, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,466	2.6%	28.9%	47.3%	18.1%	2.4%	0.6%	3.11	0.81
2013	2,205	2.8%	27.1%	47.6%	18.1%	3.4%	1.0%	3.08	0.84
2016	2,383	3.3%	29.0%	46.3%	17.4%	3.0%	1.1%	3.12	0.84
2019	1,977	4.7%	29.3%	45.1%	16.0%	3.6%	1.4%	3.16	0.88
2022	2,031	7.5%	29.5%	39.7%	16.0%	4.5%	2.9%	3.20	0.96
Total	11,062	4.1%	28.7%	45.3%	17.2%	3.3%	1.3%	3.13	0.86

Table A4.10 Perceived state of terrestrial plants and animals, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	2,027	8.3%	31.3%	32.7%	16.0%	4.0%	7.7%	3.26	1.02
Total	2,027	8.3%	31.3%	32.7%	16.0%	4.0%	7.7%	3.26	1.02

Table A4.11 Perceived state of marine plants and animals, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	2,025	9.5%	31.7%	29.9%	16.9%	4.3%	7.7%	3.27	0.99
Total	2,025	9.5%	31.7%	29.9%	16.9%	4.3%	7.7%	3.27	0.99

Table A4.12 Perceived quality of management of air quality, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,454	3.4%	24.1%	49.1%	18.6%	1.3%	3.6%	3.10	0.79
2013	2,051	5.0%	26.5%	44.7%	17.9%	1.5%	4.4%	3.16	0.84
2016	2,221	6.4%	27.1%	44.5%	16.3%	1.6%	4.0%	3.21	0.86
2019	1,925	9.4%	31.3%	39.6%	14.2%	1.9%	3.6%	3.33	0.91
2022	1,999	13.1%	32.4%	33.5%	9.3%	1.9%	9.8%	3.50	0.93
Total	10,650	7.2%	28.0%	42.7%	15.4%	1.6%	5.1%	3.25	0.88

Table A4.13 Perceived quality of management of marine environments, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	1,993	7.9%	27.5%	32.4%	18.3%	4.7%	9.1%	3.17	1.01
Total	1,993	7.9%	27.5%	32.4%	18.3%	4.7%	9.1%	3.17	1.01

Table A4.14 Perceived quality of management of coastal waters and beaches, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,459	3.3%	23.8%	42.9%	22.9%	3.0%	4.1%	3.02	0.87
2013	2,053	4.2%	22.4%	43.3%	21.3%	4.0%	4.9%	3.02	0.90
2016	2,219	3.8%	22.7%	40.7%	24.3%	4.0%	4.6%	2.98	0.90
2019	1,912	5.6%	23.0%	37.9%	24.4%	5.1%	3.9%	3.00	0.97
2022	1,986	8.5%	23.6%	35.4%	19.3%	4.8%	8.4%	3.13	1.02
Total	10,629	5.0%	23.1%	40.2%	22.4%	4.1%	5.2%	3.03	0.93

Table A4.15 Perceived quality of management of rivers and lakes, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,455	2.4%	19.1%	41.7%	26.2%	5.2%	5.4%	2.87	0.88
2013	2,044	3.4%	15.4%	35.6%	29.8%	10.4%	5.5%	2.70	0.98
2016	2,221	2.7%	15.3%	31.1%	33.1%	13.5%	4.4%	2.59	1.01
2019	1,925	5.6%	19.6%	32.5%	29.1%	8.4%	4.8%	2.84	1.04
2022	1,994	7.3%	21.2%	31.3%	22.8%	9.3%	8.0%	2.94	1.09
Total	10,639	4.2%	18.1%	34.8%	28.1%	9.2%	5.6%	2.79	1.00

Table A4.16 Perceived quality of management of wetlands, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,433	4.8%	26.2%	37.9%	14.3%	2.5%	14.2%	3.19	0.88
2013	2,033	4.8%	22.6%	37.1%	17.2%	3.3%	15.0%	3.10	0.92
2016	2,190	3.6%	21.2%	35.7%	18.2%	4.9%	16.5%	3.01	0.94
2019	1,913	4.6%	22.8%	34.0%	18.1%	5.9%	14.7%	3.03	0.99
2022	1,989	7.9%	22.4%	32.4%	17.1%	6.2%	14.0%	3.10	1.05
Total	10,558	5.1%	23.2%	35.6%	16.8%	4.4%	14.8%	3.09	0.95

Table A4.17 Perceived quality of management of native bush and forests, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,462	7.8%	35.6%	39.4%	13.3%	1.1%	2.9%	3.37	0.86
2013	2,051	6.8%	29.6%	39.9%	16.6%	2.8%	4.3%	3.22	0.91
2016	2,219	6.0%	28.8%	38.7%	18.9%	4.0%	3.4%	3.14	0.94
2019	1,917	7.9%	30.7%	38.7%	16.4%	3.1%	3.3%	3.25	0.94
2022	1,993	10.8%	33.3%	32.7%	10.7%	3.9%	8.6%	3.40	0.98
Total	10,642	7.8%	31.8%	38.0%	15.0%	2.9%	4.4%	3.28	0.93

Table A4.18 Perceived quality of management of protected natural areas, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	1,994	15.7%	35.4%	28.5%	9.3%	2.9%	8.2%	3.56	0.99
Total	1,994	15.7%	35.4%	28.5%	9.3%	2.9%	8.2%	3.56	0.99

Table A4.19 Perceived quality of management of natural environments in towns and cities, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010	2,463	2.6%	20.8%	55.5%	17.9%	0.9%	2.4%	3.06	0.73
2013	2,056	3.1%	20.4%	50.9%	21.1%	1.3%	3.2%	3.03	0.78
2016	2,228	2.8%	20.5%	50.6%	20.9%	2.3%	3.0%	3.01	0.80
2019	1,920	5.0%	22.5%	47.4%	19.2%	2.6%	3.3%	3.08	0.86
2022	1,988	7.2%	24.4%	37.8%	16.3%	5.5%	8.8%	3.13	0.99
Total	10,655	4.0%	21.6%	48.8%	19.0%	2.4%	4.0%	3.06	0.83

Table A4.20 Perceived quality of management of marine plants and animals, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	1,992	7.9%	26.1%	33.3%	16.0%	4.9%	11.9%	3.18	1.01
Total	1,992	7.9%	26.1%	33.3%	16.0%	4.9%	11.9%	3.18	1.01

Table A4.21 Perceived quality of management of terrestrial plants and animals, 2010–2022.

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
2010									
2013									
2016									
2019									
2022	1,984	7.2%	27.3%	33.1%	14.9%	5.2%	12.3%	3.19	1.01
Total	1,984	7.2%	27.3%	33.1%	14.9%	5.2%	12.3%	3.19	1.01

Table A4.22 Perceived pressures on air quality, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport	89.6	88.1	85.5	76.4	56.7	79.4
Household waste and emissions	26.1	24.1	23.4	25.0	23.8	24.6
Industrial activities	73.8	70.6	71.2	62.8	50.4	65.9
Pests and weeds	2.7	2.6	3.0	5.3	7.9	4.3
Farming	12.9	12.2	18.7	16.3	15.8	15.0
Forestry	18.6	1.5	2.4	3.8	6.0	7.2
Urban development	2.7	20.6	19.3	19.5	24.1	16.5
Mining	3.6	3.0	3.8	4.7	6.0	4.2
Sewage and stormwater	0.7	4.6	4.3	5.2	13.3	5.5
Tourism	0.2	0.7	1.8	5.1	5.5	2.5
Commercial fishing	0.1	0.3	1.6	1.6	5.9	1.9
Recreational fishing	6.7	0.4	0.2	0.4	2.0	2.2
Dumping of solid waste	20.1	8.7	6.8	9.7	15.8	12.8
Hazardous chemicals	1.9	18.2	18.4	20.2	27.6	16.6
Other	1.3	1.7	1.7	2.5	2.4	1.9
N	2,330	1,878	1,989	1,829	2,006	10,032

Table A4.23 Perceived pressures on marine environments, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport					4.4	4.4
Household waste and emissions					16.7	16.7
Industrial activities					23.9	23.9
Pests and weeds					10.5	10.5
Farming					11.7	11.7
Forestry					4.5	4.5
Urban development					10.2	10.2
Mining					4.9	4.9
Sewage and stormwater					54.7	54.7
Tourism					4.2	4.2
Commercial fishing					48.2	48.2
Recreational fishing					10.2	10.2
Dumping of solid waste					29.4	29.4
Hazardous chemicals					30.9	30.9
Other					2.0	2.0
N					1,996	1,996

Table A4.24 Perceived pressures on coastal waters and beaches, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport	5.0	4.4	5.9	4.4	4.3	4.8
Household waste and emissions	26.6	21.5	21.7	22.2	25.2	23.7
Industrial activities	20.8	20.3	19.3	19.2	21.0	20.2
Pests and weeds	8.5	6.7	7.3	6.1	10.3	7.9
Farming	11.4	14.1	15.7	12.1	12.0	13.0
Forestry	23.4	1.7	2.7	4.3	6.3	8.7
Urban development	2.0	20.8	22.8	21.3	18.8	16.2
Mining	65.8	2.4	3.3	2.5	3.9	18.6
Sewage and stormwater	12.6	66.4	62.2	56.9	59.5	49.2
Tourism	17.5	9.7	14.6	20.3	9.8	14.4
Commercial fishing	6.4	26.7	26.2	20.6	20.1	19.1
Recreational fishing	23.2	7.8	8.0	8.0	8.1	11.7
Dumping of solid waste	19.0	22.1	24.3	26.1	33.4	24.8
Hazardous chemicals	4.1	20.1	17.7	17.1	24	16.0
Other	2.1	3.8	2.9	5.6	2.9	3.3
N	2,322	1,823	1,941	1,795	1,984	9,865

Table A4.25 Perceived pressures on rivers and lakes, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport	2.7	1.5	1.5	2.9	3.4	2.4
Household waste and emissions	20.3	19.4	18.4	18.6	17.6	18.9
Industrial activities	30.7	28.7	27.8	25.4	25.6	27.8
Pests and weeds	20.0	16.6	20.3	14.2	26.9	19.9
Farming	46.6	52.9	58.1	40.9	40.5	47.6
Forestry	15.1	5.4	10.8	10.8	10.3	10.8
Urban development	4.0	15.3	15.2	17.2	16.5	13.1
Mining	45.7	6.3	5.3	5.6	4.6	15.4
Sewage and stormwater	5.5	44.1	43.4	41.8	44.4	34.1
Tourism	3.7	3.9	4.6	8.5	7.8	5.6
Commercial fishing	4.7	4.0	4.0	7.4	4.4	4.8
Recreational fishing	18.5	5.3	5.5	5.8	4.7	8.5
Dumping of solid waste	23.3	19.4	19.0	21.2	27.4	22.2
Hazardous chemicals	5.5	23.9	22.3	21.2	27.7	19.4
Other	1.6	3.6	2.9	5.0	2.4	3.0
N	2,304	1,831	1,958	1,790	1,980	9,863

Table A4.26 Perceived pressures on wetlands, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport	2.6	3.0	3.5	3.9	4.8	3.5
Household waste and emissions	10.1	9.4	9.8	9.4	11.4	10.1
Industrial activities	16.7	16.8	19.6	16.6	19.6	17.8
Pests and weeds	32.7	32.3	35.6	29.7	35.4	33.2
Farming	31.6	37.3	41.8	32.0	31.3	34.5
Forestry	23.7	9.2	13.1	13.2	12.5	15.0
Urban development	5.1	26.9	27.0	27.7	30.3	22.3
Mining	24.3	6.7	5.3	6.3	5.5	10.5
Sewage and stormwater	5.3	26.2	26.8	27.4	28.7	21.8
Tourism	0.8	6.1	7.1	9.2	5.5	5.4
Commercial fishing	1.0	1.0	1.0	2.4	3.0	1.6
Recreational fishing	13.2	1.4	1.4	3.6	3.7	5.2
Dumping of solid waste	15.5	18.5	18.3	17.7	25.6	19.1
Hazardous chemicals	20.5	16.4	15.8	14.3	20.3	17.8
Other	4.7	10.5	7.2	10.8	3.2	7
N	2,305	1,776	1,892	1,742	1,928	9,643

Table A4.27 Perceived pressures on native bush and forests, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport	4.4	3.0	3.3	5.6	4.6	4.2
Household waste and emissions	3.9	3.6	3.5	5.3	7.6	4.8
Industrial activities	18.3	15.4	14.5	16.8	17	16.5
Pests and weeds	58.5	51.2	57.0	50.0	47.9	53.2
Farming	31.1	29.7	33.7	23.5	19.0	27.5
Forestry	37.7	42.0	42.0	41.5	47.2	41.9
Urban development	23.9	30.1	29.9	29.4	35.7	29.6
Mining	4.0	24.4	19.4	14.2	14.4	14.6
Sewage and stormwater	18.9	3.3	3.6	5.8	6.0	8.2
Tourism	0.2	9.9	14.6	19.8	16.9	11.5
Commercial fishing	0.9	0.3	0.6	1.7	2.9	1.3
Recreational fishing	13.3	0.7	0.9	1.2	1.9	4.2
Dumping of solid waste	11.0	10.2	12.6	14.2	11.9	11.9
Hazardous chemicals	4.5	10.1	10.2	10.7	12.8	9.4
Other	2.6	4.5	3.5	4.7	2.1	3.4
N	2,324	1,852	1,969	1,795	1,950	9,890

Table A4.28 Perceived pressures on protected natural areas, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport					8.0	8.0
Household waste and emissions					9.7	9.7
Industrial activities					17.9	17.9
Pests and weeds					44.6	44.6
Farming					13.5	13.5
Forestry					17.6	17.6
Urban development					26.1	26.1
Mining					11.2	11.2
Sewage and stormwater					12.7	12.7
Tourism					26.9	26.9
Commercial fishing					4.9	4.9
Recreational fishing					3.5	3.5
Dumping of solid waste					16.9	16.9
Hazardous chemicals					15.4	15.4
Other					2.7	2.7
N					1,899	1,899

Table A4.29 Perceived pressures on natural environments in towns and cities, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport					36.2	36.2
Household waste and emissions					41.3	41.3
Industrial activities					30.7	30.7
Pests and weeds					13.4	13.4
Farming					3.5	3.5
Forestry					2.6	2.6
Urban development					51.2	51.2
Mining					3.4	3.4
Sewage and stormwater					27.8	27.8
Tourism					8.3	8.3
Commercial fishing					1.8	1.8
Recreational fishing					2.1	2.1
Dumping of solid waste					21.1	21.1
Hazardous chemicals					16.3	16.3
Other					2.6	2.6
N					1,957	1,957

Table A4.30 Perceived pressures on marine plants and animals, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport					3.2	3.2
Household waste and emissions					14.8	14.8
Industrial activities					19.2	19.2
Pests and weeds					21.0	21.0
Farming					9.3	9.3
Forestry					5.8	5.8
Urban development					10.0	10.0
Mining					4.3	4.3
Sewage and stormwater					47.7	47.7
Tourism					6.7	6.7
Commercial fishing					47.4	47.4
Recreational fishing					14.3	14.3
Dumping of solid waste					21.9	21.9
Hazardous chemicals					28.3	28.3
Other					1.6	1.6
N					1,940	1,940

Table A4.31 Perceived pressures on terrestrial plants and animals, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Motor vehicles and transport					5.7	5.7
Household waste and emissions					16.1	16.1
Industrial activities					23.0	23.0
Pests and weeds					39.0	39.0
Farming					24.9	24.9
Forestry					15.5	15.5
Urban development					24.1	24.1
Mining					8.2	8.2
Sewage and stormwater					29.8	29.8
Tourism					6.8	6.8
Commercial fishing					6.6	6.6
Recreational fishing					5.2	5.2
Dumping of solid waste					21.8	21.8
Hazardous chemicals					23.8	23.8
Other					2.0	2.0
N					1,922	1,922

Table A4.32 Proportion of respondents who participate in environmental activities, 2010–2022 (%).

	2010	2013	2016	2019	2022	Total
Reduced, or limited your use of electricity	85.9	80.7	79.3	75.0	49.0	74.2
Reduced, or limited your use of fresh water	60.6	62.6	56.0	56.9	33.1	53.9
Visited a marine reserve	27.7	27.2	27.0	26.0	15.1	24.6
Visited a national park	56.2	55.0	55.4	52.0	33.1	50.4
Bought products that are marketed as environmentally friendly	78.9	77.2	81.8	76.7	45.9	72.0
Recycled household waste	95.7	94.1	95.0	90.2	79.0	90.9
Composted garden and/or household waste	72.1	71.7	74.8	69.3	47.4	67.0
Grown some of your own vegetables	75.1	75.2	73.4	67.3	55.9	69.5
Been involved in a project to improve the natural environment	28.0	25.5	28.7	33.4	9.7	24.9
Obtained information about the environment from any source	65.7	62.4	64.0	60.5	19.3	54.4
Taken part in hearings or consent processes about the environment	15.2	13.2	15.3	18.6	4.7	13.3
Participated in an environmental organisation	21.3	21.8	24.8	25.1	6.2	19.6
Commuted by buses or trains	49.5	52.7	52.4	53.3	22.4	45.8
Been an active member of a club or group that restores and/or replants natural environments	13.6	14.4	15.0	20.5	5.1	13.5
Made a financial donation to a non-government environmental organisation	27.0	28.0	32.8	31.5	10.1	25.6
N	2,330	1,878	1,989	1,829	2,006	10,032

Table A4.33 Perceived environmental performance of farms, by region (%).

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
Northland	58	12.1	29.5	33.7	10.0	2.7	12.1	3.43	0.97
Auckland	316	10.3	31.6	27.3	7.0	2.5	21.5	3.51	0.94
Waikato	251	16.6	25.9	35.7	8.9	2.6	10.3	3.50	1.00
Bay of Plenty	91	15.0	24.7	27.5	12.2	2.6	17.9	3.45	1.06
Gisborne	19	10.7	4.3	48.3	10.9	7.7	18.1	2.99	1.07
Hawke's Bay	49	14.8	30.3	24.2	13.2	3.8	13.8	3.45	1.09
Taranaki	38	16.1	33.9	21.9	14.5	4.6	9.0	3.47	1.12
Manawatū-Whanganui	93	18.5	24.2	27.6	7.0	8.3	14.4	3.44	1.20
Wellington	141	5.5	27.8	27.8	6.7	3.4	28.8	3.35	0.93
Nelson	18	9.7	51.9	9.3	11.7	4.6	12.7	3.58	1.06
Tasman	13	11.6	30.5	18.2	11.3	4.7	23.6	3.43	1.15
Marlborough	17	17.1	20.1	40.3	5.0	0.0	17.4	3.60	0.91
Canterbury	241	8.9	27.8	31.2	12.7	5.2	14.2	3.26	1.03
West Coast	14	40.0	12.0	28.6	12.4	0.0	7.1	3.86	1.16
Otago	78	12.6	19.4	36.0	9.4	9.5	13.2	3.19	1.15
Southland	193	18.9	26.9	34.7	8.0	2.8	8.7	3.56	1.01
Total	1,632	12.5	28.2	29.8	8.8	3.6	17.2	3.45	1.01

Table A4.34 Perceived quality of action taken by farms for water quality, by region (%).

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
Northland	54	11.1	23.5	31.5	15.1	1.0	17.7	3.35	0.98
Auckland	296	9.4	25.9	25.2	10.4	3.3	25.7	3.37	1.02
Waikato	223	13.5	20.4	28.0	14.8	2.5	20.9	3.35	1.07
Bay of Plenty	82	9.0	23.4	28.7	13.5	1.5	24.0	3.33	0.97
Gisborne	17	0.0	16.8	33.6	18.4	7.7	23.5	2.78	0.93
Hawke's Bay	45	15.2	25.9	23.5	10.3	5.1	20.0	3.45	1.14
Taranaki	34	15.5	18.8	38.3	10.7	3.5	13.1	3.37	1.05
Manawatū-Whanganui	83	14.4	19.7	23.9	11.6	7.2	23.2	3.29	1.21
Wellington	125	7.9	13.9	28.3	8.9	4.6	36.4	3.18	1.06
Nelson	16	20.2	4.9	33.1	11.3	9.5	21.0	3.19	1.34
Tasman	12	7.4	18.7	33.6	15.1	5.4	19.8	3.09	1.07
Marlborough	14	14.7	11.3	41.2	0.0	5.0	27.7	3.43	1.07
Canterbury	222	9.1	24.2	24.4	14.5	6.3	21.5	3.20	1.11
West Coast	14	36.9	15.1	20.4	20.6	0.0	7.1	3.73	1.24
Otago	72	11.0	16.7	28.8	18.6	5.8	19.2	3.10	1.13
Southland	171	15.7	25.6	24.1	13.8	2.8	17.9	3.46	1.09
Total	1,482	11.1	22.4	26.6	12.2	3.9	23.8	3.32	1.07

Table A4.35 Perceived quality of action taken by farms for climate change, by region (%).

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
Northland	48	9.5	12.5	34.7	13.0	3.1	27.2	3.17	1.02
Auckland	297	10.2	18.9	26.1	12.2	5.9	26.6	3.21	1.12
Waikato	207	9.7	17.5	28.1	16.0	2.8	26.0	3.21	1.04
Bay of Plenty	75	7.2	15.5	25.2	14.1	5.4	32.6	3.08	1.09
Gisborne	16	0.0	20.9	29.2	22.0	0.0	27.9	2.98	0.80
Hawke's Bay	45	10.3	22.3	32.3	11.5	5.1	18.4	3.26	1.06
Taranaki	32	16.2	16.0	31.8	9.8	4.6	21.5	3.37	1.14
Manawatū-Whanganui	77	12.3	16.9	27.9	6.1	6.6	30.2	3.32	1.15
Wellington	123	7.0	20.0	21.9	9.0	4.9	37.2	3.24	1.08
Nelson	15	13.4	6.7	29.3	11.9	14.0	24.7	2.92	1.35
Tasman	12	0.0	27.9	30.4	10.5	5.0	26.1	3.10	0.92
Marlborough	14	7.9	12.8	30.0	12.4	8.4	28.5	2.99	1.17
Canterbury	212	9.1	19.5	24.1	17.6	5.6	24.1	3.12	1.12
West Coast	15	23.8	28.2	43.2	0.0	4.8	0.0	3.66	1.03
Otago	66	12.4	15.3	20.2	14.2	13.1	24.8	3.00	1.33
Southland	169	15.9	17.6	31.0	11.6	2.9	21.0	3.41	1.08
Total	1,425	10.3	18.2	26.8	12.6	5.3	26.8	3.21	1.11

Table A4.36 Perceived quality of action taken by farms for biodiversity performance, by region (%).

	N	Very good (5)	Good (4)	Adequate (3)	Bad (2)	Very bad (1)	Don't know	Mean (1–5)	Std. dev.
Northland	44	12.1	29.5	33.7	10.0	2.7	12.1	3.21	1.17
Auckland	273	10.3	31.6	27.3	7.0	2.5	21.5	3.34	1.02
Waikato	198	16.6	25.9	35.7	8.9	2.6	10.3	3.20	1.02
Bay of Plenty	71	15.0	24.7	27.5	12.2	2.6	17.9	3.34	1.08
Gisborne	13	10.7	4.3	48.3	10.9	7.7	18.1	2.76	1.29
Hawke's Bay	40	14.8	30.3	24.2	13.2	3.8	13.8	3.45	1.08
Taranaki	30	16.1	33.9	21.9	14.5	4.6	9.0	3.48	1.04
Manawatū-Whanganui	77	18.5	24.2	27.6	7.0	8.3	14.4	3.50	1.20
Wellington	112	5.5	27.8	27.8	6.7	3.4	28.8	3.20	1.04
Nelson	14	9.7	51.9	9.3	11.7	4.6	12.7	2.98	1.39
Tasman	11	11.6	30.5	18.2	11.3	4.7	23.6	3.16	1.04
Marlborough	12	17.1	20.1	40.3	5.0	0.0	17.4	3.52	0.99
Canterbury	199	8.9	27.8	31.2	12.7	5.2	14.2	3.18	1.10
West Coast	13	40.0	12.0	28.6	12.4	0.0	7.1	3.47	1.26
Otago	63	12.6	19.4	36.0	9.4	9.5	13.2	3.10	1.12
Southland	146	18.9	26.9	34.7	8.0	2.8	8.7	3.44	1.08
Total	1,319	12.5	28.2	29.8	8.8	3.6	17.2	3.30	1.07

Table A4.37 Perceived change in environmental performance of farms over last three years, by region (%).

	N	Much better (5)	Better (4)	Neither better nor worse (3)	Worse (2)	Much worse (1)	Mean (1–5)	Std. dev.
Northland	66	10.3	23.3	50.9	11.4	4.1	3.24	0.94
Auckland	400	8.8	29.7	48.0	10.5	3.1	3.31	0.89
Waikato	278	11.1	32.2	47.3	7.7	1.7	3.43	0.85
Bay of Plenty	109	13.5	29.3	46.3	8.1	2.8	3.42	0.92
Gisborne	23	4.1	23.7	55.9	11.9	4.3	3.11	0.84
Hawke's Bay	56	10.8	39.6	35.2	12.4	2.0	3.45	0.92
Taranaki	43	16.1	30.0	43.4	5.9	4.5	3.47	0.99
Manawatū-Whanganui	109	17.0	19.7	50.9	7.1	5.3	3.36	1.02
Wellington	194	7.6	30.3	51.7	6.6	3.8	3.31	0.85
Nelson	20	7.0	41.7	46.0	5.3	0.0	3.50	0.72
Tasman	16	13.5	31.6	38.1	11.5	5.3	3.36	1.06
Marlborough	20	18.3	22.2	42.7	12.5	4.2	3.38	1.08
Canterbury	278	8.8	33.8	42.4	9.5	5.5	3.31	0.96
West Coast	15	30.6	22.7	42.0	4.8	0.0	3.79	0.97
Otago	86	16.7	22.4	46.0	11.1	3.7	3.37	1.01
Southland	213	12.7	38.6	41.7	4.2	2.8	3.54	0.87
Total	1929	10.6	30.4	46.8	8.8	3.3	3.36	0.91

11.5 APPENDIX 5 – BONFERRONI PAIRWISE MULTIPLE COMPARISON AND REGRESSION TABLES

Table A5.1 through Table A5.6 give a comparison in the perceived condition of environmental domains from survey to survey.

For each environmental domain, a one-way ANOVA (not shown) was run with a post hoc pairwise comparison of means using a Bonferroni procedure (table shown) comparing the average perceived condition of that domain for those survey years. Perceived condition of that domain was measured on a 1 to 5 Likert scale, where 1 equals 'Very bad' and 5 equals 'Very good'.

The estimates are the average change in perceived condition of that domain from row year survey to column year survey. Significance is indicated by the p-value below each estimate in parentheses.

Table A5.1 Bonferroni multiple comparison test for perceived state of air quality, 2010–2022.

	2010	2013	2016	2019
2013	0.072			
	(0.05)			
2016	0.187	0.115		
	(0.00)	*(0.00)*		
2019	0.219	0.147	0.032	
	(0.00)	*(0.00)*	*(1.00)*	
2022	0.423	0.351	0.235	0.203
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*

Table A5.2 Bonferroni multiple comparison test for perceived state of rivers and lakes, 2010–2022.

	2010	2013	2016	2019
2013	-0.233			
	(0.00)			
2016	-0.304	-0.071		
	(0.00)	*(0.27)*		
2019	-0.128	0.105	0.176	
	(0.00)	*(0.02)*	*(0.00)*	
2022	-0.044	0.189	0.26	0.084
	(1.00)	*(0.00)*	*(0.00)*	*(0.14)*

Table A5.3 Bonferroni multiple comparison test for perceived state of wetlands, 2010–2022.

	2010	2013	2016	2019
2013	-0.121			
	(0.00)			
2016	-0.209	-0.088		
	(0.00)	*(0.06)*		
2019	-0.10	0.021	0.110	
	(0.02)	*(1.00)*	*(0.01)*	
2022	-0.043	0.078	0.166	0.057
	(1.00)	*(0.18)*	*(0.00)*	*(0.95)*

Table A5.4 Bonferroni multiple comparison test for perceived state of coastal waters and beaches, 2010–2022.

	2010	2013	2016	2019
2013	-0.023			
	(1.00)			
2016	-0.033	-0.01		
	(1.00)	*(1.00)*		
2019	-0.122	-0.099	-0.089	
	(0.00)	*(0.01)*	*(0.03)*	
2022	-0.026	-0.003	0.007	0.096
	(1.00)	*(1.00)*	*(1.00)*	*(0.02)*

Table A5.5 Bonferroni multiple comparison test for perceived state of native bush and forests, 2010–2022.

	2010	2013	2016	2019
2013	-0.168			
	(0.00)			
2016	-0.278	-0.11		
	(0.00)	*(0.00)*		
2019	-0.241	-0.073	0.037	
	(0.00)	*(0.19)*	*(1.00)*	
2022	-0.065	0.103	0.213	0.176
	(0.31)	*(0.01)*	*(0.00)*	*(0.00)*

Table A5.6 Bonferroni multiple comparison test for perceived state of natural environments in towns and cities, 2010–2022.

	2010	2013	2016	2019
2013	-0.034			
	(1.00)			
2016	0.009	0.043		
	(1.00)	*(0.92)*		
2019	0.043	0.080	0.034	
	(0.97)	*(0.04)*	*(1.00)*	
2022	0.088	0.122	0.079	0.044
	(0.01)	*(0.00)*	*(0.03)*	*(1.00)*

Table A5.7 to Table A5.12 show a comparison in perceived quality of management of environmental domains from survey to survey.

For each environmental domain a one-way ANOVA (not shown) was run with a post hoc pairwise comparison of means using a Bonferroni procedure (table shown) comparing the average perceived quality of management of that domain for those survey years. Perceived quality of management of that domain is measured on a 1 to 5 Likert scale, where 1 equals 'Very bad' and 5 equals 'Very good'.

The estimates are the average change in perceived quality of management of that domain from row year survey to column year survey. Significance is indicated the by p-value below each estimate in parentheses.

Table A5.7 Bonferroni multiple comparison test for perceived quality of management of air quality, 2010–2022.

	2010	2013	2016	2019
2013	0.063			
	(0.17)			
2016	0.114	0.051		
	(0.00)	*(0.59)*		
2019	0.232	0.169	0.118	
	(0.00)	*(0.00)*	*(0.00)*	
2022	0.405	0.342	0.291	0.173
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*

Table A5.8 Bonferroni multiple comparison test for perceived quality of management of rivers and lakes, 2010–2022.

	2010	2013	2016	2019
2013	-0.168			
	(0.00)			
2016	-0.28	-0.112		
	(0.00)	*(0.00)*		
2019	-0.024	0.144	0.255	
	(1.00)	*(0.00)*	*(0.00)*	
2022	0.072	0.24	0.352	0.097
	(0.198)	*(0.00)*	*(0.00)*	*(0.03)*

Table A5.9 Bonferroni multiple comparison test for perceived quality of management of wetlands, 2010–2022.

	2010	2013	2016	2019
2013	-0.097			
	(0.02)			
2016	-0.188	-0.092		
	(0.00)	*(0.03)*		
2019	-0.168	-0.071	0.021	
	(0.00)	*(0.30)*	*(1.00)*	
2022	-0.095	0.002	0.094	0.073
	(0.02)	*(1.00)*	*(0.03)*	*(0.26)*

Table A5.10 Bonferroni multiple comparison test for perceived quality of management of coastal waters and beaches, 2010–2022.

	2010	2013	2016	2019
2013	-0.001			
	(1.00)			
2016	-0.038	-0.036		
	(1.00)	*(1.00)*		
2019	-0.021	-0.020	0.017	
	(1.00)	*(1.00)*	*(1.00)*	
2022	0.112	0.113	0.150	0.133
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*

Table A5.11 Bonferroni multiple comparison test for perceived quality of management of native bush and forests, 2010–2022.

	2010	2013	2016	2019
2013	-0.149			
	(0.00)			
2016	-0.223	-0.074		
	(0.00)	*(0.103)*		
2019	-0.119	0.03	0.104	
	(0.00)	*(1.00)*	*(0.00)*	
2022	0.032	0.181	0.255	0.152
	(1.00)	*(0.00)*	*(0.00)*	*(0.00)*

Table A5.12 Bonferroni multiple comparison test for perceived quality of management of natural environments in towns and cities, 2010–2022.

	2010	2013	2016	2019
2013	-0.035			
	(1.00)			
2016	-0.058	-0.024		
	(0.18)	*(1.00)*		
2019	0.017	0.052	0.076	
	(1.00)	*(0.53)*	*(0.04)*	
2022	0.061	0.096	0.119	0.044
	(0.17)	*(0.00)*	*(0.00)*	*(1.00)*

Table A5.13 to Table A5.17 show the average marginal change in probability from 2022 of attributing damage to five environmental domains to 14 difference pressures.

For each environmental domain 14 logit regressions were run, one for each perceived cause of damage, estimating the marginal change in probability of respondents choosing that cause in each year compared to the baseline 2022 survey. Estimates are the average marginal change in the given year from the 2022 baseline holding all other years constant. probability Significance is indicated by asterisks, where:

*** means P < .01,
** means P < .05, and
* means P < .10.

Standard errors are given in parentheses below. Standard errors are clustered at the regional council level.

Table A5.13 Average marginal change in probability from 2022 of attributing damage to air quality to 14 different pressures, 2010–2022.

	Dependent variable: Cause of damage													
	Motor vehicles & transport	Household waste & emissions	Industrial activities	Pests & weeds	Farming	Forestry	Urban development	Mining	Sewage & stormwater	Tourism	Commercial fishing	Recreational fishing	Dumping of solid waste	Hazardous chemicals
Baseline probability (2022 avg.)	0.583	0.246	0.518	0.076	0.167	0.057	0.237	0.06	0.128	0.051	0.056	0.015	0.151	0.270
2010	0.322	0.025	0.245	-0.051	-0.043	0.130	-0.213	-0.024	-0.121	-0.049	-0.055	0.049	0.053	-0.257
	(0.017)***	(0.021)	(0.011)***	(0.008)***	(0.009)***	(0.008)***	(0.016)***	(0.007)***	(0.009)***	(0.006)***	(0.005)***	(0.006)***	(0.018)***	(0.007)***
2013	0.295	-0.010	0.202	-0.051	-0.056	-0.046	-0.048	-0.030	-0.086	-0.041	-0.049	-0.014	-0.066	-0.086
	(0.013)***	(0.031)	(0.014)***	(0.008)***	(0.004)***	(0.006)***	(0.016)***	(0.008)***	(0.011)***	(0.006)***	(0.005)***	(0.005)***	(0.012)***	(0.010)***
2016	0.272	-0.021	0.195	-0.043	0.012	-0.037	-0.042	-0.018	-0.083	-0.037	-0.040	-0.013	-0.081	-0.072
	(0.016)***	(0.024)	(0.017)***	(0.008)***	(0.013)	(0.005)***	(0.017)**	(0.011)*	(0.011)***	(0.004)***	(0.006)***	(0.004)***	(0.012)***	(0.011)***
2019	0.195	0.004	0.127	-0.028	-0.002	-0.023	-0.037	-0.020	-0.074	-0.003	-0.040	-0.010	-0.060	-0.069
	(0.011)***	(0.014)	(0.012)***	(0.007)***	(0.011)	(0.005)***	(0.021)*	(0.008)**	(0.012)***	(0.007)	(0.005)***	(0.005)**	(0.010)***	(0.016)***
Num. of obs.	9,984	9,984	9,984	9,984	9,984	9,984	9,984	9,984	9,984	9,984	9,984	9,984	9,984	9,984
Wald χ^2	646.4	31.28	556.2	134.1	142.9	1017	268.6	25.38	178	151.4	128.3	239.2	226.3	2624
Pseudo R^2	0.081	0.001	0.027	0.025	0.007	0.013	0.067	0.007	0.077	0.081	0.010	0.016	0.032	0.087
Log likelihood	-4565	-5569	-6130	-1677	-4173	-2148	-4142	-1692	-1933	-1050	-828.7	-808.1	-3626	-4117

Table A5.14 Average marginal change in probability from 2022 of attributing damage to wetlands to 14 different pressures, 2010–2022.

	Dependent variable: Cause of damage													
	Motor vehicles & transport	Household waste & emissions	Industrial activities	Pests & weeds	Farming	Forestry	Urban development	Mining	Sewage & stormwater	Tourism	Commercial fishing	Recreational fishing	Dumping of solid waste	Hazardous chemicals
Baseline probability (2022 avg.)	0.041	0.110	0.193	0.360	0.337	0.126	0.322	0.052	0.277	0.054	0.027	0.032	0.245	0.190
2010	-0.016	-0.016	-0.016	-0.004	-0.016	0.130	-0.272	0.195	-0.216	-0.047	-0.017	0.095	-0.091	-0.012
	(0.006)***	(0.008)**	(0.007)**	(0.012)	(0.018)	(0.017)***	(0.021)***	(0.017)***	(0.014)***	(0.004)***	(0.004)***	(0.009)***	(0.012)***	(0.009)
2013	-0.018	-0.011	-0.024	0.014	0.055	-0.040	-0.059	0.007	-0.014	0.005	-0.017	-0.020	-0.079	-0.023
	(0.006)***	(0.009)	(0.011)**	(0.021)	(0.020)***	(0.007)***	(0.025)**	(0.009)	(0.014)	(0.006)	(0.004)***	(0.006)***	(0.009)***	(0.017)
2016	-0.010	-0.012	-0.002	0.018	0.088	0.004	-0.051	0.001	-0.012	0.019	-0.018	-0.020	-0.067	-0.034
	(0.007)	(0.007)*	(0.011)	(0.015)	(0.016)***	(0.010)	(0.021)**	(0.011)	(0.009)	(0.005)***	(0.003)***	(0.005)***	(0.008)***	(0.015)**
2019	-0.006	-0.018	-0.028	-0.046	-0.008	0.001	-0.033	0.002	0.003	0.038	-0.007	0.000	-0.067	-0.048
	(0.007)	(0.007)***	(0.009)***	(0.011)***	(0.020)	(0.008)	(0.017)**	(0.008)	(0.011)	(0.006)***	(0.004)	(0.006)	(0.014)***	(0.012)***
Num. of obs.	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603
Wald χ^2	62.76	13.39	22.65	64.31	84.98	166.1	537.6	315.6	222.9	120.8	41.68	361.5	237.6	25.15
Pseudo R^2	0.005	0.001	0.001	0.002	0.006	0.032	0.069	0.097	0.054	0.052	0.001	0.109	0.007	0.002
Log likelihood	-1325	-3097	-4514	-6251	-6233	-3931	-4817	-2831	-4800	-1917	-731.7	-1621	-4542	-4341

Table A5.15 Average marginal change in probability from 2022 of attributing damage to rivers and lakes to 14 different pressures, 2010–2022.

	Dependent variable: Cause of damage													
	Motor vehicles & transport	Household waste & emissions	Industrial activities	Pests & weeds	Farming	Forestry	Urban development	Mining	Sewage & stormwater	Tourism	Commercial fishing	Recreational fishing	Dumping of solid waste	Hazardous chemicals
Baseline probability (2022 avg.)	0.029	0.166	0.260	0.285	0.435	0.110	0.168	0.041	0.436	0.077	0.038	0.045	0.262	0.272
2010	-0.007	0.047	0.062	-0.071	0.068	0.039	-0.121	0.424	-0.386	-0.049	0.008	0.119	-0.031	-0.228
	(0.005)	(0.016)***	(0.012)***	(0.016)***	(0.023)***	(0.010)***	(0.011)***	(0.010)***	(0.018)***	(0.007)***	(0.007)	(0.009)***	(0.011)***	(0.006)***
2013	-0.012	0.033	0.041	-0.092	0.126	-0.050	-0.015	0.022	-0.007	-0.038	-0.008	0.004	-0.095	-0.038
	(0.004)***	(0.014)**	(0.019)**	(0.015)***	(0.017)***	(0.011)***	(0.013)	(0.006)***	(0.009)	(0.006)***	(0.006)	(0.012)	(0.016)***	(0.009)***
2016	-0.014	0.023	0.025	-0.070	0.155	-0.002	-0.013	0.013	-0.002	-0.030	-0.003	0.002	-0.085	-0.051
	(0.007)**	(0.009)***	(0.012)**	(0.018)***	(0.011)***	(0.007)	(0.010)	(0.005)***	(0.021)	(0.006)***	(0.006)	(0.009)	(0.011)***	(0.009)***
2019	-0.004	0.017	0.002	-0.137	-0.001	-0.002	-0.001	0.010	-0.002	0.006	0.032	0.015	-0.050	-0.065
	(0.004)	(0.012)	(0.015)	(0.015)***	(0.018)	(0.008)	(0.013)	(0.005)**	(0.013)	(0.010)	(0.007)***	(0.008)**	(0.015)***	(0.008)***
Num. of obs.	9,819	9,819	9,819	9,819	9,819	9,819	9,819	9,819	9,819	9,819	9,819	9,819	9,819	9,819
Wald χ^2	27.69	10.09	41.83	218.9	418.4	136.2	239.4	3028	690.3	105	44.48	252.3	75.65	460.4
Pseudo R^2	0.006	0.002	0.002	0.012	0.011	0.013	0.031	0.243	0.113	0.022	0.011	0.052	0.007	0.057
Log likelihood	-1028	-4777	-5873	-5033	-6728	-3341	-3753	-3132	-5598	-2008	-1753	-2533	-5028	-4498

Table A5.16 Average marginal change in probability from 2022 of attributing damage to native bush and forests to 14 different pressures, 2010–2022.

	Dependent variable: Cause of damage													
	Motor vehicles & transport	Household waste & emissions	Industrial activities	Pests & weeds	Farming	Forestry	Urban development	Mining	Sewage & stormwater	Tourism	Commercial fishing	Recreational fishing	Dumping of solid waste	Hazardous chemicals
Baseline probability (2022 avg.)	0.046	0.070	0.166	0.497	0.199	0.475	0.351	0.147	0.055	0.175	0.023	0.016	0.111	0.115
2010	-0.006	-0.034	0.006	0.124	0.108	-0.111	-0.100	-0.116	0.127	-0.172	-0.017	0.111	0.001	-0.075
	(0.005)	(0.007)***	(0.008)	(0.020)***	(0.012)***	(0.016)***	(0.026)***	(0.017)***	(0.015)***	(0.007)***	(0.005)***	(0.008)***	(0.013)	(0.007)***
2013	-0.018	-0.043	-0.031	0.058	0.089	-0.069	-0.054	0.094	-0.026	-0.072	-0.018	-0.013	-0.014	-0.013
	(0.004)***	(0.008)***	(0.011)***	(0.026)**	(0.014)***	(0.018)***	(0.018)***	(0.014)***	(0.006)***	(0.012)***	(0.005)***	(0.004)***	(0.010)	(0.009)
2016	-0.013	-0.038	-0.024	0.093	0.126	-0.065	-0.058	0.056	-0.020	-0.024	-0.016	-0.010	0.009	-0.011
	(0.007)*	(0.008)***	(0.011)**	(0.021)***	(0.011)***	(0.021)***	(0.014)***	(0.011)***	(0.008)**	(0.014)*	(0.007)**	(0.003)***	(0.010)	(0.015)
2019	0.004	-0.021	-0.003	0.019	0.039	-0.051	-0.046	0.003	-0.001	0.022	-0.011	-0.005	0.026	-0.016
	(0.006)	(0.010)**	(0.008)	(0.019)	(0.014)***	(0.019)***	(0.015)***	(0.009)	(0.005)	(0.011)**	(0.005)**	(0.004)	(0.008)***	(0.011)
Num. of obs.	9,843	9,843	9,843	9,843	9,843	9,843	9,843	9,843	9,843	9,843	9,843	9,843	9,843	9,843
Wald χ^2	30.20	135	21.17	237	364.8	107.3	68.74	151.9	461.5	283.4	50.84	326.5	19.38	88.94
Pseudo R^2	0.005	0.015	0.002	0.007	0.01	0.004	0.004	0.061	0.082	0.096	0.037	0.186	0.002	0.019
Log likelihood	-1627	-1697	-4261	-6708	-5720	-6648	-5966	-3884	-2425	-3262	-529	-1264	-3511	-2925

Table A5.17 Average marginal change in probability from 2022 of attributing damage to coastal waters and beaches to 14 different pressures, 2010–2022.

	Dependent variable: Cause of damage													
	Motor vehicles & transport	Household waste & emissions	Industrial activities	Pests & weeds	Farming	Forestry	Urban development	Mining	Sewage & stormwater	Tourism	Commercial fishing	Recreational fishing	Dumping of solid waste	Hazardous chemicals
Baseline probability (2022 avg.)	0.046	0.246	0.217	0.104	0.128	0.057	0.195	0.034	0.595	0.100	0.207	0.077	0.328	0.235
2010	0.007	0.017	-0.007	-0.020	-0.007	0.167	-0.176	0.643	-0.484	0.075	-0.145	0.145	-0.145	-0.197
	(0.005)	(0.015)	(0.014)	(0.010)**	(0.011)	(0.013)***	(0.013)***	(0.012)***	(0.011)***	(0.011)***	(0.010)***	(0.014)***	(0.018)***	(0.010)***
2013	-0.001	-0.037	-0.024	-0.035	0.007	-0.044	0.028	-0.012	0.094	-0.003	0.043	-0.009	-0.113	-0.039
	(0.012)	(0.017)**	(0.016)	(0.010)***	(0.010)	(0.007)***	(0.017)*	(0.005)**	(0.017)***	(0.010)	(0.018)**	(0.011)	(0.032)***	(0.015)**
2016	0.012	-0.033	-0.019	-0.030	0.035	-0.032	0.039	-0.000	0.033	0.046	0.050	-0.003	-0.098	-0.055
	(0.007)*	(0.013)**	(0.016)	(0.009)***	(0.008)***	(0.008)***	(0.018)**	(0.007)	(0.022)	(0.010)***	(0.015)***	(0.011)	(0.022)***	(0.011)***
2019	-0.007	-0.017	-0.021	-0.046	-0.008	-0.016	0.020	-0.012	-0.004	0.094	0.010	-0.004	-0.061	-0.072
	(0.007)	(0.013)	(0.015)	(0.009)***	(0.016)	(0.006)***	(0.014)	(0.005)**	(0.014)	(0.007)***	(0.012)	(0.008)	(0.021)***	(0.014)***
Num. of obs.	9,820	9,820	9,820	9,820	9,820	9,820	9,820	9,820	9,820	9,820	9,820	9,820	9,820	9,820
Wald χ^2	36.72	13.49	11.99	45.35	23.73	765.2	545.9	2651	3905	258	793.4	276.4	120.4	549.3
Pseudo R^2	0.002	0.002	0.001	0.006	0.003	0.144	0.077	0.478	0.156	0.015	0.044	0.053	0.013	0.053
Log likelihood	-1916	-5327	-4955	-2696	-3828	-2338	-4133	-2432	-5744	-3977	-4601	-3189	-5366	-4055

A multi-variate logit regression was run for each of the 15 activities estimating the marginal change in probability of respondents participating in each activity based on their gender, age group, education attainment, and ethnicity in 2022 (Table A5.18). All variables are binary. Estimates are the average difference in probability of participating in a given activity between the stated demographic (e.g., Male) and its respective alternative (e.g., Female or Gender diverse) holding all other demographics constant. Asterisks represent significant differences where:

*** means P < .01,
** means P < .05, and
* means P < .10.

Standard errors are given in parentheses below. Standard errors are clustered at the regional council level.

Table A5.18 Average marginal change in probability of participating in 15 environmental activities by demographics in 2022.

	Dependent variable: Participation in activity														
	Recycled	Grown your own veggies	Reduced electricity	Composted	Bought environ. friendly	Reduced use of fresh water	Visited a national park	Used public transport	Obtained environ. information	Visited a marine reserve	Made financial donation	Involved in environ. project	Participate in environ. organisation	Participate in environ. hearings	Participate in environ. restoration
Male	-0.056	-0.075	-0.074	-0.059	-0.156	-0.052	0.059	0.045	0.012	0.052	0.013	0.014	0.007	0.015	0.016
(=1)	(0.018)***	(0.013)***	(0.029)**	(0.019)***	(0.020)***	(0.022)**	(0.016)***	(0.021)**	(0.013)	(0.020)**	(0.010)	(0.012)	(0.010)	(0.009)	(0.008)*
Aged 44 and over	0.155	0.219	0.114	0.232	0.077	0.111	-0.040	-0.047	-0.019	-0.009	0.021	0.025	0.004	0.009	-0.018
(=1)	(0.024)***	(0.025)***	(0.025)***	(0.030)***	(0.027)***	(0.022)***	(0.019)**	(0.015)***	(0.019)	(0.014)	(0.017)	(0.011)**	(0.009)	(0.007)	(0.006)***
Tertiary qualification	0.006	0.013	0.019	0.067	0.098	0.052	0.143	0.119	0.120	0.051	0.053	0.061	0.047	0.035	0.027
(=1)	(0.017)	(0.017)	(0.021)	(0.023)***	(0.017)***	(0.028)*	(0.022)***	(0.021)***	(0.024)***	(0.017)***	(0.019)***	(0.011)***	(0.005)***	(0.009)***	(0.009)***
Māori	-0.029	0.057	0.046	0.050	0.077	0.084	0.008	0.035	0.053	0.048	0.004	0.042	0.066	0.046	0.044
(=1)	(0.026)	(0.042)	(0.025)*	(0.045)	(0.029)***	(0.019)***	(0.032)	(0.027)	(0.027)**	(0.034)	(0.021)	(0.029)	(0.022)***	(0.016)***	(0.015)***
Num. of obs.	1,917	1,917	1,917	1,917	1,917	1,917	1,917	1,917	1,917	1,917	1,917	1,917	1,917	1,758	1,917
Wald χ^2	169.8	162.7	56.57	145	296.2	39.96	28.60	50.45	21.07	32.45	5.429	21.78	28.73	20.67	25.06
Pseudo R^2	0.042	0.037	0.016	0.037	0.032	0.015	0.012	0.016	0.012	0.011	0.005	0.017	0.020	0.020	0.013
Log likelihood	-894.1	-1246	-1307	-1280	-1286	-1194	-1209	-953.8	-935	-765.4	-627.4	-595.5	-439.7	-327.6	-382

A logit regression was run for each activity estimating the marginal change in probability of respondents participating in each activity in each year compared to the baseline 2022 survey proportion (Table A5.19). Estimates are the average marginal change in the given year from the 2022 baseline holding all other years constant. Asterisks represent significance, where:

*** means P < .01,
** means P < .05, and
* means P < .10.

Standard errors are given in parentheses below. Standard errors are clustered at the regional council level.

Table A5.19 Average marginal change in probability from 2022 of participating in 15 environmental activities, 2010–2022.

	Dependent variable: Participation in activity														
	Recycled	Grown your own veggies	Reduced electricity	Composted	Bought environ. friendly	Reduced use of fresh water	Visited a national park	Used public transport	Obtained environ. information	Visited a marine reserve	Made financial donation	Involved in environ. project	Participate in environ. organisation	Participate in environ. hearings	Participate in environ. restoration
Baseline probability (2022 avg.)	0.811	0.595	0.514	0.508	0.488	0.327	0.337	0.206	0.198	0.141	0.101	0.097	0.063	0.052	0.044
2010	0.143	0.187	0.359	0.232	0.327	0.299	0.215	0.266	0.454	0.113	0.165	0.171	0.143	0.078	0.094
	(0.023)***	(0.015)***	(0.018)***	(0.016)***	(0.014)***	(0.019)***	(0.017)***	(0.020)***	(0.017)***	(0.014)***	(0.011)***	(0.008)***	(0.009)***	(0.008)***	(0.007)***
2013	0.135	0.183	0.301	0.232	0.292	0.297	0.189	0.271	0.392	0.108	0.165	0.144	0.135	0.080	0.073
	(0.024)***	(0.021)***	(0.020)***	(0.021)***	(0.015)***	(0.019)***	(0.019)***	(0.018)***	(0.011)***	(0.016)***	(0.010)***	(0.013)***	(0.010)***	(0.008)***	(0.009)***
2016	0.144	0.159	0.284	0.248	0.332	0.251	0.196	0.303	0.434	0.121	0.231	0.190	0.187	0.102	0.109
	(0.020)***	(0.024)***	(0.021)***	(0.018)***	(0.016)***	(0.016)***	(0.014)***	(0.027)***	(0.015)***	(0.020)***	(0.012)***	(0.013)***	(0.012)***	(0.010)***	(0.006)***
2019	0.103	0.088	0.230	0.192	0.291	0.235	0.176	0.319	0.406	0.102	0.204	0.221	0.174	0.133	0.118
	(0.019)***	(0.021)***	(0.019)***	(0.017)***	(0.015)***	(0.025)***	(0.019)***	(0.012)***	(0.011)***	(0.013)***	(0.005)***	(0.009)***	(0.008)***	(0.010)***	(0.011)***
Num. of obs.	9,864	9,867	9,897	9,870	9,879	9,810	9,846	9,870	9,831	9,853	9,869	9,847	9,851	9,844	9,883
Wald χ^2	174	250.4	859.6	354.9	880.6	450.3	252.1	382.3	1947	137.7	559.1	562	714.9	205.8	395.4
Pseudo R^2	0.060	0.021	0.071	0.030	0.064	0.037	0.018	0.043	0.088	0.011	0.034	0.032	0.034	0.026	0.024
Log likelihood	-2633	-5722	-5140	-5925	-5312	-6512	-6700	-6475	-6191	-5258	-5407	-5271	-4637	-3590	-3701