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FOREWORD

The principal aim of the OECD's Environmental Performance Reviews programme is to help *member countries improve their individual and collective performances in environmental management* with the following primary goals:

– to help *individual governments* assess progress;

– to promote a continuous policy *dialogue among member countries*, through a peer review process; and

– to stimulate *greater accountability* from member countries' governments towards their public opinion, within developed countries and beyond.

Environmental performance is assessed with regard to the degree of achievement of *domestic objectives and international commitments*. Such objectives and commitments may be broad aims, specific qualitative goals, precise quantitative targets or a commitment to a set of measures to be taken. Assessment of environmental performance is also placed within the context of historical environmental records, the present state of the environment, the physical endowment of the country in natural resources, its economic conditions and demographic trends.

These systematic and independent reviews have been conducted for all member countries as part of the first cycle of reviews. The OECD is now engaged in the second cycle of reviews directed at *promoting sustainable development*, with emphasis on implementation of domestic and international environmental policy, as well as on the integration of economic, social and environmental decision-making.

The present report reviews environmental performance of New Zealand. The OECD extends its most sincere thanks to all those who helped in the course of this review, to the representatives of member countries to the Working Party on Environmental Performance, and especially to the examining countries (Australia, Korea and the Netherlands) and their experts. The OECD is particularly indebted to the government of New Zealand for its co-operation in expediting the provision of information and the organisation of the experts' mission to New Zealand, and in facilitating contacts with many individuals both inside and outside administrative and governmental structures. The present review benefited from grant support from Japan and Austria.

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The OECD Working Party on Environmental Performance conducted the review of New Zealand at its meeting on 27 September 2006 and approved its conclusions and recommendations.

Lorents G. Lorentsen
Director, Environment Directorate

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Signs

The following signs are used in Figures and Tables:
. .: not available
– : nil or negligible
. : decimal point.

The sign * indicates that not all countries are included.

Country Aggregates

OECD Europe: All European member countries of the OECD (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and United Kingdom).

OECD: The countries of OECD Europe plus Australia, Canada, Japan, the Republic of Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

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Currency

Monetary unit: New Zealand dollar (NZD)

In 2005, NZD 1.421 = USD 1.

Cut-off Date

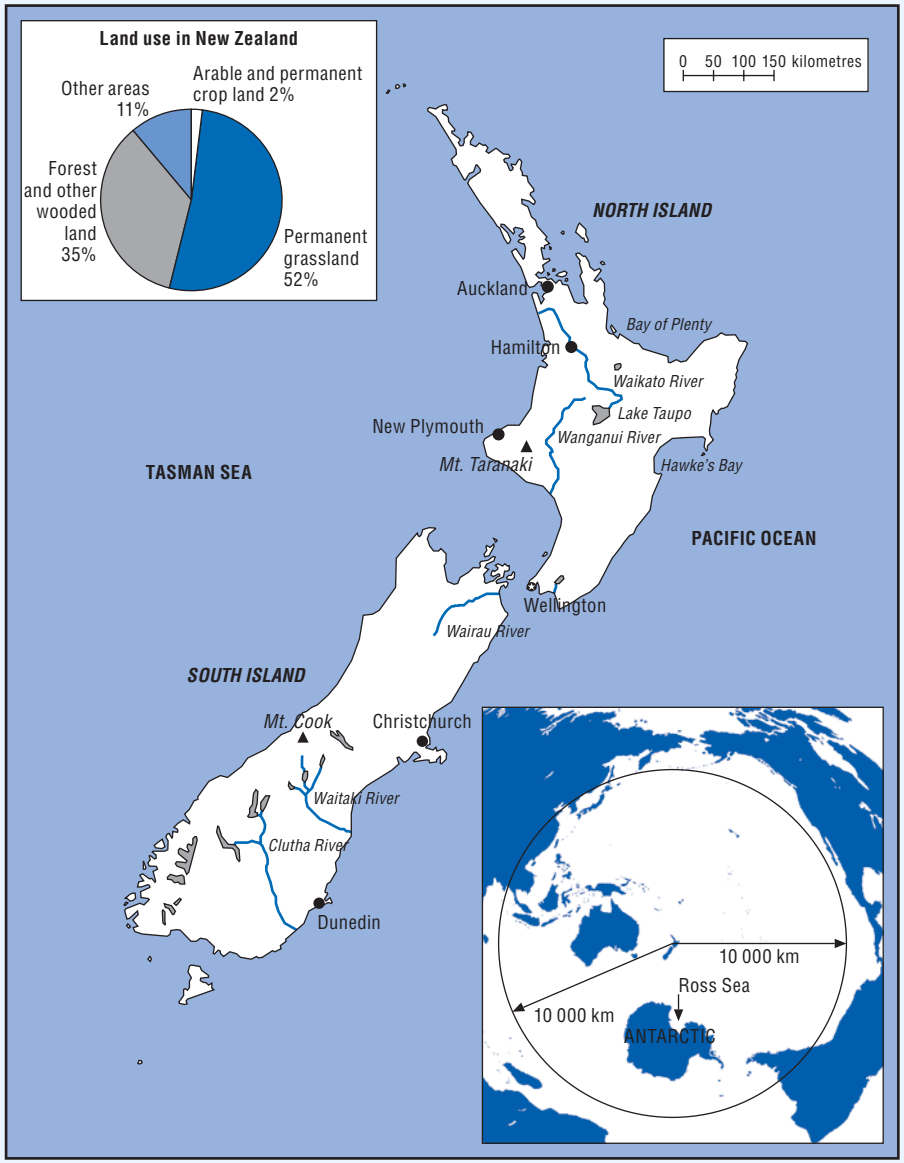
This report is based on information and data available up to July 2006.

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Map of New Zealand



Source: OECD, Environment Directorate.

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CONCLUSIONS AND RECOMMENDATIONS*

Since 1996, *New Zealand's GDP has grown by 30%* while the population has increased by 9%. Real per capita GDP is nonetheless 11% below the OECD average. The country is dependent on international trade, with exports contributing 29% of GDP and natural resource-based exports (from agriculture, forestry, fishing and aquaculture) accounting for a large share. Services generate 66% of the value added in the economy, industry 24% and primary production 10%.

With relatively low population density, *natural resource management-related issues* continued to dominate the environmental policy agenda during the review period. A broad reform of environmental management institutions, which was catalysed by the 1991 Resource Management Act (RMA), overhauled the institutional framework for environmental planning and management, and continued the devolution of most policy implementation responsibilities to regional and territorial authorities (collectively known as local authorities). Concurrently, a major reform of local government consolidated the number of subnational authorities from 800 to 90. The full effects of these reforms on environmental management began to be felt only in the late 1990s, as their implementation took years.

Major sources of environmental pressure, including agriculture, transport, tourism and energy production and consumption, expanded during the review period. Energy intensity is now about equal to the OECD average, having fallen by 18% during the review period. While the intensity of water, fertiliser and pesticide use remains on the low side for OECD countries, the review period saw significant increases, with consequent growth in pressures on the environment.

* Conclusions and Recommendations reviewed and approved by the Working Party on Environmental Performance at its meeting on 27 September 2006.

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To face these *environmental management challenges*, it will be necessary for New Zealand to: i) strengthen national policy guidance, in the form of policy statements and national environmental standards, in the interest of promoting a level national playing field and improving regulatory efficiency; ii) further integrate environmental concerns into economic and sectoral decisions, particularly by using economic instruments to internalise environmental costs of economic activities; and iii) further develop international environmental co-operation.

This report examines progress made by New Zealand since the previous OECD Environmental Performance Review (1996) relative to its established *domestic objectives and international commitments* regarding the environment. It also reviews progress in the context of the OECD Environmental Strategy,** and compared to the recommendations of the 1996 OECD review. Progress has stemmed from environmental and economic decisions and actions by central, regional and territorial authorities, as well as by enterprises, households and non-governmental organisations (NGOs). Thirty-eight recommendations are made that could contribute to further environmental progress in New Zealand.

1. Environmental Management

Strengthening implementation of environmental policies

During the review period, *local authorities* largely assumed the additional environmental management responsibilities devolved to them under the RMA. No operational regional policy statements or regional coastal plans existed at the time of the 1996 OECD review, but by 2006 all regional authorities had issued policy statements, and all but four had coastal plans in place. Overall, *local authorities* have used the RMA-based *resource consent* system to manage point sources of pollution effectively. Investment in water supply and sewerage has led to better sanitation. Local councils increasingly apply *user charges* for landfilling and resource consent processing. A first set of national environmental standards (concerning air quality) was issued in 2004; it includes five standards for ambient (outdoor) air quality, and seven standards banning activities that discharge toxics into the air. Additional government funding since July 2002 and development of a robust case management system have improved the functioning of the *Environment Court* and halved the backlog of cases from the 2001 level. Since 2000, the central

** The following objectives of the "OECD Environmental Strategy for the First Decade of the 21st Century" are covered in the Conclusions and Recommendations: maintaining the integrity of ecosystems (Section 1), decoupling of environmental pressures from economic growth (Section 2) and global environmental interdependence (Section 3).

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government has issued several national strategies to help guide local government in implementing the RMA, and has worked to improve public understanding of RMA processes. After the first national state of the environment report was published in 1997, a project helped define several sets of national environmental indicators. The *Parliamentary Commissioner for the Environment* has provided independent, cross-sectoral analysis that has helped focus environmental sustainability efforts. Environmental expenditure (for pollution abatement and control as well as water supply and nature conservation) has increased in recent years, although it remains rather low (less than 1% of GDP).

Notwithstanding these achievements, there remains *room for improvement* in New Zealand's environmental management. The central government has so far provided little statutory guidance in the form of *national standards and policy statements* to local authorities regarding implementation of the RMA and monitoring of environmental conditions. Recent success in issuing national strategies concerning elements of environmental management is tempered by their non-binding nature, which makes their implementation vulnerable to changes in government. The *Environment 2010 Strategy*, adopted in 1995, was set aside a few years later. Differences in *technical capacity, knowledge, skills* and issues among local authorities translate into differences in environmental management, and

Recommendations:

- accelerate the establishment of *national environmental standards* (e.g. for freshwater, waste and contaminated land) and *national policy statements* (e.g. on coastal waters and freshwater);
- review systems for *charging users for waste and waste water services*, identifying opportunities to strengthen economic incentives for resource conservation and efficiency;
- reinforce the commitment to *outcome-oriented environmental policies*, ensuring that information and data needed to assess policy effectiveness and efficiency are regularly collected and analysed;
- strengthen *monitoring of air and water quality, and waste generation and treatment*, assuring baseline consistency of methods used at local level to facilitate data aggregation and periodic reporting of key environmental indicators at national level;
- assure the effectiveness of *voluntary agreements*, requiring clear environmental performance targets, regular reporting and third-party auditing.

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businesses complain that the regulatory playing field within the country is not level. The policy mix remains focused on regulatory and voluntary approaches, with *economic instruments* underused. National-level aggregates of *data and indicators* on the state of the environment and environmental pressures are scarce, thus impeding efforts to strengthen outcome-oriented environmental policy-making. Despite recent progress, the *polluter pays principle* is not yet fully integrated into markets for environmental goods and services.

Water

The framework for water resource management was strengthened during the review period, with all but two *regional councils* issuing water management plans. The portion of the population served by *public water supply* that fully complies with drinking water guidelines increased from 50% in 1994 to 83% in 2004. The portion of the population served by public waste water treatment is high (80%), and of that the majority (91%) is connected to secondary or tertiary treatment. National drinking water quality guidelines are aligned with those of the World Health Organization. A 2003 *voluntary agreement* (the Dairying and Clean Streams Accord) reached among the dairy industry and central and regional governments has stimulated investment by farmers in fencing and culverts; restrictions on access of dairy stock to waterways is expected to reduce diffuse nutrient loading of streams. Pollution of surface waters by *point sources* decreased over the review period due to improved treatment capacity and regulation through resource consents. Implementation of coastal management plans has helped reduce pollutant loading to *coastal waters* and thus improved coastal bathing water quality. Since 1995, six rivers have been designated *outstanding water resources* via national water conservation orders, bringing to 14 the number of rivers and lakes for which certain natural values are protected.

However, there is still *considerable need for progress* in water management and related outcomes. The absence of a national policy statement and legally binding national environmental standards for ambient waters has made it difficult for regional authorities to design regulatory or economic measures to limit *diffuse pollution of surface waters*. Over 15% of the population is supplied *drinking water* that does not meet national drinking water guidelines, and the Ministry of Health has declared that it has reached the limits of what it can do with non-regulatory approaches. Water quality in *rivers and lakes* has declined in regions dominated by pastoral farming, where high nutrient inputs and microbiological contamination destabilise natural ecosystems and pose risks to *human health*. In lowland areas, surface waters regularly exceed national water

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quality guidelines, and consequent damage to aquatic ecosystems is widespread, mainly due to run-off and leaching from pastoral farming and rural septic tanks. With increased demand for water for irrigation and domestic water consumption, the *first-come, first-served approach* to water allocation needs refinement. Particularly in water-stressed regions, there is a need to improve understanding of sustainable yield levels of key aquifers, and to rationalise allocation of water as an economic commodity. For farmers and households alike, incentives to conserve water are weak, as *pricing* is generally not linked to volume abstracted or consumed.

Recommendations:

- issue a *national policy statement on freshwater quality*, establish *national environmental standards* for drinking water sources, and strengthen national approaches for protecting receiving water quality;
- introduce *market-based instruments* to internalise the environmental costs of non-point source discharges from agriculture (e.g. run-off of fertilisers, urine from grazing stock);
- strengthen and expand the use of *water demand management measures* (e.g. volumetric metering, pricing for full recovery of water management costs, water efficiency standards);
- further expand the *knowledge base concerning sustainable abstraction levels* of key aquifers, and strengthen regulatory control of total allowable abstraction;
- consider introducing *cap-and-trade systems* and other regulatory and market-based instruments to rationalise the allocation of water abstraction rights in water-stressed regions.

Waste

Waste management rose on the environmental agenda during the review period. Publication in 2002 of the *national Waste Strategy* gave needed focus and clarity, as well as national objectives and targets, to a waste management framework otherwise fragmented in its legislation and institutions. In some areas, enhanced co-operation among local councils has facilitated the closing of small substandard landfills and the opening of larger landfills with better environmental

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performance. During the review period, a range of *technical guidelines for landfills* was established, and the portion of landfills having modern pollution control systems increased (e.g. leachate collection systems at 13% of landfills in 1995, 47% in 2002). Since the Waste Strategy set the objective of assuring full cost recovery for waste disposal, local councils have begun to apply *waste levies* on waste entering landfills. *Recycling of municipal waste* has expanded, with 75% of local councils providing kerbside collection of recyclable materials in 2004, up from 20% in 1996. A voluntary agreement (the Packaging Accord) based on the extended producer responsibility principle has contributed to increased recovery rates for packaging waste. Remediation of *contaminated land* has progressed at priority sites, although further progress on pre-1991 sites is dogged by unresolved financial liability issues.

Despite these recent improvements, New Zealand still faces *waste management challenges*. The rate of *municipal waste generation* continued to increase during the review period, with little sign of decoupling from GDP. The fragmented legislative and institutional framework for waste management has stymied efforts to take a cradle-to-grave approach to materials management. Related legislation mostly deals with the disposal end of the waste hierarchy, with recycling, recovery and minimisation dealt with solely on a voluntary basis. The absence of national environmental standards for disposal facilities has created an uneven playing field for landfill operators, and thus stunted the development of a market for waste management services. The *economic viability*

Recommendations:

- develop national regulations specifically concerning the *management of hazardous waste* and introduce mandatory and comprehensive systems for tracking its transport, treatment and disposal;
- expand and upgrade *waste treatment and disposal facilities* (e.g. landfills, hazardous waste platforms, waste water treatment plants), promoting co-operation among territorial authorities where this will lead to economies of scale, and applying the polluter pays principle;
- increase regulatory support for *recovery or recycling* (including deposit-refund systems) of priority waste, such as end-of-life vehicles and electronic goods, building on the extended producer responsibility principle;
- clarify liability arrangements for the *remediation of contaminated sites*, and develop financing mechanisms that apply the polluter pays principle as fully as possible.

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of recycling of a range of materials is limited by distance from larger markets, and this constraint makes even established recycling activities (e.g. for glass) vulnerable to collapse. *Information on waste management* is still not aggregated at regional or national levels, hampering strategic planning. Implementation of legislation on *hazardous waste management* relies largely on local authorities that may lack necessary technical capacity. As tracking of volumes and movements of hazardous waste is in its infancy, it is very difficult to manage associated environmental risks as called for in the Hazardous Substances and New Organisms Act.

Nature and biodiversity

In a global context, New Zealand has a *special responsibility* for biodiversity conservation, since a high percentage of its 90 000 native species are endemic and unique. New Zealand increased the priority given to nature and biodiversity conservation in the review period through *expanded funding and policy measures*. The security of 200 threatened species has improved through effective *species recovery programmes*, and there were no known species extinctions during the review period. Natural processes provide essential "ecosystem services" and form the base for important economic activities (e.g. tourism, forestry, fisheries, agriculture). *Protected areas* have been expanded to cover 32% of the country's land area and 7.5% of its territorial sea, significantly higher than in most OECD countries. A substantial increase in the area of private land protected under *covenant agreements* has extended the reach of efforts to protect indigenous biodiversity in remnant areas, although not always in accordance with national conservation priorities. Since 1998, *review of land tenure* arrangements in the high-country of the South Island has added 105 km^2 to public conservation lands and waters, and boosted the representation of tussock grasslands in protected areas. The Biodiversity Strategy (2000) and Biosecurity Strategy (2003), as well as two general policies issued in 2005, gave needed guidance to environmental managers. *Maori tribes* are increasingly taking responsibility for the management of their customary fishing rights.

Nevertheless, nature and biodiversity conservation still faces *major challenges* in New Zealand. Despite sizable decreases in the numbers of certain pests (e.g. rats, possums, rabbits) in some areas, *invasive species* continue to pose serious risks to indigenous ecosystems and species and inflict high economic damage overall. Land use change analysis shows a *net loss of nearly 175 km^2 of indigenous habitat* between 1996 and 2002. The central government recently decided not to proceed with a national policy statement on biodiversity,

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a draft of which was presented for consultation in 2001, but instead to pursue biodiversity objectives through a non-statutory approach. In the absence of data on ecosystem conditions and trends, conservation objectives continue to be defined in terms of agency output rather than *performance outcomes*. Efforts to put ecosystem survey and monitoring techniques into use have been slow and sporadic. Conservation of *freshwater and wetland ecosystems* has trailed that of other biotopes, even as pressures on them from diffuse pollution and water abstraction have grown. The rapid and prolonged increase in numbers of *tourists to a few places in national parks* and conservation areas has led to deficits in waste and waste water capacity and damage to habitats. Although New Zealand's marine environment is very vulnerable to alien species, control of risks from ballast water and vessel hull fouling is in its infancy.

Recommendations:

- issue *national policy guidance concerning conservation of biodiversity* on private land, and ensure that nature conservation objectives are fully reflected in spatial and coastal plans;
- reinforce protection of *wetlands and freshwater ecosystems* and consider introducing economic or fiscal instruments to curb pressures from agriculture and urbanisation;
- strengthen and harmonise *monitoring of major pressures on biodiversity and ecosystems*, both within and outside protected areas;
- further develop partnership approaches to conserving *biodiversity on private land*, prioritising conservation of ecosystems that are under-represented in public conservation lands and waters;
- develop and implement measures to mitigate *environmental pressures associated with increasing tourist numbers* and tourism concessions on conservation lands and waters.

2. Towards Sustainable Development

Integration of environmental concerns into economic decisions

Integration of environmental concerns into economic planning and development progressed during the review period. New Zealand has weakly

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decoupled its emissions of major air pollutants (SO_x, NO_x, NMVOCs) from its economic growth, and has lowered the energy intensity of its economy by 18% since 1996. Cross-subsidisation of electricity has been eliminated and higher end-user prices have strengthened incentives for conservation. *Renewable energy sources* constitute 30% of the energy supply, higher than in most OECD countries. Standards for motor vehicle fuel quality, issued in 1988, were recently revised. *Environmentally harmful subsidies* in the agriculture and fishery sectors are among the lowest in the OECD. The management of fisheries through a system of *individual transferable quotas* has helped avoid stock collapses and served as an example for other OECD countries. The *2003 Sustainable Development Programme of Action* defined a national approach to sustainable development and set out overarching principles and goals, thus giving needed guidance to territorial authorities. Supporting objectives were formulated in several national strategies (e.g. on biodiversity, waste, energy efficiency) issued since 2001. *Codes of practice* established by business associations in several sectors (e.g. tourism, fisheries, forestry) are facilitating best-practice sharing.

Despite this progress, New Zealand faces a *number of challenges* in integrating environmental concerns into economic activities. No strong decoupling of environmental pressures from GDP growth has been observed. Air emissions from power plants and mobile sources increased significantly during the review period. The use of *nitrogenous fertiliser* has outstripped GDP growth

Recommendations:

- strengthen and extend measures to *decouple environmental pressures* from economic growth, where possible using market-based approaches to ensure that environmental costs are reflected in prices;
- further develop *economic and regulatory measures* to reduce diffuse water and air pollution from agriculture, tourism and transport;
- further strengthen measures to promote *energy efficiency* in the transport, energy and industrial sectors (e.g. energy taxation and pricing, product standards, building codes);
- augment measures to encourage improved *emission performance of motor vehicles* and to internalise the environmental costs of road transport (e.g. fuel taxes, fuel quality standards, inspection of in-use motor vehicles, road user charges);
- ensure that *national sustainable development objectives* are reflected in territorial development plans and resource consents.

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since 1996, with consequent increases in run-off to surface waters. The rate of car ownership has grown very rapidly, and is now one of the highest among OECD countries; little has been done to manage demand for private road transport in favour of less polluting modes. Although still good overall, *air quality* has deteriorated in some urban areas, due mostly to emissions from motor vehicles, home heating and industry. *Economic and fiscal instruments* (e.g. taxes, charges, deposit-refund programmes) are little used to internalise the external environmental costs of sectoral activities, although the country's commitment to using market-based solutions is deep rooted. Sustained growth in demand for electricity has led to increased use of fossil fuels for power generation, with consequent increases in *greenhouse gas (GHG) emissions*.

Agriculture, forestry and the environment

Considerable progress was made during the review period in integrating environmental concerns into the daily management of agriculture and forestry operations. The *removal of agricultural subsidies* in the late 1980s catalysed the conversion of marginal pastoral land to plantation forests or back to native bush. Environmental risks posed by accumulation of *unwanted, old or obsolete agrochemicals* on farms have been reduced through collection and disposal campaigns by regional councils and the Ministry for the Environment (MfE). Some 320 km^2 of highly erosion-prone pastureland has been reforested since 1992 through the East Coast Forestry Project, advancing nature conservation and erosion control objectives. *Conservation of indigenous forests* has been strengthened through the progressive uptake of sustainable forest management practices by private forestry operators, and the permanent conservation of 1 300 km^2 of state-owned indigenous forests on the West Coast. Forestry and horticulture operations have increasingly adopted *environmental management systems*, some to assure access to markets. The area of land used for organic farming more than tripled during the review period, and an official organic assurance system was introduced. The Dairying and Clean Streams Accord has helped restrict run-off of urine from dairy stock to surface waters. The process of *land tenure review* in the South Island has helped reduce the impact of grazing on fragile high-country ecosystems.

Despite these advances, the agriculture and forestry sectors still face challenges with respect to better integration of environmental concerns. In contrast to many OECD countries, *GHG emissions* from agriculture (e.g. methane and nitrous oxide) account for some 50% of the national total, and are rising. *Changes in agricultural production* have led to increased intensity of inputs, including fertiliser and irrigation water, with consequent increases in

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environmental pressures. There is considerable potential to internalise related external costs through use of market-based instruments (e.g. taxes, charges, trading). The use of on-farm *nutrient budgeting* is still the exception rather than the rule, though it is growing. Diffuse pollution from agriculture is associated with elevated levels of *pathogens and nitrates* in lowland water bodies. Farmer compliance with resource consents for the disposal of *dairy shed effluent* is highly variable, with some farmers still spreading manure close to waterways. The scale of environmental pressures generated by intensification of agriculture during the review period, particularly as evidenced by the *deterioration of surface water quality in lowland areas*, warrants consideration of economic or fiscal instruments aimed at rationalising the use of agricultural inputs and encouraging sustainable land management practices. Land use change imagery has confirmed that clearing of native forests continues, in some instances without required resource consents.

Recommendations:

- further apply *sustainable land and forest management* approaches (e.g. environmental farm planning, nutrient budgeting, application of sustainable forest management practices) and assess their effectiveness in reducing pressures on the environment;
- strengthen compliance with the *environmental conditions set in resource consents and permits* (e.g. concerning disposal of dairy effluents, timber harvest in private indigenous forests) through increased inspection and enforcement;
- define and implement measures to reduce net *GHG emissions from the agriculture and forestry sectors*, prioritising those that also meet other environmental objectives (e.g. flood protection, nature conservation) so as to capture "win-win" opportunities;
- assure independent evaluation of the *effectiveness of voluntary agreements and covenants* in reducing environmental pressures from agriculture and forestry activities.

Integration of environmental and social decisions

Within a well-developed institutional framework for *sustainable development*, New Zealand has made considerable progress towards integrating and balancing environmental and social concerns. Greater *public participation*

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and consultation under the RMA has increased stakeholder input to environmental management and policy formulation. *Maori* have become more involved in environmental management through expanded natural resource rights and greater representation on regional and territorial councils. Access to judicial processes has significantly improved with the operation of the *Environment Court* since 1996, and a boost in its funding since 2002 that helped accelerate treatment of cases. Access to justice has been further facilitated through the Environmental Legal Assistance Fund, which provides funding to stakeholders wishing to bring environmental cases to court. Public awareness of environmental issues has increased and *environmental education* has been reinvigorated through the national Strategy for Environmental Education and its implementing guidelines for teachers.

Despite these gains, areas for improvement remain. Consistent *environmental indicators and trend data* that can be aggregated at national level are scarce, and the sole national state of the environment report was published in 1997. Although *public consultation* as part of RMA processes is extensive, it could be rendered more efficient in certain cases. Indeed, NGOs, Maori, businesses and other stakeholders complain of "consultation fatigue" and report that they must sometimes drop out of lengthy consultation processes when they become too costly. There is increasing public concern that New Zealand's "*clean and green*" *image* is waning; nevertheless, surveys show that this concern is not matched by a willingness to take personal action or accept the costs of measures

Recommendations:

- expand availability of quantitative *indicators and time series data related to environmental quality*, assuring policy relevance and public access;
- develop and implement a national *environmental health plan* (as called for in the national Health Strategy), setting quantified targets for reducing related public health costs and for minimising differences in exposure among various population groups;
- expand measures to reduce health risks associated with *poor indoor air quality*, substandard housing and unsafe heating;
- strengthen measures to prevent human exposure to *harmful levels of pesticides* through pesticide spray drift, residues in food and improper disposal;
- continue to promote the integration of *environmental education* in school curricula and in occupational training.

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to improve the environment. Poor *indoor air quality* and drinking water that does not comply with guidelines entail health risks, with socio-economically disadvantaged and Maori households disproportionately affected. New Zealand has a high rate of *waterborne disease* compared to other OECD countries. Ambient air quality in large urban areas has deteriorated, posing health risks. In agricultural areas, exposure to *pesticides from spray drift* is a public concern.

3. International Co-operation

New Zealand continues to give *high priority to international co-operation* for environmental protection, both to reduce pressures on shared natural resources and to maintain a level playing field in the context of expanding international economic integration and competition. Since 1996, New Zealand has ratified and begun implementing a number of international conventions related to *marine issues*, as recommended in the previous OECD review. It has also worked actively to promote international co-operation for the conservation of biodiversity and seabirds. A range of measures has been introduced to comply with the UN Fish Stocks Agreement regarding flag state control of fishing vessels on the high seas, and the industry has initiated negotiations with the central government to ban *destructive fishing practices* in one-third of New Zealand's offshore waters. The country has met all of its port state control requirements under the Tokyo Memorandum of Understanding. Concerning *ozone-depleting substances*, New Zealand has complied fully, and often before international deadlines, with phase-out timetables established under the Vienna Convention's protocols. Surveillance at the borders for illegally transported CITES-protected items is strong, although fines and sanctions are sometimes too low to be dissuasive. Within the South Pacific region, New Zealand has provided technical assistance on trade and environment and marine conservation issues. Environmental considerations are systematically taken into account in *official development assistance* projects. Concerning the *Antarctic*, New Zealand produced the first state of the environment report of the Ross Sea Region and worked with the United States to establish the first Antarctic Specially Managed Area. Regulatory requirements for *seabird scaring devices* on fishing boats have helped reduce seabird mortality, although more than 5 000 seabirds per year are still killed as by-catch in New Zealand waters.

Despite these achievements, there is a need for further progress on several fronts. The *GHG intensity* of the New Zealand economy is the fourth highest in the OECD, and GHG emissions continued to grow during the review period. A domestic target for 2000, concerning reduction of CO_2 emissions, was not met. *Carbon sequestration in forests*, a key factor in New Zealand's GHG accounting

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since 1990, is likely to diminish over time as planted forests reach maturity, and government retention of forestry carbon sink credits may have contributed to the weakening of incentives to expand plantations. The suspension of the *climate change policy package* in 2005 (including its planned carbon tax) has created great uncertainty about how New Zealand will meet its *Kyoto target*. The country has acquired relatively little experience using Kyoto flexible mechanisms, although their use will likely be required to meet the Protocol target. The *energy intensity* of the industrial sector is high, and the carbon intensity of the electricity supply, although still low, is increasing. Low taxation of motor vehicle fuels (or nonexistent in the case of diesel) translates into relatively low prices at the pump, giving little incentive for fuel conservation. To meet the phytosanitary requirements of importing countries, New Zealand still depends heavily on *methyl bromide* (a strong ozone-depleting substance) for the fumigation of export forest products and strawberries. Development of a national *ocean policy* has been slow, and the management of some high seas fish stocks remains challenging. Consideration should be given to increasing domestic or international protection of certain endemic insect species which are heavily affected by international trade.

Recommendations:

- adopt and implement a clear and comprehensive *package of climate change policy measures* (e.g. economic instruments, flexible mechanisms) to meet New Zealand's international commitments, giving consideration to setting sectoral targets; develop strategies for future climate protection commitments in line with guidelines of the Intergovernmental Panel on Climate Change;
- give consideration to allocating *carbon sink credits* and liabilities to forest owners, and ensure that the agriculture sector reduces its GHG emissions through low-cost practice changes and efficiency gains (e.g. energy efficiency improvements, increased biogas recovery);
- review and adjust fines and sanctions for smuggling of *CITES-protected species* or derived products, to ensure that they are dissuasive relative to the potential gains from smuggling;
- finalise and implement the *ocean policy* and pursue the further expansion of marine reserves and the strengthening of regional co-operation for the management of *high seas fish stocks*;
- increase levels of *official development assistance* and continue to mainstream environmental concerns into ODA.

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2

WATER AND WASTE MANAGEMENT*

Features

- Restoring surface water quality
- Protecting drinking water quality
- Rationalising water allocation
- Recovering full costs of waste disposal
- Improving management of hazardous waste

* This chapter reviews progress since the previous OECD Environmental Performance Review of 1996. It also reviews progress with respect to the objective "maintaining the integrity of ecosystems" of the 2001 OECD Environmental Strategy.

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Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of New Zealand:

Water

- issue a *national policy statement on freshwater quality*, establish *national environmental standards* for drinking water sources, and strengthen national approaches for protecting receiving water quality;
- introduce *market-based instruments* to internalise the environmental costs of non-point source discharges from agriculture (e.g. run-off of fertilisers, urine from grazing stock);
- strengthen and expand the use of *water demand management measures* (e.g. volumetric metering, pricing for full recovery of water management costs, water efficiency standards);
- further expand the *knowledge base concerning sustainable abstraction levels* of key aquifers, and strengthen regulatory control of total allowable abstraction;
- consider introducing *cap-and-trade systems* and other regulatory and market-based instruments to rationalise the allocation of water abstraction rights in water-stressed regions;

Waste

- develop national regulations specifically concerning the *management of hazardous waste* and introduce mandatory and comprehensive systems for tracking its transport, treatment and disposal;
- expand and upgrade *waste treatment and disposal facilities* (e.g. landfills, hazardous waste platforms, waste water treatment plants), promoting co-operation among territorial authorities where this will lead to economies of scale, and applying the polluter pays principle;
- increase regulatory support for *recovery or recycling* (including deposit-refund systems) of priority waste, such as end-of-life vehicles and electronic goods, building on the extended producer responsibility principle;
- clarify liability arrangements for the *remediation of contaminated sites*, and develop financing mechanisms that apply the polluter pays principle as fully as possible.

Conclusions

Water

The framework for water resource management was strengthened during the review period, with all but two *regional councils* issuing water management plans. The portion of the population served by *public water supply* that fully complies with

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drinking water guidelines increased from 50% in 1994 to 83% in 2004. The portion of the population served by public waste water treatment is high (80%), and of that the majority (91%) is connected to secondary or tertiary treatment. National drinking water quality guidelines are aligned with those of the World Health Organization. A 2003 *voluntary agreement* (the Dairying and Clean Streams Accord) reached among the dairy industry and central and regional governments has stimulated investment by farmers in fencing and culverts; restrictions on access of dairy stock to waterways is expected to reduce diffuse nutrient loading of streams. Pollution of surface waters by *point sources* decreased over the review period due to improved treatment capacity and regulation through resource consents. Implementation of coastal management plans has helped reduce pollutant loading to *coastal waters* and thus improved coastal bathing water quality. Since 1995, six rivers have been designated *outstanding water resources* via national water conservation orders, bringing to 14 the number of rivers and lakes for which certain natural values are protected.

However, there is still *considerable need for progress* in water management and related outcomes. The absence of a national policy statement and legally binding national environmental standards for ambient waters has made it difficult for regional authorities to design regulatory or economic measures to limit *diffuse pollution of surface waters*. Over 15% of the population is supplied *drinking water* that does not meet national drinking water guidelines, and the Ministry of Health has declared that it has reached the limits of what it can do with non-regulatory approaches. Water quality in *rivers and lakes* has declined in regions dominated by pastoral farming, where high nutrient inputs and microbiological contamination destabilise natural ecosystems and pose risks to *human health*. In lowland areas, surface waters regularly exceed national water quality guidelines, and consequent damage to aquatic ecosystems is widespread, mainly due to run-off and leaching from pastoral farming and rural septic tanks. With increased demand for water for irrigation and domestic water consumption, the *first-come, first-served approach* to water allocation needs refinement. Particularly in water-stressed regions, there is a need to improve understanding of sustainable yield levels of key aquifers, and to rationalise allocation of water as an economic commodity. For farmers and households alike, incentives to conserve water are weak, as *pricing* is generally not linked to volume abstracted or consumed.

Waste

Waste management rose on the environmental agenda during the review period. Publication in 2002 of the *national Waste Strategy* gave needed focus and clarity, as well as national objectives and targets, to a waste management framework otherwise fragmented in its legislation and institutions. In some areas, enhanced co-operation

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among local councils has facilitated the closing of small substandard landfills and the opening of larger landfills with better environmental performance. During the review period, a range of *technical guidelines for landfills* was established, and the portion of landfills having modern pollution control systems increased (e.g. leachate collection systems at 13% of landfills in 1995, 47% in 2002). Since the Waste Strategy set the objective of assuring full cost recovery for waste disposal, local councils have begun to apply *waste levies* on waste entering landfills. *Recycling of municipal waste* has expanded, with 75% of local councils providing kerbside collection of recyclable materials in 2004, up from 20% in 1996. A voluntary agreement (the Packaging Accord) based on the extended producer responsibility principle has contributed to increased recovery rates for packaging waste. Remediation of *contaminated land* has progressed at priority sites, although further progress on pre-1991 sites is dogged by unresolved financial liability issues.

Despite these recent improvements, New Zealand still faces *waste management challenges*. The rate of *municipal waste generation* continued to increase during the review period, with little sign of decoupling from GDP. The fragmented legislative and institutional framework for waste management has stymied efforts to take a cradle-to-grave approach to materials management. Related legislation mostly deals with the disposal end of the waste hierarchy, with recycling, recovery and minimisation dealt with solely on a voluntary basis. The absence of national environmental standards for disposal facilities has created an uneven playing field for landfill operators, and thus stunted the development of a market for waste management services. The *economic viability of recycling* of a range of materials is limited by distance from larger markets, and this constraint makes even established recycling activities (e.g. for glass) vulnerable to collapse. *Information on waste management* is still not aggregated at regional or national levels, hampering strategic planning. Implementation of legislation on *hazardous waste management* relies largely on local authorities that may lack necessary technical capacity. As tracking of volumes and movements of hazardous waste is in its infancy, it is very difficult to manage associated environmental risks as called for in the Hazardous Substances and New Organisms Act.

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1. Objectives and Management Framework

1.1 Water management

Legislative and institutional framework

The *1991 Resource Management Act (RMA)* devolved additional responsibility for management of water resources to 12 regional councils and five unitary councils (hereafter collectively referred to as *regional authorities*), with management delineated along water basin boundaries. Their responsibilities are threefold: i) for *freshwater*, to regulate abstraction and diversion, direct and indirect discharges to water bodies and construction of dams and flood control infrastructure; ii) for *coastal marine waters*, to regulate pollutant discharges and the impact of reclamation activities; and iii) for *water catchments*, to mitigate flood risks, soil degradation and erosion. Regional authorities define water management priorities in regional policy statements and plans and in regional coastal plans. They are also responsible for issuing effects-based environmental permits, called "resource consents", for activities they regulate. In 2006, all but the Gisborne and Canterbury regions had operative regional plans, and about half of the plans specifically included enhancing water quality as an objective. Responsibility for assuring *water services* (e.g. water supply, sewerage reticulation and waste water collection and treatment) lies primarily with district and city councils (hereafter collectively referred to as *territorial authorities*). When their activities involve abstracting water or discharging waste water, territorial authorities are regulated by regional authorities through resource consents.

Under the RMA, the *central government* can use three tools to guide regional authorities' management of water resources. First, national *water conservation orders*[1] may be used to protect "outstanding" water resources by prohibiting damming and restricting abstraction. In addition, the Ministry for the Environment (MfE) can promote consistency among regional authorities' approaches to water management by developing and issuing general *national policy statements* or more detailed *national environmental standards*. All plans, policy statements and resource consents issued by regional authorities must be consistent with national policy statements and environmental standards. By 2006, national conservation orders had been used to designate 14 outstanding water bodies, six of them since 1995 (Table 2.1). The other two national tools, however, had hardly been used[2] (Chapter 4). Although the Coastal Policy Statement (1994) has a chapter on coastal water quality, no national policy statement exists for freshwater, nor have national environmental standards been issued for receiving water quality (fresh or coastal) despite a 1996 OECD recommendation to this effect. The national Sustainable Development Programme of Action (2003) identifies better management of freshwater as one of four key sustainability issues, and describes three desired outcomes: i) freshwater is

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allocated and used sustainably, efficiently and equitably; ii) freshwater quality is maintained to meet all appropriate needs; and iii) water bodies with nationally significant natural, social or cultural heritage are protected.

In the absence of national environmental standards concerning water, the MfE has endorsed *non-statutory national guidelines for freshwater quality* (Table 2.2). *Guidelines for drinking water quality*, established by the Ministry of Health (MoH), also lack statutory standing, although their stated purpose is to protect public health (MoH, 2005). Regional plans or resource consents may also set limits for point-source discharges.

Policy objectives

New Zealand's *Environment 2010 Strategy* (MfE, 1995a) includes several goals related to *water management*:

– maintain sufficient water in water bodies to meet current and future needs;

Table 2.1 **Water bodies protected by national water conservation orders**[a]

	Location	Year effective
Rivers		
Motu	North Island	1984
Rakaia	South Island	1988
Manganui-a-teo	North Island	1989
Ahuriri	South Island	1990
Grey	South Island	1991
Rangitikei	South Island	1993
Kawarau	North Island	1997
Mataura	South Island	1997
Buller	South Island	2001
Mohaka	North Island	2004
Motueka and Riwaka	South Island	2004
Rangitata	South Island	2006
Lakes		
Wairarapa	North Island	1989
Ellesmere	South Island	1990

a) By law, once a water body is designated as having "outstanding" values (i.e. of national significance), additional abstractions can be permitted only to the extent that they are clearly compatible with protection of those values.

Source: Adapted from the New Zealand Recreational Canoeing Association.

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– ensure that quality of surface freshwater and coastal waters is sufficient to meet community needs (e.g. swimming, fishing, shellfish gathering) and that aquatic life is not significantly affected by discharges;

– restore and prevent further degradation of groundwater quality and quantity;

– prevent degradation of quality and flow of water resources identified as having national significance for recreational, scenic, scientific or cultural reasons.

In 2003, the MfE and the Ministry of Agriculture and Forestry (MAF) jointly launched the *Sustainable Water Programme of Action* to identify priorities for government action to improve freshwater management. With input from working groups on water allocation and use, water quality and water bodies of national

Table 2.2 **Selected guidelines for freshwater quality,**[a] 2006

	Impact rationale	Guideline value
Turbidity	Esthetics/contact recreation	4.1 NTU (upland); 5.6 NTU (lowland)
Visual clarity	Esthetics/contact recreation	0.8 m (upland); 0.6 m (lowland)
Total nitrogen	Possible adverse ecosystem effects	0.295 gNm^{-3} (upland); 0.614 gNm^{-3} (lowland)
Nitrate	Possible adverse ecosystem effects	50.0 gm^{-3} (public water supply); 400.0 gm^{-3} (stock water supply)
Nitrite	Possible adverse ecosystem effects	3.0 mgm^{-3} (public water supply); 36.0 mgm^{-3} (stock water supply)
Dissolved inorganic nitrogen	Possible adverse ecosystem effects	0.167 gm^{-3} (upland); 0.444 gm^{-3} (lowland)
Ammonia	Possible adverse ecosystem effects	0.010 gm^{-3} (upland); 0.021 gm^{-3} (lowland)
Total phosphorus	Possible adverse ecosystem effects	0.026 gm^{-3} (upland); 0.033 gm^{-3} (lowland)
Dissolved reactive phosphorus	Possible adverse ecosystem effects	0.009 gm^{-3} (upland); 0.010 gm^{-3} (lowland)
Faecal coliforms	Stock water supply	100/100 ml (median)
E. coli	Contact recreation	≤ 260/100 ml (single sample "acceptable" level); 260-550 ml (single sample, "alert" level); > 550/100 ml (single sample "action" level)
Periphyton (filamentous)	Drinking water	< 1/100 ml
	Esthetics/recreation	120 mg chlorophyll α/m^2
	Trout habitat and angling	120 mg chlorophyll α $/m^2$
	Benthic faunal diversity	50 mg chlorophyll α $/m^2$

a) All guidelines for drinking water, bathing water and receiving waters are non-statutory, and thus are not legally enforceable.
Source: Adapted from the MfE, 1992, 1994, 1999, 2000a, 2002a; ANZECC, 2000; MoH, 2005; MfE/MoH, 2003.

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importance, the programme identified eight key water management issues and proposed a package of policy actions for discussion (MfE, 2004a-d). Extensive consultation in 2005 showed broad-based support for several of the *proposed policy directions*, in particular for the development of: i) a national policy statement on freshwater; ii) minimum national standards for water quality and limits on water abstraction; iii) increased central government guidance for regional authorities through technical support and best-practice sharing; and iv) market-based instruments to manage diffuse discharges (MfE, 2005a). In April 2006, the Cabinet approved an initial "implementation package", calling for the development of a national policy statement on managing increased demand for water and definition of national environmental standards regarding the measurement of water abstraction and use and the setting of minimum environmental flows. The package also left open the possibility of developing a national policy statement on surface water quality, and of further developing tools for recovering costs of water management.

1.2 Waste management

Legislative and institutional framework

New Zealand's institutional framework for waste management is *fragmented*. Six national laws[3] define various aspects of waste management responsibility. The Local Government Act (LGA) assigns *local authorities* primary responsibility for municipal waste management, and amendments in 1996 required these authorities to establish waste management plans for their jurisdictions and to enact local by-laws for waste management. The preparation of *waste management plans* by local councils has advanced since 1996, although nearly 20% of councils missed the June 2005 statutory deadline for their preparation, and a few have not produced plans at all. The targets set out in the 2002 national Waste Strategy (Table 2.3) are not incorporated in 25% of local plans. Also, most plans address only solid waste, making no provisions for management of hazardous waste, liquid waste and waste water (MfE, 2002b). The "end-of-pipe" focus of New Zealand's waste management institutions partly reflects the lack of overarching legislation addressing materials management.

Responsibility for mitigating risks posed by *hazardous waste* is shared among *territorial and regional authorities* under four national laws.[4] The RMA requires regional policy statements to define land use management approaches that mitigate risks from activities involving hazardous substances. Local plans are also to incorporate risk reduction provisions for hazardous facilities that meet minimum performance standards set by the 1996 Hazardous Substances and New Organisms (HSNO) Act (e.g. for safe separation distances, spill containment and waste management). The 2005 revision of the Land Transport Act stopped short of

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Table 2.3 **Selected targets of national Waste Strategy**

Subject	Target	Target date[a]
Waste minimisation	Territorial authorities to report on progress on waste minimisation	Annually
	Regional councils to include waste minimisation objectives in new or renewed industrial resource consents	2005
	95% of the population to have access to community recycling facilities	2010
	Territorial authorities to incorporate in building regulations reference to space allocation for recycling facilities in multi-unit residential and commercial buildings	2005
Waste disposal	Operators of all landfills, cleanfills and waste water treatment plants have calculated user charges to achieve full cost recovery and established a time frame for phasing them in	2005
	All cleanfills comply with cleanfill disposal guidelines	2005
	All substandard landfills upgraded or closed	2010
	All substandard waste water treatment facilities have been upgraded, closed or replaced with systems that comply with relevant regional and coastal plans and guidelines	2020
Hazardous waste	Establishment of an integrated and comprehensive national hazardous waste management policy covering reduction, transport, treatment and disposal	2005
	20% increase of recovery and recycling rates for priority hazardous waste	2012
Industrial waste	Territorial authorities implement and monitor by-laws on industrial waste	2005
	Territorial authorities ensure that all new or renewed industry waste resource consents include waste minimisation objectives	2005
	At least ten major businesses to have voluntary agreements with central or local government regarding waste minimisation	2005
Construction and demolition waste	Territorial authorities to identify construction and demolition waste quantities and set local targets for diversion from landfill	2005
	50% of reduction going to landfill as compared to December 2005 level	2008
Organic waste	All territorial authorities to estimate the rate of generation of organic waste and set local targets for diversion from disposal	2003
	Garden waste diverted from landfill and beneficially used (60%, 95%)	2005, 2010
	95% of sewage sludge to be diverted from landfill to composting, beneficial use or appropriate treatment to minimise methane emissions and leachate	2007
	95% of commercial organic waste to be diverted from landfill to beneficial use	2010
Contaminated sites	Finalise list of contaminated sites and submit 50% of them to rapid risk assessment	2008
	Risk assessments of remaining contaminated sites completed, and remediation plans established for high-risk sites	2010
	All high-risk contaminated sites mitigated or remediated	2015
Organochlorines	New Zealand meets its Stockholm Convention commitment to collect and destroy PCBs and organochlorine pesticide waste	2010
	Average body burdens of dioxins reduced to 10% of present level	2020

a) All deadlines are December of the given year.
Source: Adapted from the MfE, 2002b.

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requiring electronic tracking of the movement of hazardous waste, although some waste handlers participate in the voluntary WasteTRACK regime. At present, various aspects of hazardous waste management are regulated under three different national policies; use and disposal are regulated under the RMA, storage under the HSNO Act and transport under the Land Transport Act. The complexity of the institutional framework for hazardous waste management has been recognised as a serious constraint; in particular, the national Waste Strategy set a goal of establishing a comprehensive national hazardous waste management policy by 2005, but this has yet to be done (MfE, 2002b).

Policy objectives

The *Environment 2010 Strategy* (MfE, 1995a) set several waste management objectives to be met by 2010, including:

– manage waste to reduce risks to environmental quality and public health to levels that are widely agreed as being socially acceptable;

– clean up contaminated sites to reduce risk to the environment, people and the economy;

– manage or prevent the harmful effects of hazardous substances in order to protect the environment and well-being of people and communities.

The *Waste Strategy* set a range of *national targets* covering waste minimisation, disposal and management (Table 2.3). Although the strategy provided needed focus, many of its targets were more short-term than strategic (half are to be achieved by 2007). Nonetheless, the strategy sets three orientations: i) moving towards full cost recovery for waste disposal; ii) significantly reducing the rate of waste generation; and iii) further applying the principles of extended producer responsibility and "cradle-to-grave" materials management.

Although there are *no national environmental standards* regarding waste management per se, the national environmental standards on air quality, issued in 2004, include standards regarding the capture of landfill gases and the banning of fires at landfills. Existing *guidelines* for waste treatment and disposal are not legally binding. Several sets of technical guidelines for landfills, for instance, have been issued since 2000.[5] Although regional authorities are advised to reflect these guidelines in resource consents for landfills (which specify conditions for discharges to air and water) uptake is highly variable.

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2. Water Management

2.1 Ambient water quality trends

Rivers and lakes

Compared to New Zealand's national guideline values, *water quality of a number of rivers* is poor, according to an assessment by the National Institute of Water and Atmospheric Research (NIWA) of river water quality trends from 1996 to 2002 (Larned *et al.*, 2005). Based on a data set comprising water quality measurements from 15 regional authorities and NIWA's National River Water Quality Network, the study showed that national guidelines[6] were exceeded at 58% of the sites monitored for ammonium concentration, 69% for E. coli, 61% for dissolved reactive phosphorus, 42% for NO_x and 40% for clarity. Results of a nationwide comparison of rivers located in four major land cover classes indicated that urban classes had the lowest water quality, followed by the pastoral, plantation forest and natural classes. In fact, *few rivers in urban watersheds met any of the water quality guidelines*, and those in low-elevation pastoral watersheds also generally failed to meet them. While pollutant concentrations in rivers in mountain and hill areas were generally at or near guideline values, only those in undeveloped areas were actually below the guideline limits. Whereas run-off and storm water are the chief sources of urban water contamination, diffuse pollution from farming is the main source of water quality degradation in rural areas (Snelder and Scarsbrook, 2003).

The latest nationwide assessment of *water quality in lakes*, made in 1997, estimated that 10-40% of lowland lakes were eutrophic (Burns and Rutherford, 1997). Although no national assessment has been carried out since then, recent data from regional councils give little reason to believe that lake water quality has improved, overall. The water quality of Lake Taupo, the country's largest lake, has gradually declined as nitrogen inputs from diffuse sources have continued to increase (Box 2.1). The water quality of nine of the eleven Rotorua Lakes, very popular tourist destinations, has either not improved or has declined; only two have shown improvement (Scholes, 2004). However, some lakes (e.g. Horowhenua, Tutira) have shown considerable improvement in water quality after diversion of point-source discharges. But overall, the high rates of non-conformity of New Zealand's surface waters with national guidelines, and the resulting ecological damage, signal the need to better understand and control *diffuse sources* of water pollution.

Groundwater

New Zealand's *aquifers* are generally associated with alluvial gravel, fractured volcanic rock and karst lithology, and are thus by nature highly susceptible to microbial

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Box 2.1 **Lake protection**

Lake Taupo

Lake Taupo is *New Zealand's largest lake* (623 km^2; 45 km wide and 190 m deep). Situated in the Waikato region, it is critical to the local economy, as it attracts many tourists and its trout fishery generates NZD 70 million per year (about 10% of the Taupo district GDP). Data point to a gradual decline in the *health of the oligotrophic lake*, with algae blooms and reduced visibility resulting from nitrogen inputs both urban and rural in origin. The decline continued during the review period: more of the particulate form of nitrogen is being found in the lake's surface waters, and potentially toxic algae blooms occurred in 2001 and 2003 (Environment Waikato, 2003). Pastoral land use contributes 37% of nitrogen input to the lake, although less than 10 km^2 of the catchment (which covers 2 800 km^2) is used for dairy farming and about 600 km^2 for pasturing sheep and beef cattle. Projections suggest that if all pasture land in the catchment were converted to dairy farms, the nitrogen load to the lake would be more than 20% higher (Journeaux, 2004).

In 2003, the regional council proposed a *Strategy for Protecting Lake Taupo*. The overall target is to reduce manageable nitrogen input by 20% over 15 years (Environment Waikato, 2003), so that water quality in 2020 should be roughly the same as in 2003. Some NGOs have challenged the target as unambitious, since the lake's health was compromised by nitrogen levels in 2003 (EDS, 2004). The strategy entails changing farming practices in the catchment, upgrading sewerage systems around the lake and converting some pastoral land to low-nitrogen uses. To these ends, a *funding package* of NZD 81.5 million (45% from the central government, 33% from Environment Waikato, 22% from Taupo District Council) will be made available over the 15 years, primarily to encourage pastoral farmers to diversify to low-nitrogen land uses through a mixture of financial incentives and advisory services.

Support for action to reduce pollution of the lake is widespread, yet considerable debate remains about whether the *polluter pays principle* is being adequately applied. Effectively, there is a risk of establishing a precedent for reversal of environmental damage relying on provision of government cash to those responsible. Environment Waikato has proposed modifying its regional plan to *cap nitrogen inflow* at 2003 levels from all sources (EDS, 2004). A system of tradable nitrogen credits, evoked in the strategy, deserves further study as a potential alternative.

Lake Ellesmere

Lake Ellesmere, an *important wetland system*, is a shallow (average depth 1.4 metres), brackish lagoon in the Canterbury region, covering 265 km^2. In 1990, it was declared an outstanding wildlife habitat under a national conservation order (Table 2.1). It hosts up to 98 000 wetland birds at any one time, as well as commercial eel and flounder fishing. Natural events, combined with changes in land use such as conversion of surrounding flax and raupo wetlands into farms, have affected the lake ecology. Uncontrolled increases in diffuse effluents have made the lake *eutrophic*. Green algae blooms are frequent and widespread. Environment Canterbury, the regional council, faces the challenge of establishing minimum flows for the more than 40 tributaries feeding the lake so as to meet irrigation needs while protecting the lake. Consultations and studies continue, and a draft action plan has been under development since 2002.

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contamination because of their high permeability. Faecal coliforms are frequently found in groundwater in rural areas (Davies-Colley *et al.*, 2003). In the Canterbury Plains, nearly 20% of monitored wells show long-term deterioration, and in some, concentrations are up to two times higher than drinking water guidelines (Hanson *et al.*, 2002; Close *et al.*, 2002). Major sources of contamination are grazing livestock, fertiliser run-off and septic tank leachate. In the Waikato region, faecal bacteria were detected in 13% of wells in dairying areas and 50% of wells in towns lacking reticulated sewerage (Sinton, 2001). A survey by the Tasman District Council of the Waimea Plains aquifer in 2000 showed 60% of shallow wells and 20% of deeper wells testing positive for faecal bacteria. New Zealand has a high rate of waterborne disease compared with other OECD countries (Chapter 6). Intensity of pesticide use remains low and is not believed to pose much risk of groundwater contamination (Chapter 5). As part of the National Groundwater Monitoring Programme, pesticide concentrations in selected groundwater wells are monitored once every four years.

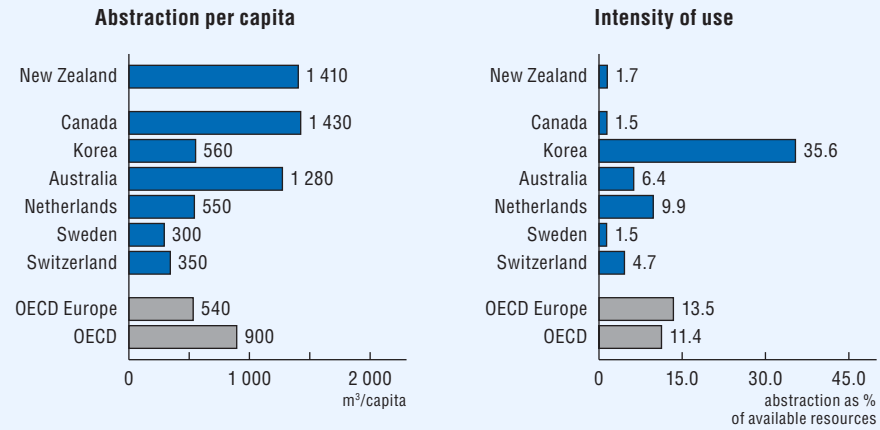
2.2 Water allocation and demand management

The *intensity of water use* in New Zealand is one of the lowest among OECD countries, as the country as a whole has abundant water resources (Figure 2.1). However, the per capita water abstraction rate is two to three times higher than the average for OECD countries, reflecting the importance of irrigated agriculture and hydroelectricity generation. Nationally, annual water consumption (i.e. excluding hydroelectricity generation) totals some 5.4 billion cubic metres, with the bulk going to irrigation (77%), followed by public supply (16%) and industry (7%) (Lincoln Environmental, 2000). During the review period, abstractions outpaced growth in GDP because of large-scale conversion from sheep farming to irrigated dairy farming and a steady increase in horticulture and viticulture (PCE, 2004; StatsNZ, 2004a). Population growth and increasing affluence have also increased household consumption. Growth and intensification of water use happened very quickly during the review period, and the allocation and use system has not kept up.

As water has not historically been a scarce resource in New Zealand, the *economic dimension* of its allocation has been little developed. Under the RMA, regional authorities allocate abstraction rights to users through *resource consents* issued on a first-come, first-served basis. The rights may be valid for up to 35 years (e.g. in Canterbury and Otago). To recover administrative costs, most councils charge applicants a *processing fee* for water abstraction consents, and some charge consent holders a variable fee for compliance monitoring. Metering and volumetric charging of abstracted water is rare (Box 2.2). Councils have diverse approaches for dealing with an overallocated or fully allocated resource. The Wellington Regional Council

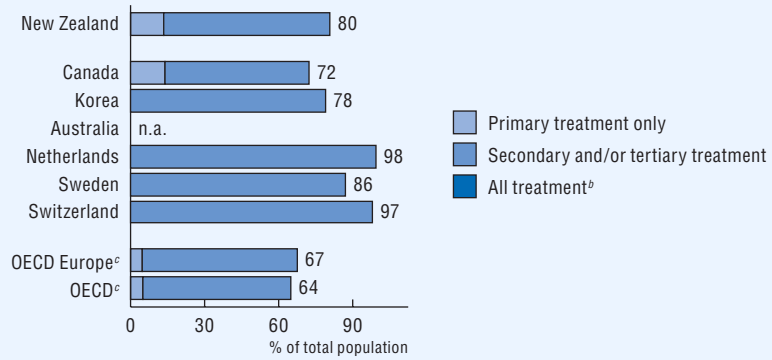
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Figure 2.1 **Freshwater use,** early 2000s[a]



a) Or latest available year.
Source: OECD, Environment Directorate.

Figure 2.2 **Population connected to public waste water treatment plant,** early 2000s[a]



a) Or latest available year.
b) Primary, secondary and/or tertiary treatment.
c) Secretariat estimates.
Source: OECD, Environment Directorate.

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Box 2.2 **Pricing of water and waste management**

Water abstraction and services

Historically, New Zealand has had plentiful water resources, and the notion that water is a public good that should be delivered at "*cost of supply*" is deeply entrenched. Abstraction of natural water from rivers, lakes and aquifers is not paid for, but administrative and compliance monitoring costs are recovered. Most *water abstraction consents* do not stipulate volumetric limits, though commercial enterprises and large domestic users (e.g. households with swimming pools) are charged on a volumetric basis. Farmers receiving water from community irrigation projects pay the full cost of supply, since such systems are privately owned by farmers' co-operatives.

Households are rarely charged on a volumetric basis for *water supply or waste water treatment*. Instead, a flat rate is typically integrated into municipal taxes (MfE, 2004a), often calculated as a function of house or land area, capital value or both. For example, for an average New Zealand household, a variable charge for water supply amounts to about NZD 165 per year. This is paid on top of a general rate of NZD 304 per NZD 100 000 of property value. Communities with fewer than 10 000 residents are eligible for central government subsidies for water services, which may cover up to 50% of the cost.

Waste services

To finance *municipal waste services*, an increasing number of local councils are moving from tax-based funding to waste charge or "pay-as-you-throw" systems, and from zero or nominal charges to higher or full cost recovery. The shift seems to have accelerated since the New Zealand Waste Strategy (2002) established full cost recovery as a national objective. In some cases, households pay waste management charges by buying special garbage bags at NZD 1-2 per 60 litre bag. In general, however, households do not pay a separate fee for waste collection (including kerbside collection of recyclables), whose cost is incorporated into municipal taxes as a flat fee.

Landfill disposal charges are in the range of NZD 30-135 per tonne. They are generally increasing as substandard landfills are upgraded and larger landfills with modern pollution control equipment come into operation.

has established minimum flows and allocation limits for the 15 rivers within its borders that are fully allocated (MfE, 2004a). Where minimum flows cannot be assured if additional consents are granted, councils (e.g. Tasman District Council) often put applicants on a *waiting list* for water rights to be liberated. Other councils

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use *rationing systems*, reviewing existing consents and adjusting them to reduce allocations enough to accommodate new entries. RMA provisions that allow the transfer of water consents have seldom been used, perhaps because they do not allow temporary or partial transfers.

The *first-come, first-served allocation system* has prevented optimal allocation of water as an economic commodity with environmental and social dimensions. Once a water body is fully allocated, it is very difficult for new users to gain access, regardless of the value of their proposed use, because trading is not developed and consents tend to be issued for long periods. One side-effect is that, in some high demand catchments, users overconsume in order to secure rights they may need in the future. In some areas, the scarcity value of water is being factored into land prices, particularly in viticulture and dairy areas (StatsNZ, 2004b). Within the framework of the Sustainable Water Programme of Action, the MfE in 2005 considered options for rationalising water allocation, particularly in water-stressed regions. The options include establishing a market for water consent transfer within highly stressed catchments, modifying abstraction consents to create incentives for conservation (e.g. metering, volumetric limits and charges) and developing water use efficiency standards (MfE, 2005a).

Present *water pricing arrangements* for households create little incentive for conservation. Municipal water supply is provided by the 68 territorial authorities, in addition to two bulk suppliers providing water to Auckland and Wellington. Most councils charge households for water and waste water services through a uniform annual charge or a charge based on property value (Box 2.2). There is thus no economic incentive for consumers to reduce their water consumption through efficiency or conservation measures. As many areas are experiencing population growth and increasing demand, some municipalities are facing diminishing aquifer and river levels. In the few areas where meters and *flow-based charges* have been introduced, consumption per capita has decreased markedly (PCE, 2001). The MfE observes that uptake of *water-saving devices* has been very modest; discussions are under way on requiring installation of such devices in building codes or setting water efficiency standards for buildings. The introduction of *water efficiency labelling requirements* for white goods and plumbing products in 2006 is a step in the same direction.

2.3 Management of pollutant discharges

Pollutant loading of rivers from point sources such as dairy and pig farms and factories has declined since the 1980s. As regional plans and resource consents have become more demanding, treatment systems have been expanded or upgraded. However, pollution from *non-point sources* has become a more serious concern.

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Although the trend towards land application of dairy shed effluents has reduced nutrient inputs to *surface waters*, this has to a large extent been counterbalanced by an increase in stocking rates on dairy pastures (Chapter 6).

Point-source discharges

The portion of the population connected to *public sewerage* in New Zealand is well above the OECD average (Figure 2.2). A full 50% of the connected population is covered by tertiary treatment and 41% by secondary treatment. The two biggest cities, Auckland and Christchurch, upgraded their municipal waste water treatment plants to tertiary treatment during the review period. However, a recent MoH survey revealed that 25-33% of reticulated community sewerage systems were underperforming, particularly in smaller communities. The national Waste Strategy includes a target to upgrade, close or replace all substandard waste water treatment plants by 2020 (Table 2.3). To assist territorial authorities engaged in upgrades, the MfE has issued municipal waste water monitoring guidelines and a handbook on municipal waste water management for small communities (NZWERF, 2002; MfE, 2003). In addition, in 2003 the MoH launched a ten year, NZD 150 million *sewerage subsidy programme* to help communities of fewer than 10 000 people to upgrade their waste water treatment facilities. By May 2006, about 75% of the budget had been committed for 40 communities.

Point-source discharges from large industries are limited in number, because the industrial sector is small. Nonetheless, progress has been made in this field since the last OECD review. Examples include major improvements in the waste water treatment system of large paper mills in Waikato and the Bay of Plenty, and the construction of an ocean outfall for waste water from large milk processing plants in Taranaki. A shift in the management of agricultural point-source discharges (from dairy and piggery sheds), favouring disposal on land over discharging to water systems, has reduced pressures on river and marine water quality, although effects on groundwater should still be monitored.

Non-point source discharges

The rapid expansion of *dairy farming* in the plains areas of New Zealand has greatly increased diffuse pollution to surface waters and groundwater in some regions (e.g. Canterbury, Waikato). During the review period, stock numbers (and thus urine) per hectare mushroomed, as did the use of nitrogenous fertiliser to improve diary pastureland (Chapter 4). Since almost all dairy farmers in New Zealand are members of the dairy co-operative Fonterra, setting standards for all suppliers, as the *2003 Dairying and Clean Streams Accord* did, is potentially a highly effective way to encourage improvements in their environmental performance. Indeed, a preliminary

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assessment of progress suggests that many dairy farmers have complied with the commitment to exclude stock from waterways by installing bridges or culverts. The accord integrated many actions that were already under way, however, so while most of its performance targets are expected to be achieved by 2007, it is hard to assess its direct influence (Box 2.3). Given the degraded state of many of New Zealand's rivers and lakes, it appears that serious consideration should be given to the application of market-based instruments such as a fertiliser tax or nitrogen charges to internalise the environmental costs of excess nutrient inputs (Chapter 4). Such approaches have proven effective in several OECD countries.

Box 2.3 **The Dairying and Clean Streams Accord**

During the review period, *dairy farming* was one of the fastest growing industries in the country, and produced 20% of total export income (Chapter 4). In 2005, dairy farms covered about *11% of total agricultural land*. Since 1996, stock numbers have increased by 30% and average herd size by 50%. Fertiliser and irrigation use also increased rapidly (Chapter 5). With the ever-increasing significance of the dairy industry in the economy and the continuing intensification of dairy farming, concerns over environmental impacts have grown. In the early 2000s, Fish and Game New Zealand, which has statutory responsibility for freshwater sport fishing and game bird hunting, launched the "*Dirty Dairy Campaign*" to raise public awareness of the environmental risks of dairying.

Historically, the "*clean and green*" *image* of New Zealand has given its dairy products a comparative advantage in world markets. Thus, Fonterra, the dairy co-operative to which 96% of dairy farmers belong, quickly took a leadership role in studying and proposing solutions to the environmental pressures from dairying. In 2003, the voluntary Dairying and Clean Streams Accord was concluded by the MfE, MAF, regional councils and Fonterra (Fonterra Cooperative Group *et al.*, 2003). The accord specified *five priority objectives* and associated quantitative targets:

- dairy cattle are blocked from access to streams, rivers and lakes (50% by 2007; 90% by 2012);
- bridges or culverts are installed where stock regularly cross waterways (50% by 2007, 90% by 2012);
- dairy farms have systems in place to manage nutrient inputs and outputs (100% by 2007);
- dairy farm effluent discharges comply with resource consents and regional plans (100%, immediately);
- regionally significant wetlands are fenced off and their natural water regimes protected (50% by 2005, 90% by 2007).

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Box 2.3 **The Dairying and Clean Streams Accord** *(cont.)*

The first annual assessment by Fonterra in late-2004 (Table 2.4) revealed that the 2007 targets for the *first two objectives* had already been met, as 67% of Fonterra suppliers had taken measures to keep dairy cattle away from streams, rivers and lakes.

Establishing *nutrient management systems* and monitoring at farm level has proved more challenging; only 17% of suppliers indicated that they had a system in place. Since this target could yield an economic benefit for farmers, as evidenced over the past decade in the Netherlands, its achievement should be given special effort.

The assessment also reported that 99% of suppliers that required *resource consents* had them. However, this does not indicate compliance. Indeed, data from regional councils' compliance monitoring indicate that much progress has yet to be made towards this target. For example, in Waikato only 43% of farms surveyed were in full compliance with requirements covering the spreading of dairy effluent onland; 16% were deemed seriously non-compliant and 41% totally non-compliant (Environment Waikato, 2005). In Canterbury, 61% of dairy farms were in full compliance with resource consents or permitted activities in 2003/04, a significant improvement over the 19% of 2001/02, but still a ways off the target. In Southland, 83% of inspected farms were found to comply fully with dairy effluent discharge requirements in 2003/04. In general, the most common violations relate to discharges occurring too near or directly into waterways, and inappropriate land application of effluent. Regional councils are generally putting greater effort into compliance monitoring and have increased enforcement through prosecution. For example, the most common prosecution by Environment Southland is for the discharge of dairy shed effluent reaching water.

Overall evaluation

Implementation of the water management-related recommendations of the 1996 OECD Environmental Performance Review has been modest, overall (Table 2.5). Modest progress has also been made towards the water-related objectives of the Environment 2010 Strategy. In practice, the exclusive reliance on discharge limits set on a case-by-case or regional basis (through resource consents or regional plans) has proved inadequate to protect surface water quality, for two major reasons: i) it presupposes a level of knowledge of receiving water conditions and ecology (and a degree of political will to control inputs) that may not always exist at regional level; ii) it ignores the importance of diffuse inputs, such as run-off from pastoral lands and septic tanks, which cannot be addressed through resource consents. Additional management tools are needed to limit diffuse pollution. These might include fiscal instruments (e.g. a fertiliser tax) or the further development of partnership approaches (e.g. codes of conduct concerning application of agricultural inputs).

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Table 2.4 **Progress towards targets of the Dairying and Clean Streams Accord**

Accord objective	Associated target	Progress
Dairy cattle are excluded from streams, rivers and their banks.	Dairy cattle are excluded from 50% of streams, rivers and lakes by 2007, 90% by 2012.	Target for 2007 met, with two-thirds of Fonterra suppliers achieving total stock exclusion from waterways in 2004.
Regular (more than twice a week) stock crossing points have bridges or culverts.	50% of regular crossing-points have bridges or culverts by 2007, 90% by 2012.	Target for 2007 met in 2004.
Farm dairy effluent is appropriately treated and discharged.	100% of dairy farm effluent discharge complies with resource consents and regional plans immediately.	Target met, with 99% of Fonterra suppliers who operate under resource consents reportedly fully complying with them.
Nutrients are managed effectively to minimise inputs to groundwater and surface waters.	100% of dairy farms have in place systems to manage nutrient inputs/outputs by 2007.	Progress towards target slow. In 2004, only 17% of Fonterra suppliers had nutrient accounting systems in place.
Existing regionally significant or important wetlands (as defined by regional councils[a]) are fenced and their natural water regimes protected.	50% of regionally significant wetlands fenced by 2005, 90% by 2007.	Where regionally significant wetlands have been identified, the 2005 and 2007 targets have been met.

a) Very few regional councils have yet identified regionally significant wetlands.
Source: Fonterra Cooperative Group *et al.*, 2004.

2.4 Drinking water management

In 2004, about *89% of the population* had access to reticulated drinking water supplies that were registered with the MoH (2 111 reticulated systems in all; most managed by local authorities, some managed by schools, prisons, campgrounds). About 83% of those connected to reticulated supply (74% of the total population) received drinking water that fully complied with bacteriological and chemical standards (MoH, 2005). This is a considerable improvement over the mid-1990s, when only 50% of reticulated households received fully compliant water. This improvement stems from the MoH's effective use of non-regulatory tools, including: i) national drinking water guidelines (issued in 1995, 2000 and 2005); ii) surveillance by health protection officers; iii) a register of community drinking water supplies; iv) public health grading of community water supplies; v) annual reports on the microbiological quality of

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Table 2.5 **Implementation of recommendations of the 1996 OECD Environmental Performance Review**

Recommendation	Performance as of March 2006
WATER MANAGEMENT	
Pursue recent initiatives and strengthen measures dealing with point and diffuse sources of livestock waste from intensive agriculture.	Agricultural discharge to land prioritised over discharge to water bodies through resource consents and codes of practice. Under Dairying and Clean Streams Accord, dairy farmers must take measures to limit cattle contact with water bodies.
Develop receiving water standards and measurable targets (e.g. reduction of pollutant discharges, compliance with water and discharge permits) for use in water management plans.	National environmental standards for receiving waters not established. Numerous regional plans set long-term targets for improving water quality (e.g. Manawatu-Wanganui, Southland, Wellington).
Continue to pursue good compliance with permit conditions.	Inspection and enforcement activities continued.
Implement demand management practices, including pricing mechanisms that respect the user pays principle, particularly where water resources are scarce.	Water pricing, metering and demand management practices not widely developed.
Strengthen drinking water quality regulatory procedures.	Guidelines harmonised with WHO standards, but still non-statuatory.
Encourage greater co-operation among regional councils to enable them to share costs and expertise.	Exchange of expertise promoted through forums operating for various levels of regional council staff.
WASTE MANAGEMENT	
Develop a national waste information database, including definition and classification of different kinds of waste.	Database not developed.
Increase involvement of central government in assisting territorial authorities with guidelines on waste management practices, especially regarding assessment of environmental effects.	Several sets of technical guidelines for landfills issued since 2000, and guidance on waste management planning available on MfE website.
Implement specific legislation for the control, treatment and disposal of hazardous waste; take steps to facilitate the positioning of dedicated treatment facilities within the country and negotiate disposal agreements with other OECD countries, as need be.	Still no specific legislation for management of hazardous waste. RMA established risk mitigation procedures for hazardous facilities, to be implemented in local spatial plans. Most hazardous waste exported to OECD countries for destruction.

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Table 2.5 **Implementation of recommendations of the 1996 OECD Environmental Performance Review** *(cont.)*

Recommendation	Performance as of March 2006
Promote cleaner production and recycling, including waste reduction at source, creation of recycling facilities within the country or promotion of exports to other countries by securing markets for recycled products.	Separate collection carried out by 75% of territorial authorities. Markets for recycled materials still insecure. Increased uptake of clean production techniques by SMEs.
Improve landfill disposal practices by tightening disposal standards, providing for the collection and treatment of leachate and closing substandard landfills.	Several sets of (non-statutory) guidelines issued, specifying technical norms of landfills. National environmental standards on capture of landfill gas, and banning of waste burning in landfills, issued in 2004. Overall, still only 20% of operational landfills have engineered liners.
Introduce disposal charges, taking account of present real and future landfill costs.	The MfE regularly updates Landfill Full Cost Accounting Guide, with associated spreadsheet for calculating full cost charges. Waste disposal charges and waste levies used in some districts to finance closing of old landfills and opening of more modern ones.
Clean up those contaminated sites that present the highest risks of contamination to waterways and aquifers.	Contaminated Sites Remediation Fund used to clean up several high-risk sites, often located adjacent to waterways or estuaries.

Source: Recommendations from OECD, 1996.

drinking water supplies; vi) laboratory accreditation rules for all testing laboratories; and vii) maintenance of a national electronic water quality database, called WINZ.

Despite the improvement, in 2004 about *15% of the population* connected to reticulated water supply received water that was non-compliant with national guidelines (MoH, 2005). While 12% of the population received water that was inadequately monitored to comply with guidelines, 3% received water that exceeded the national guideline for E.coli concentration. In addition, more than 11% of the population is served by unregistered supplies, many of which were not monitored. Rates of non-compliance vary geographically: e.g. in 2004 the proportion of the population receiving water complying with the guidelines was 4% in Marlborough, 18% in Wanganui and 29% in Rotorua (MoH, 2005). Overall, the rate of compliance with drinking water standards is highly correlated to *community size*. While most large communities' water consistently complies with microbiological standards, towns of fewer than 5 000 people

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frequently receive non-compliant water. Outbreaks of *waterborne disease* have been connected to contaminated water sources (Chapter 6). For example, an outbreak of campylobacteriosis at a North Island school in 2001, which affected 75% of the student body, was linked to a spring contaminated by faeces from dairy cows. Grazing farm animals have also been linked to outbreaks of campylobacteriosis in Canterbury.

Recognizing the need to reinforce drinking water management in small communities, the MoH in 2005 launched the *Drinking Water Assistance Fund*, totalling NZD 150 million to be distributed from 2006 to 2015 to provide technical assistance to small water suppliers. The fund is the third in a trilogy of funds totalling NZD 311 million established by the government in recent years. The first, established in 2003, provided NZD 150 million to help councils pay for sewerage. An additional fund of NZD 11 million was established in 2005 to help small communities cope with water and waste water needs of tourists (Taylor, 2005).

The MoH issued *new drinking water guidelines*[7] in August 2005, building on those issued in 1995 and 2000. The new guidelines, which entered into force in 2006, draw heavily on the third edition of the World Health Organization Guidelines for Drinking-water Quality and the US Environmental Protection Agency surface and groundwater rules. A new section deals with small water supply systems (serving fewer than 5 000 people), and provisions for the control of algae and pathogens are reinforced. On the day that the MoH issued the new guidelines, it also published a statement on its website saying it believed it had now "reached the limit of what can be achieved with non-regulatory intervention" and announcing its plan to develop new legislation, the *Health (Drinking Water) Amendment Bill*, which would require suppliers to take "all practicable steps to comply" with the guidelines. The MfE has complemented the MoH's plan by proposing a national environmental standard for the protection of drinking water source waters (MfE, 2005b). Finalisation and approval of the proposed Health Amendment Bill and the national environmental standards for source waters should be fast-tracked, as they would lend the statutory backing needed to assure the protection of public health from contamination of drinking water supplies.

2.5 Coastal water management

The New Zealand Coastal Policy Statement provides an overall framework for the management of coastal resources that guides local authorities in day-to-day management of coastal areas (DOC, 1994). Concerning coastal water quality, the statement mandates regional authorities to establish limits for municipal waste water discharges and apply them retroactively to consents already issued. A 2004 review of the statement's effectiveness was very positive, overall, but it was noted that not all regional coastal plans were yet operational and that local plans and subsequent land use planning decisions often inadequately reflected statement priorities. The overall conclusion of the review,

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nevertheless, was that the statement had stimulated changes in the handling of municipal waste water discharges, and thus led to significant improvements in coastal water quality (e.g. near Auckland, Wanganui and Wellington) (Rosier, 2004).

Coastal bathing waters are monitored closely in summer, and the results made public. Samples are taken several times per month in summer at some 400 coastal water quality monitoring sites. Comparison of 2004/05 summer coastal water quality data with the guidelines for recreational water quality showed that 92% of the sites were consistently compliant[8] and that the number of consistently compliant sites had risen by 7% since the summer of 2003/04 (MfE, 2006).

Aquaculture became a major source of pressure on New Zealand's coastal water quality during the review period. In 2005, the country had some 1 200 aquaculture farms, the bulk concentrated in the Marlborough Sounds, generating about NZD 250 million per year. In the late 1990s, aquaculture became a "gold rush" industry, and applications to regional authorities for resource consents for aquaculture ventures suddenly surged. The capacity of coastal waters for aquaculture facilities was poorly understood, so the MfE announced a two-year *moratorium on aquaculture* consents in late 2001. This allowed the Environment Court to deal with a backlog of appeals on aquaculture decisions, and enabled regional authorities to designate aquaculture management areas in their coastal plans. The 2004 Aquaculture Reform Act confirms regional councils' responsibility to balance demand for further creation of marine farms against coastal water quality and ecological needs, and specifies that further growth in marine farms must be limited to designated aquaculture management areas (Chapter 3).

3. Waste Management

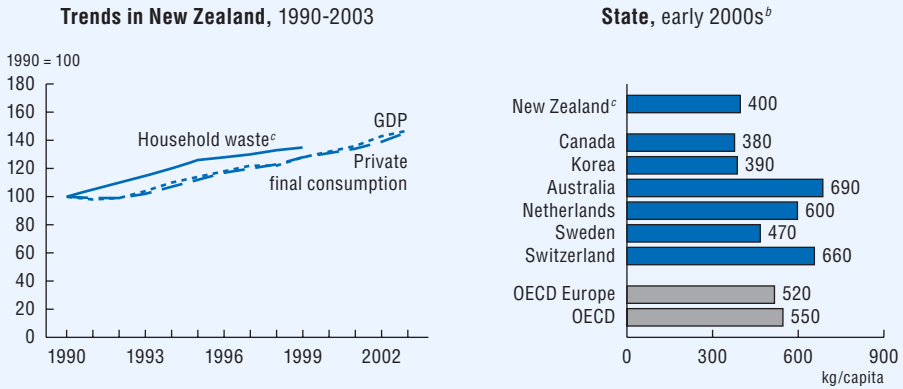
3.1 Waste generation and disposal trends

Waste generation

National statistics on waste generation have not been available since 1999. The trend before then showed municipal waste generation slightly decoupling from GDP (Figure 2.3). The MfE estimates that waste generation more or less tracked GDP growth over the review period (MfE, 2002b), with upward pressure on waste generation (e.g. from economic growth and increasing consumption) partly offset by increasing waste recovery rates. Waste data collected at territorial level are also patchy. Where data exist, they often indicate only the combined amount of municipal and industrial waste deposited in council-owned landfills, along with estimates of the volume of construction and demolition waste going to "cleanfills". As the 1996 OECD review noted, the absence of a comprehensive *national waste database* is a serious constraint on effects-based, objective-driven policy-making.

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Figure 2.3 **Municipal waste generation**[a]



a) In interpreting national figures, it should be borne in mind that survey methods and definitions of municipal waste may vary from one country to another. According to the definition used by the OECD, municipal waste is waste collected by or for municipalities and includes household, bulky and commercial waste and similar waste handled at the same facilities.
b) Or latest available year.
c) Data refer to household waste landfilled (about 300 kg/capita) and packaging waste recycled.
Source: OECD, Environment Directorate.

Waste treatment and disposal

Landfilling continues to be the prevalent disposal method in New Zealand for all types of solid waste, except for some medical waste, quarantine waste (which is incinerated) and hazardous waste (which is exported for safe disposal). Annually, about 3.2 million tonnes of waste is landfilled, and a similar volume of construction and demolition waste goes to cleanfill sites. About 280 000 tonnes of hazardous waste is also landfilled each year; about 70 000 tonnes of this is first stabilised at special treatment facilities (MfE, 2002c). New Zealand's 20 waste *incinerators* burn 13 000 tonnes of medical waste per year, in addition to quarantine waste. Few special arrangements exist for recovering or disposing of electronic waste; most is landfilled (ZWNZ, 2004).

A series of *national censuses of landfills* have confirmed a continuous improvement in pollution control capacity. For example, from 1998 to 2002, the proportion of landfills with engineered liners rose from 4% to 20%, and the proportion with landfill gas collection systems increased from 5% to 10%. Leachate collection systems, present in only 13% of landfills in 1995, were present in 47% in 2002 (MfE, 1995b, 1998, 2002). A recently introduced requirement that large landfills install gas collection systems is

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expected to further accelerate progress. But, although these trends are positive, they indicate that the majority of landfills still lack modern pollution control technology. The closure or upgrading of remaining *substandard landfills* will need to be accelerated to meet the national commitment to close them all by 2010 (Table 2.4).

Resource consents for waste treatment and disposal facilities set site-specific limits on discharges to the environment. In theory, this approach is efficient because it allows the taking into account of differences (e.g. in site characteristics, waste volumes and types) that influence the environmental effects of the activities. In practice, however, it has led to great inconsistency within and among regions in pollution control performance at landfills, with technical *guidelines for landfills* unevenly reflected in landfill resource consents (MfE, 2002c). Large differences in charges at the gate result from this variability, encouraging transport of waste to substandard landfills with lower internalisation of environmental costs (and hence lower disposal fees). This mutes incentives for waste minimisation and distorts the market for waste management services. The country-wide application of *full cost recovery landfill charges*, as envisaged in the Waste Strategy, should be accelerated (Box 2.4).

3.2 Waste reduction, recovery and recycling

Much progress in recycling has been made since the mid-1990s. The number of territorial authorities providing kerbside collection of recyclable materials has more than quadrupled since 1996, with over 75% of councils providing such services in 2005. Voluntary agreements with *industry* to promote recovery and recycling have had mixed results. The 1996 Packaging Accord has contributed to higher rates of packaging recycling (Figure 2.4) and in 2004 was expanded to retailers, importers, recyclers and local governments (MfE, 2004e). Sectoral action plans[9] with detailed commitments and targets were drawn up under the 2004 accord. The Used Oil Recovery Programme, launched in 1996 by major oil companies with the aim of recovering and reusing oil, was suspended in the late 1990s due to legal and technical uncertainties (MfE, 2000b), but now collects about half the used oil generated in the country. Other problematic types of waste, such as *high-density polyethylene agrochemical containers*[10] and plastic silage wrap, are not included in voluntary agreements. As many territorial authorities will not accept such material at landfills, farmers often turn to on-farm solutions (e.g. burning, burying), which have negative environmental impacts (MAF, 2001a).

Waste exchange programmes, many of them regional, match up businesses that generate, recycle and reuse waste. The programmes have expanded in recent years, and now cover the majority of the North Island and some of the largest districts in the South Island (e.g. Christchurch, Nelson). Membership in the Waikato and Bay of

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Box 2.4 **Cost recovery in landfilling**

Landfill Full Cost Accounting Guide

To help local authorities move towards *full recovery of landfilling costs* (investment and operation), the MfE published the Landfill Full Cost Accounting Guide in 1996, with updates in 2002 and 2004. Recognising that many councils take operating costs into account only when setting the landfill gate charge, the guide helps decision-makers calculate *full cost recovery charges*. The guide provides a general methodology and a *spreadsheet programme* that operators can use to estimate total cost per tonne of waste. More than 100 parameters are built into the spreadsheet, including costs for planning and design, construction of individual cells, operation, leachate and gas management systems, and closure and after-care (MfE, 2002c). The calculation result is robust, and the guide has been extensively used by local governments and private landfill operators.

Landfill waste levies

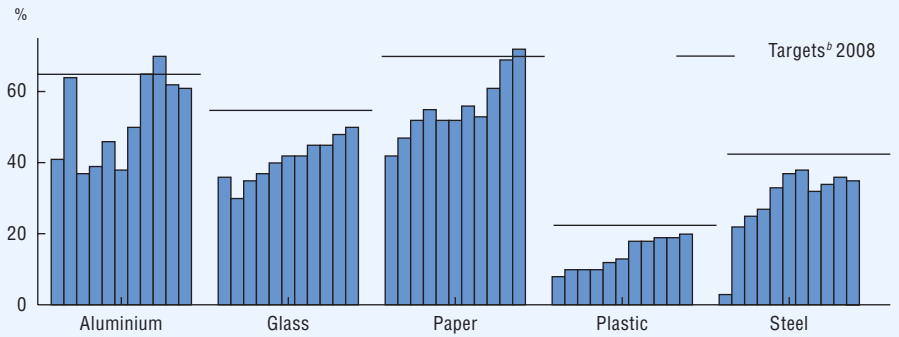
Waste levies have been used in New Zealand since 1998, when Christchurch City Council introduced one (Christchurch City Council, 2005). In 2005, three Auckland councils introduced by-laws to charge levies on all solid waste collected. Waste management companies challenged the legality of the levies before the High Court, arguing that they were invalid because local councils do not have the power to tax. The companies also expressed concern that inconsistent approaches to local waste levies would affect competition, citing the potential for "waste flight" (transport of waste to adjacent areas not subject to levies). In 2006, the High Court ruled that the councils had overstepped their powers and struck down the by-laws, leaving the councils unable to impose waste levies.

Before the court decision, consultations among the MfE, the waste industry and Auckland and Christchurch councils showed a *high degree of agreement* on the need for a waste levy to be applied nationally to avoid distorting competition among waste management operators (Ward, 2006). There was general agreement that a levy should be set at a level that would provide funding to local authorities to support long-term objectives related to minimising waste generation and diverting waste from landfill. Imposing such a levy on waste deposited at landfills was seen as the most efficient point of capture. It was generally agreed that a significant part of the revenue should be made available to local authorities to fund waste minimisation efforts, and that another part should be channeled to a central fund to support the wider objectives of the New Zealand Waste Strategy.

Deliberations and consultations continue among central and local governments and waste management industry representatives regarding the design and administration of a national waste levy. The MfE, meanwhile, is assessing possible means of administering such a levy and using it to stimulate product stewardship and waste minimisation at local level. Developing and applying such a levy, planned for 2007, will be important to support the objectives of the national Waste Strategy locally and nationally.

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Figure 2.4 **Recycling rates[a] of packaging materials,** 1994-2004



a) Collected waste packaging materials by weight as % of consumption for packaging.
b) Set in New Zealand Packaging Accord 2004, jointly prepared by MfE, Packaging Council of New Zealand, Local Government New Zealand and Recycling Operators of New Zealand.
Source: Packaging Council of New Zealand.

Plenty waste exchange has grown by 63% since 2003 to more than 1 300 businesses. In 2003, the 16 waste exchanges operating nationwide were estimated to have diverted 22 710 m^3 of waste from landfill (ZWNZ, 2004).

Despite these gains, *much room for improvement* remains. Very few waste streams are dealt with by nationwide recycling programmes with targets. Some of the bulkiest and most problematic types of waste (e.g. electronic waste, end-of-life vehicles) have not been addressed, and illegal dumping of such items remains a problem. End-of-life computers and other electronic goods still go to landfill. The extended producer responsibility principle is not consistently reflected in recycling initiatives, which often rely heavily on support from local authorities. Co-operation with industrial associations, companies and importers should be further cultivated, perhaps through nationwide take-back systems. Actions by horticulturalists, which have led to the use of returnable herbicide containers and switching from plastic to cardboard containers, show the potential of such approaches (MAF, 2001b).

As a geographically isolated country with a relatively small economy, New Zealand has an inherent difficulty in establishing stable *recycling markets* within its territory. The vulnerability of its recycling markets was underlined by a glass recycling crisis after a sharp increase in glass imports led the country's sole glass recycling company to drop the price of clear cullet from NZD 92 per tonne to NZD 75 per tonne in December 2004 and then to NZD 10 per tonne in May 2005

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(ZWNZ, 2004). Detailed market analysis of selected recycling materials deemed sensitive to market conditions would help clarify the challenges in establishing more sustainable recycling markets. In addition, the use of economic instruments to create incentives for waste recovery and recycling could help create markets.

3.3 Hazardous waste management

During most of the review period, New Zealand *did not collect or aggregate data* on the amounts of hazardous waste generated or transported in the country. In 2005, some companies handling liquid hazardous waste voluntarily introduced electronic tracking of hazardous waste. Regulatory support for this Internet-based system, called WasteTRACK, should be considered in order to expand tracking to other waste transporters. Since 2002, a range of guidelines[11] on hazardous waste management has been developed by the MfE in co-ordination with industrial associations and academics. Although the guidelines are non-statutory, they do provide useful guidance to landfill operators, and can be made binding through resource consents for landfill operation.

Good progress has been made in collecting and destroying *persistent organic pollutants* (POPs) accumulated on farms. In 2003, the MfE launched a three-year, NZD 1.5 million national programme that achieved the collection and disposal of 180 tonnes of agrochemicals collected from nine regions. POPs made up more than two-thirds of the total. A National Implementation Plan to comply with the *Stockholm Convention*, outlining how remaining stockpiles (estimated at 350 tonnes) of accumulated agricultural POPs will be collected and destroyed, is to be finalised in late 2006. Most collected POPs are exported (mainly to France) for safe disposal, since New Zealand lacks the necessary facilities (Chapter 7).

Overall, *hazardous waste management progressed slowly* in New Zealand during the review period. As the 1996 OECD review noted, related legislation is highly fragmented, and responsibilities sometimes overlap under the numerous laws involved. The distribution of responsibility among national, regional and territorial authorities is unclear in certain cases, a situation likely to hinder their ability to respond if urgent action is needed. Under the RMA, local authorities are responsible for issuing resource consents for hazardous waste management to mitigate risks to public health and the environment. But few local authorities have the technical capacity for the necessary risk assessments, and the transaction costs of proceeding case by case would be quite high. Considering the potentially grave and even irreversible effects that could stem from mismanagement of hazardous waste, as well as the diseconomies of scale associated with regional-level management, *greater central government involvement* is warranted, for example in the form of a national policy statement and national environmental standards, a nationwide electronic tracking system and increased inspection and enforcement.

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3.4 Remediation of contaminated sites

In the 1990s, it was estimated that there were *7 000 to 8 000 contaminated sites* in New Zealand; about 1 500 of them were deemed to pose high risks to human health or the environment (MfE, 1988; Worley Consultants Ltd., 1992). More recent studies by regional councils suggest that these estimates are quite conservative. Most contaminated sites were previously used for pesticide manufacture, coal gas production, waste disposal, timber treatment or sheep dipping. The MfE estimated total clean-up costs to be NZD 1 billion, based on 1992 figures. Since 1996, *remediation of contaminated sites* has been left mainly to local authorities. Several territorial councils have remediated old gaswork and landfill sites for redevelopment. *Establishing liability* for clean-up has been difficult, as most land contamination occurred before passage of the RMA in 1991, and potentially liable companies often no longer exist or have created shell companies to protect their assets.

Recognising these *practical difficulties*, in 1999 the MfE began making grants available to assist local authorities with remediation, and its *Contaminated Sites Remediation Fund* (MfE, 2005c) allocated NZD 2 million per year to regional councils over 2003-06 to investigate and remediate high-risk sites (i.e. those posing large human health risks and those located in ecologically or culturally sensitive areas). Half of the fund went to councils as competitive grants. The other half was reserved for clean-up of the Fruitgrowers Chemical Company site at Mapua[12] (with co-funding by the Tasman District Council) and the Tui mine site (co-funded by Environment Waikato, as the Waikato regional council is known). In all, the fund supported assessment, remediation planning and actual clean-up for 24 projects.

There is still a need to clarify *liability for site clean-up* and to establish enforceable soil contamination limits. The 2005 amendments to the RMA made the important first step of defining the term "contaminated land". Also in 2005, the MfE announced plans to develop health-based *national environmental standards* to define acceptable levels of a range of soil contaminants, including arsenic, cadmium, DDT and lead. Finalisation of such standards would give needed certainty to all parties involved in land remediation by facilitating systematic identification and registration of contaminated sites, and would aid in establishing liability by linking the presence of certain pollutants with past landowners.

4. Pollution Abatement and Control Expenditure

Data on *public environmental protection expenditure* have been produced since 2001, and the latest available data are for 2003. In fiscal year 2003,[13] public environmental expenditure for water and waste management amounted to *0.6% of*

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GDP (StatsNZ, 2005). The total included pollution abatement and control expenditure for waste and waste water, as well as environmental expenditure on inland water management activities aimed at sustainable use (e.g. catchment works, flood protection works, hydrological monitoring).

Local government accounted for 99% of this environmental expenditure, reflecting the importance of territorial and regional councils in environmental management in New Zealand (Table 2.6). Public expenditure on *waste water management* amounted to NZD 603 million, or 0.45% of GDP, in 2003. Of this, capital investment accounted for 54% and operation and maintenance for the remainder (StatsNZ, 2005). Public expenditure on *waste management* amounted to NZD 218 million, or about 0.16% of GDP, with current expenditure representing 89%. Since 2001, *operation and maintenance* has accounted for about 61% of total expenditure on water and waste management, with local authorities again responsible for 99% of the total.

Table 2.6 **Annual government expenditure for water and waste management,** 2001-03

(NZD 000, 2001 prices)

	2001	2002	2003
Central government			
Waste[a]	7 526	8 593	8 404
Waste water[b]	–	–	–
Inland water management[c]	1 231	1 276	1 363
Subtotal	8 757	9 869	9 767
Local government			
Waste[a]	214 024	204 555	198 770
Waste water[b]	588 321	621 317	572 113
Inland water management[c]	76 723	67 350	64 483
Subtotal	879 068	893 223	835 367
Total	887 825	903 091	845 134
% by local government	*99.0*	*98.9*	*98.8*

a) Includes expenditure for waste collection, transport, treatment and disposal.
b) Includes expenditure on sewerage networks and storm water management.
c) Includes inland water management activities aimed at sustainable use (catchment works, flood protection works and hydrological monitoring).
Source: StatsNZ, 2005.

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To achieve its objectives, New Zealand will need to increase investment in environmental infrastructure projects such as sewerage reticulation in rural areas, waste water treatment plants and landfills with pollution controls. In sparsely populated rural regions, establishing and operating waste management infrastructure at local level can lead to *diseconomies of scale*. In many cases, inter-council co-operation to build larger, more modern landfills (with leachate collection and landfill gas management, for example) could reduce costs and improve environmental performance of waste management facilities. Recognising this opportunity, some regions (e.g. West Coast, Waikato, Taranaki) have developed regional waste plans to help co-ordinate territorial authorities' infrastructure investment needs.

Notes

1. Introduced by amendment of the Water and Soil Conservation Act in 1981 and retained in the RMA.
2. As of 2006, only one policy statement (the 1994 Coastal Policy Statement) and one set of national environmental standards, concerning air (2004 national Air Quality Standards), had been issued.
3. Local Government Act, Health Act, Building Act, RMA, Land Transport Act and Hazardous Substances and New Organisms (HSNO) Act.
4. LGA, RMA, Land Transport Act and HSNO Act.
5. These include Guide to the Management of Closing and Closed Landfills (2001), Guide to Landfill Consent Conditions (2001), Guide to the Management of Cleanfills (2002), Landfill Full Cost Accounting Guide for New Zealand (1996, updated in 2002 and 2004) and Hazardous Waste Guidelines: Landfill Waste Acceptance Criteria and Landfill Classification (2004).
6. ANZECC, 2000 and MfE, 2002a.
7. Although titled "standards", they are non-regulatory, and are thus referred to here as "guidelines".
8. That is, at least 90% of the samples taken over the bathing season are within guideline limits.
9. They cover five manufacturing sectors (paper, plastic, aluminium, glass, steel) and four non-manufacturing sectors (central government, local government, recyclers, retailers).
10. Annually, some 700 000 such containers, totalling about 1 000 tonnes of polyethylene, require disposal.
11. These cover topics including identification and record-keeping (2002), landfill acceptance criteria and landfill classification (2004) and a code of practice for liquid and hazardous waste (2004).
12. The Mapua site, New Zealand's largest contaminated site, contained 50 000 m^3 of soil and debris contaminated with DDT, DDE, dieldrin and aldrin. It is located in a residential area flanked by estuaries.
13. July 2002 to June 2003.

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3

NATURE AND BIODIVERSITY CONSERVATION*

Features

- Economic value of ecological assets
- Control of invasive pests and weeds
- Conservation outside protected areas
- Balance between tourism and conservation

* This chapter reviews progress since the previous OECD Environmental Performance Review of 1996. It also reviews progress with respect to the objective "maintaining the integrity of ecosystems" of the 2001 OECD Environmental Strategy.

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Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of New Zealand:

- issue *national policy guidance concerning conservation of biodiversity* on private land, and ensure that nature conservation objectives are fully reflected in spatial and coastal plans;
- reinforce protection of *wetlands and freshwater ecosystems* and consider introducing economic or fiscal instruments to curb pressures from agriculture and urbanisation;
- strengthen and harmonise *monitoring of major pressures on biodiversity and ecosystems*, both within and outside protected areas;
- further develop partnership approaches to conserving *biodiversity on private land*, prioritising conservation of ecosystems that are under-represented in public conservation lands and waters;
- develop and implement measures to mitigate *environmental pressures associated with increasing tourist numbers* and tourism concessions on conservation lands and waters.

Conclusions

In a global context, New Zealand has a *special responsibility* for biodiversity conservation, since a high percentage of its 90 000 native species are endemic and unique. New Zealand increased the priority given to nature and biodiversity conservation in the review period through *expanded funding and policy measures*. The security of 200 threatened species has improved through effective *species recovery programmes*, and there were no known species extinctions during the review period. Natural processes provide essential "ecosystem services" and form the base for important economic activities (e.g. tourism, forestry, fisheries, agriculture). *Protected areas* have been expanded to cover 32% of the country's land area and 7.5% of its territorial sea, significantly higher than in most OECD countries. A substantial increase in the area of private land protected under *covenant agreements* has extended the reach of efforts to protect indigenous biodiversity in remnant areas, although not always in accordance with national conservation priorities. Since 1998, *review of land tenure* arrangements in the high-country of the South Island has added 105 km^2 to public conservation lands and waters, and boosted the representation of tussock grasslands in protected areas. The Biodiversity Strategy (2000) and Biosecurity Strategy (2003), as

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well as two general policies issued in 2005, gave needed guidance to environmental managers. *Maori tribes* are increasingly taking responsibility for the management of their customary fishing rights.

Nevertheless, nature and biodiversity conservation still faces *major challenges* in New Zealand. Despite sizable decreases in the numbers of certain pests (e.g. rats, possums, rabbits) in some areas, *invasive species* continue to pose serious risks to indigenous ecosystems and species and inflict high economic damage overall. Land use change analysis shows a *net loss of nearly 175 km^2 of indigenous habitat* between 1996 and 2002. The central government recently decided not to proceed with a national policy statement on biodiversity, a draft of which was presented for consultation in 2001, but instead to pursue biodiversity objectives through a non-statutory approach. In the absence of data on ecosystem conditions and trends, conservation objectives continue to be defined in terms of agency output rather than *performance outcomes*. Efforts to put ecosystem survey and monitoring techniques into use have been slow and sporadic. Conservation of *freshwater and wetland ecosystems* has trailed that of other biotopes, even as pressures on them from diffuse pollution and water abstraction have grown. The rapid and prolonged increase in numbers of *tourists to a few places in national parks* and conservation areas has led to deficits in waste and waste water capacity and damage to habitats. Although New Zealand's marine environment is very vulnerable to alien species, control of risks from ballast water and vessel hull fouling is in its infancy.

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1. Objectives and Institutional Framework

1.1 General objectives

New Zealand's performance in conserving nature and biodiversity can be evaluated against the *numerous objectives* it has established in domestic legislation or adopted through international agreements. New Zealand has ratified most major international agreements related to biodiversity conservation (Reference II). Internationally agreed objectives thus influence the country's management of wetlands (Ramsar Convention), international trade in endangered species (Washington Convention) and migratory species (Bonn Convention), among others (Chapter 7).

The *legislative framework* for nature and biodiversity conservation features four types of laws, aimed at: i) facilitating *nature conservation* activities (e.g. 1987 Conservation Act, 1980 National Parks Act, 1977 Reserves Act, 1977 Wild Animal

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Control Act, 1971 Marine Reserves Act, 1978 Marine Mammals Protection Act); ii) controlling *invasive species* (e.g. 1993 Biosecurity Act); iii) integrating biodiversity and nature conservation measures into *general economic development* activities (e.g. 1991 Resource Management Act); and iv) integrating nature and biodiversity conservation into *sectoral economic activities* (e.g. 1996 Fisheries Act).

The national *Environment 2010 Strategy* (MfE, 1995) set a range of environmental goals, with the aim of improving the state of the environment for present and future generations. Concerning management of nature and biodiversity, it established the following goals for 2010:

- maintain and enhance the net area of nationally remaining *indigenous forests* and enhance the ecological integrity of other remaining indigenous ecosystems;
- promote the conservation and sustainable management of biological diversity so that the quality of indigenous and exotic ecosystems is maintained or enhanced to *guard against extinctions* and permit adaptation to changing environmental conditions;
- *manage pests, weeds and diseases* to reduce the risks they pose to levels consistent with nationally established objectives for biological diversity of ecosystems, people's health and bio-security of the economy;
- *conserve and manage national fishery resources* for the benefit of all New Zealanders by providing for their sustainable use by commercial, recreational and Maori interests.

Fulfilling its commitment under the Convention on Biological Diversity, New Zealand adopted a national *Biodiversity Strategy* in 2000 (DOC and MfE, 2000). Its *four overarching goals are to*: i) promote community and individual action on behalf of biodiversity, with equitable sharing of responsibility for and benefits from biodiversity; ii) protect Maori interests in conserving and sustainably using biodiversity; iii) halt the decline of indigenous biodiversity; and iv) maintain the genetic diversity of introduced species that are valued for economic, biological or cultural reasons. The strategy was accompanied by an *action plan* defining numerous "desired outcomes" for 2020 (Table 3.1). The draft *national policy statement on biodiversity*, released for consultation in 2001, was not finalised, and the central government recently announced plans to pursue biodiversity objectives through non-statutory approaches.

New Zealand is committed to assuring the *bio-security* of its territory to protect its economic interests and environmental uniqueness. Building on the 1993 Biosecurity Act, the *2003 Biosecurity Strategy* set three overarching goals for the management of invasive species (i.e. pests and weeds): i) prevent the entry of pests

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Table 3.1 **Desired outcomes of the Biodiversity Strategy,** 2000

Theme	Selected targets (2020)
1. Biodiversity on land	Net increase in area covered by presently scarce natural habitats (e.g. lowland forests, tussock grasslands, wetlands, dune lands); restoration of some previously modified habitats Net improvement in the ecological health of presently threatened and fragmented habitats and ecosystems, with sustainable management of surrounding areas Publicly owned lands are more representative of the full range of natural habitats and ecosystems Increase in extent of privately owned and managed protected natural areas
2. Freshwater biodiversity	No net loss in the extent or condition of remaining natural freshwater ecosystems and habitats Restoration of some previously scarce or degraded habitats (e.g. lowland river systems, wetlands, riparian areas) All freshwater ecosystems support biological communities largely comprised of indigenous species Introduced fish (e.g. trout, carp) and game (e.g. ducks) are managed to minimise the threat they pose to indigenous species The harvest of indigenous and introduced freshwater species is sustainable and does not pose a threat to freshwater biodiversity
3. Coastal and marine biodiversity	All natural marine habitats and ecosystems are in a healthy, functioning state, or are recovering A full range of marine habitats and ecosystems representative of New Zealand's indigenous marine biodiversity is protected Rare or threatened marine species are protected from overharvesting and other human threats, enabling them to recover
4. Conservation and use of genetic resources	The genetic diversity of indigenous species is effectively conserved, in situ and/or ex situ An integrated policy for the management of all genetic material and for bio-prospecting is in place
5. Bio-security and biodiversity	Systematic application of a precautionary approach to the management of new organisms, including genetically modified organisms Improved co-ordination of bio-security measures between central and local government, private agencies and interested groups Eradication or containment of introduced species that seriously threaten indigenous biodiversity or important introduced species
6. Governance	Alignment with national Biodiversity Strategy across government agencies; improved co-ordination between central and local government and the private sector Central government a key player in leading, funding, co-ordinating and monitoring biodiversity policy and management initiatives Local government, private sector and communities actively participating in biodiversity management

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Table 3.1 **Desired outcomes of the Biodiversity Strategy,** 2000 *(cont.)*

Theme	Selected targets (2020)
7. Maori and biodiversity	The relationship that Maori have with indigenous biodiversity as tangata whenua (people of the land) is recognised and valued in managing biodiversity Maori knowledge, or matauranga Maori, about biodiversity is respected and preserved
8. Community participation and awareness	Educational programmes in schools, polytechnics, universities and community centres include elements about biodiversity New Zealanders have a greater appreciation of biodiversity, indigenous species, habitats and ecosystems
9. Information, knowledge and capacity	Net improvement in the knowledge base about indigenous species, their distribution and their genetic properties Net improvement in mapping ecosystems and understanding how they function and react to human pressures Net improvement in technical capacity for dealing with invasive pest species Net improvement in monitoring and public reporting on the state of indigenous biodiversity
10. International responsibilities	New Zealand is visible and effective at international level, promoting improved biodiversity management globally New Zealand has an active role in biodiversity conservation in surrounding marine areas, the Southern Ocean and Antarctica

Source: DOC and MfE, 2000.

capable of causing significant harm to the economy, environment or public health; ii) reinforce surveillance and response mechanisms to assure early detection, assessment and containment of new pests; and iii) extend work to eradicate, contain and control established pests.

The 1996 Fisheries Act is aimed at assuring *sustainable harvesting of fishery resources*. It requires that adverse effects of fishing on the aquatic environment be avoided, remedied or mitigated and stocks managed so as to meet the needs of future generations. The 2005 Strategy for Managing the Environmental Effects of Fishing sets the objective of establishing environmental standards to aid in managing negative environmental impacts from fishing (MFish, 2005). Work has begun on developing standards for managing such impacts on seabirds, sea lions and dolphins, among others.

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Integrating *Maori views* into nature and biodiversity conservation decisions is an objective stemming from the Treaty of Waitangi (Chapter 6). The treaty principles are included in environmental legislation, in recognition of the special relationship Maori have with the environment. A national network of 14 Maori advisers, one in each regional conservancy of the Department of Conservation (DOC), supports the integration of Maori views into regional conservation decisions. DOC routinely consults with Maori tribes on conservation decisions affecting management of natural resources and preservation of special Maori cultural sites within public conservation lands and waters, as New Zealand's protected areas are collectively known (DOC, 1997). The Ministry of Fisheries (MFish) has appointed 12 Maori relations managers (pou hononga) to work with the country's 14 Maori fishery forums, and eight extension officers to advise the forums on policy and on fishery management.

Progress can also be evaluated against the related recommendations made in the *1996 OECD Environmental Performance Review*. These included:

- expedite the programme for survey and assessment of unprotected natural areas and provide for more effective implementation of programmes resulting from the assessments;
- encourage effective ecosystem management irrespective of land tenure and use;
- identify and reserve an adequate and representative sample of marine ecosystems within a system of marine and estuarine protected areas;
- develop opportunities for greater Maori ownership and/or management of protected areas;
- develop a national policy statement on biological diversity;
- ensure that the total allowable commercial catches for fisheries are set to move stocks to scientifically based assessments of maximum sustainable yield.

1.2 Institutional framework

DOC is the central government agency with primary responsibility for conserving New Zealand's natural heritage. It acts as advocate, policy adviser and manager for public conservation lands and waters and can confer protected status on natural areas and species. It is charged with conserving biodiversity in *designated land and marine conservation areas* while assuring recreational access. It also implements recovery programmes for endangered species and bio-security measures to limit the spread of invasive species. It employs a permanent staff of about 1 600, as well as seasonal workers. In 2005/06, DOC's budget totalled NZD 280.8 million, with nature conservation work accounting for 47% and recreation for 41%.

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The *New Zealand Conservation Authority*, a statutory body established in 1990, provides policy advice to DOC and reviews and approves draft conservation management strategies and plans for protected areas. It has 13 members: five appointed after consultation with the ministers of Maori affairs, tourism and local government; three from environmental NGOs; one from the Ngai Tahu tribe; and four from the general public. In addition, 14 advisory *Conservation Boards* (one for each of DOC's 13 regional conservancies plus one for the Chatham Islands) serve as an interface between local communities and DOC. Eight of these boards must include representatives from particular Maori tribes.

The *Ministry for the Environment* (MfE) is responsible for promoting the "sustainable management of natural and physical resources" under the *Resource Management Act (RMA)*. It contributes to biodiversity conservation through indicator development, ecosystem classification and environmental education (Chapter 6). Under the RMA, *regional councils* are charged with ensuring the reflection of nature and biodiversity conservation concerns in regional policy statements and plans and in resource consents. The 2003 amendments to the RMA added "maintaining indigenous biological diversity" and "maintaining and enhancing ecosystems in water bodies and coastal waters" to their responsibilities. A 2005 review found that most councils had integrated biodiversity conservation objectives into regional plans, but concluded that many lacked the resources to execute the plans (Lee *et al.*, 2005).

Several agencies have responsibility for *management of biological resources*. MFish sets policy and administers management systems to assure the sustainable use of fishery resources, and has primary responsibility for managing the effects of fishing on protected species and the aquatic environment. The *Ministry of Agriculture and Forestry* (MAF), through its Biosecurity New Zealand unit, leads and co-ordinates bio-security defence, from pre-border controls to pest management. MAF also has lead responsibility for promoting sustainable farming and managing indigenous forests (Chapter 5). The Environmental Risk Management Authority makes decisions on applications to introduce new organisms to New Zealand. National and regional *fish and game councils*, with members elected by the holders of sport fishing or game licences, have primary responsibility for managing both native and introduced species of game birds and sport fish.

Maori tribes are important managers of natural resources, both as landowners (Maori land[1] covers 15 000 km^2, or about 5.5% of the country's land area) and as holders of resource rights. About 80% of indigenous forest located on private land is in Maori ownership (PCE, 2002). The 1992 Treaty of Waitangi (Fisheries Claim) Settlement Act granted Maori about one-third of the commercial fishing quota and authorised an entitlement to 20% of the quota for any species subsequently brought into the national

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management regime (Bess, 2001). In 2005, Maori owned around 40% of the commercial fishing quota, in addition to extensive, non-commercial customary fishing rights. Tangata Kaitiaki (guardians) have been appointed to manage customary fishing in accordance with regulations: 125 kaitiaki in the South Island, 146 in the North Island.

2. Economic Importance of Ecological Assets

New Zealand's ecological assets represent significant economic value. *Natural ecosystem processes* are the foundation of the country's land-based primary production (e.g. farming, forestry, horticulture). They provide essential inputs and "ecosystem services", including raw material production, water purification, waste decomposition, crop pollination, pest control and climate regulation. In 2003, the Biosecurity Council estimated that *60% of national exports and 20% of GDP* depended on primary production (Biosecurity Council, 2003). A "*clean and green*" environment is also an asset sustaining New Zealand's growing tourism sector and its exports of agriculture products (Chapters 4 and 5).

As in other OECD countries, the *annual value of the ecosystem services* provided by nature in New Zealand may exceed GDP. A 1999 economic study estimated that the country's natural systems, including introduced and indigenous species, generate annual value nearly three times greater than GDP (Patterson and Cole, 1999). *Terrestrial ecosystems* were valued at NZD 46 billion per year, including NZD 9 billion from direct outputs (e.g. food, fibre), NZD 30 billion from ecosystem services (e.g. erosion control, soil formation, pollination, pest control) and NZD 7 billion from passive values (e.g. option, existence and bequest values). *Marine ecosystem services* were valued at NZD 184 billion per year (four times higher than terrestrial inputs), reflecting the fact that the country's exclusive economic zone (EEZ) is 14 times greater than its land area.

Thus, the *value of biodiversity at the margin* is considerable in New Zealand. For example, in the year of the analysis, a 5-10% loss of annual direct benefits from indigenous biodiversity would have been worth NZD 500-1 000 million (i.e. up to 1% of GDP). By comparison, in the same year, the government spent less than NZD 200 million on biodiversity management. Since the adoption of the Biodiversity Strategy in 2000, New Zealand has put more priority on nature conservation through *expanded funding and policy measures*. For example, DOC budget allocation for nature conservation increased by 75% between 1995 and 2004, to over NZD 126 million. The risk of biodiversity loss increased during the review period and will likely continue to do so, due to growing international trade and travel and to climate change, all of which increase the likelihood of introduction of pests and diseases (OECD, 2003).

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3. Management of Species

In a global context, New Zealand has a special responsibility for biodiversity conservation, since a high percentage of its native species are *endemic and unique* (Reference IV). For example, of the country's nearly 2 350 native plant species, approximately 80% are endemic. The islands' geographic isolation led to the evolution of large, ground-dwelling birds that filled niches typically occupied by small mammals on the continents. These unique species are particularly vulnerable to predation from humans, feral cats, ferrets and other mammals, while native vegetation is vulnerable to browsing pests, such as deer and feral goats, as well as to competition from invasive weeds. Over 8 000 marine species have been identified, including 84 seabirds, 52 marine mammals, 1 200 ish, 2 000 molluscs, 300 sponges, 400 echinoderms, 900 seaweeds, and 700 micro-algae. Overall, *pressures* from land conversion, hunting, logging and invasive species have driven to extinction about one-third of native land and freshwater birds and nearly one-fifth of seabirds, along with three of seven species of endemic frogs and at least twelve invertebrates. At the same time, some introduced plants and animals are essential to farming and forestry, and other such as trout and deer have become important to sport fishing and hunting.

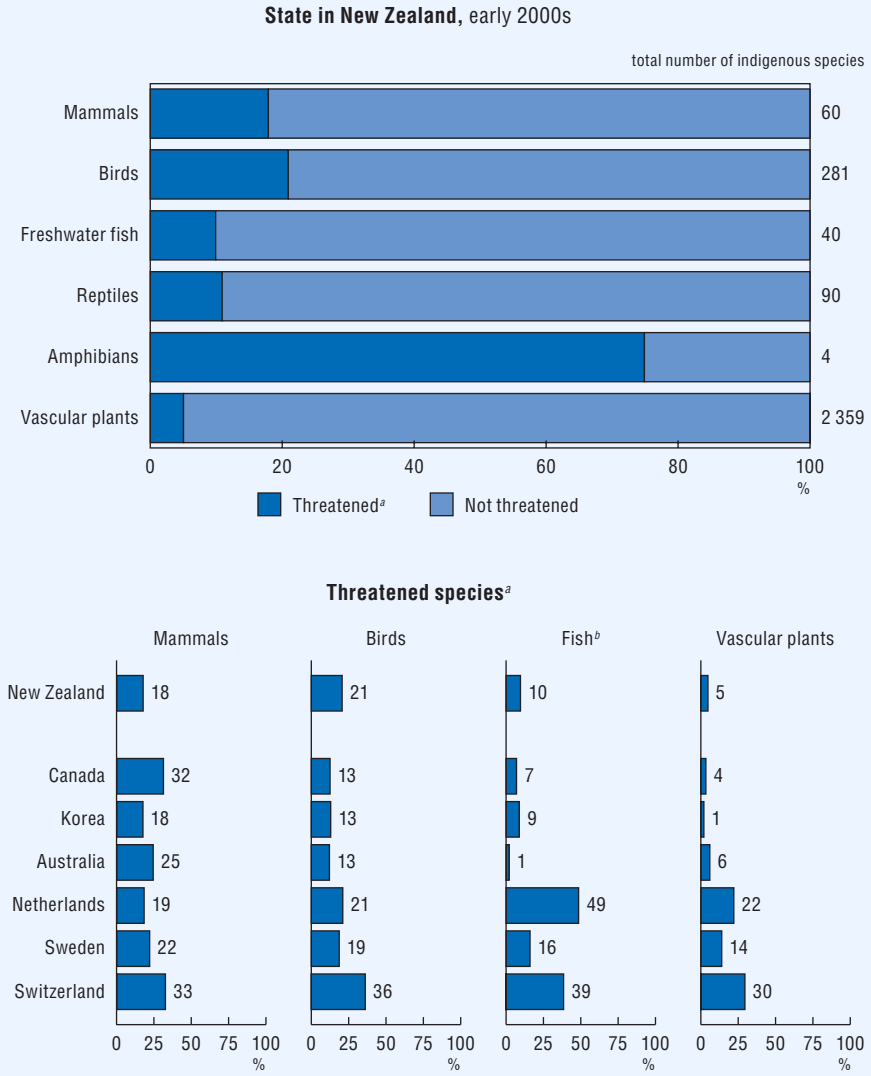
3.1 Native species

Of New Zealand's estimated *90 000 native species*, about *668 (0.75%) are listed as "threatened"*.[2] About 20% of the country's mammal and bird species are threatened, as are about 10% of reptile and freshwater fish species, 75% of amphibians and 5% of vascular plants (Hitchmough and Bull, in press) (Figure 3.1).

The *security of over 200 threatened or near-threatened indigenous species stabilised* or improved during the review period, and there were no known species extinctions. DOC has implemented *recovery plans* for over 170 of the 926 species (about 18%) listed as threatened or near-threatened, and estimates that over 80% of species recovery actions such as predator control and habitat improvement have significantly reduced pressures on the target species (DOC, 2004). But the large majority of threatened and near-threatened species are not subject to recovery plans and continue to decline. In some cases, securing these species will require overall ecosystem support measures, such as pest control. As resources for recovery programmes are limited, a new *threat classification system* was introduced in 2002 in the hope of helping target conservation efforts at priority species. It addresses a fuller range of species than the old system, including marine species, and is more accessible to managers and stakeholders, as it is available online.

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Figure 3.1 **Fauna and flora**



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species. New Zealand: species classed as "acutely threatened" in the New Zealand Threat Classification System.
b) Freshwater fish except for Canada and Australia.
Source: OECD, Environment Directorate.

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Since 2000, DOC has also sought to increase the *efficiency of its recovery plans* by shifting their focus from a single species to multiple species found together. The idea is to develop recovery plans for indicator species and then merge them to create management regimes for each type of native ecosystem. It is hoped that such a multi-species approach can be used to accelerate conservation of aquatic and wetland species, hitherto largely overlooked. A first *multi-species recovery plan* was launched for four native fish species in 2005 (DOC, 2005a). It is too early to evaluate the effectiveness or efficiency of the approach.

3.2 Invasive species

Invasive pests and weeds pose *serious threats to indigenous species* in New Zealand, as they compete with them for habitat and food, degrade or alter their habitats and sometimes prey on them. The most damaging animal pests include possums, rats, rabbits, goats, deer, stoats and feral cats. Naturalised plant species (2 400 species) outnumber native plants (2 350 species) and compete with them for habitat (Beston, 2005). New Zealand has traditionally prioritised control of pests posing risks to primary production and trade (e.g. possum, white spotted tussock moth), and has implemented a variety of effective management measures (Chapter 7). Bio-security risks to indigenous flora and fauna have received less attention. The annual damage caused by pests, weeds and pathogens reportedly topped *1% of GDP* in 1999, and has likely not decreased since (NZCA, 1999). The 2003 Biosecurity Strategy put continued emphasis on protecting against invasive species. In addition to taking measures aimed at blocking the entry of new pest species, New Zealand operates extensive programmes to eradicate or contain established pests and to control their impact on protected natural areas. The annual costs of damage by pests and weeds, and the expenditure by the central government, regional councils and the private sector to combat them, are high and increasing (Box 3.1).

Preventive measures

The rate of detection of alien organisms at New Zealand's *international airports* improved during the review period through strengthened techniques and increased resources (Box 3.1). To shore up this gain, amid the increasing risk of alien introductions associated with the growing volume and diversity of passengers and goods, border inspections are increasingly targeted at the passenger and freight deemed to pose the highest risk (Williams *et al.*, 2000). Compared to terrestrial invasive species, marine alien species have received little attention, and surveillance and enforcement at *marine ports* is still nascent. The country is particularly vulnerable to marine pest introductions because of its reliance on international shipping: about 95% of national exports, by value, are transported by ship (Coutts,

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Box 3.1 **Expenditure on bio-security**

In 2003, New Zealand's *expenditure on bio-security* totalled NZD 500 million (0.37% of GDP), including activities undertaken by the central government, regional councils, industry and private landowners. Government funds accounted for about 60% of this total.

Central government funding for preventive bio-security measures increased from NZD 83 million in 1998 to NZD 141 million in 2003 (PCE, 2000; Biosecurity Council, 2003). About 87% of this funding goes to MAF, while DOC receives about 2%, MFish 2% and the Ministry of Health 9%. MAF's Biosecurity New Zealand unit co-ordinates most central government expenditure for *preventive bio-security measures*, which include extensive and routine inspections of passengers, baggage, imported goods and mail at airports, seaports and postal sorting centres. Seizures of suspect material from arriving aircraft and passengers more than doubled during the review period, reflecting growth in bio-security risks associated with increased international travel and shipping, as well as increased inspection capacity (e.g. more X-ray machines). Even so, the burgeoning of new invasive species – such as didymo, a freshwater algae – has resulted in new threats to native ecosystems, with high costs to the economy (NZIER, 2006). In 2004, DOC spent more than NZD 45 million on the *control of established animal pests and invasive weeds* in protected areas.

Regional councils spend at total of about NZD 40 million per year on pest management, half of it funded through the Animal Health Board for tuberculosis control (PCE, 2000). Reported spending by *regional and district councils* for biodiversity protection is dominated by expenditure for control of invasive species (Table 3.2).

Table 3.2 **Local government spending for indigenous biodiversity protection,** selected councils, 2003/04

	Marlborough District Council (NZD 000)	Northland Regional Council (NZD 000)	Environment Waikato (NZD 000)
Control of animal pests	83	812	860
Control of plant pests	476	185	793
Protection of habitats[a]	140	114	1 314
Restoration of riparian margins[b]	110	27	696
Other services[c]	100	5	48
Total	909	1 143	3 711

a) Includes protection of land areas of significant ecological value and land care arrangements.
b) Includes soil erosion control and integrated river bank management.
c) Includes provision of public information and policy development.
Source: MfE, 2005.

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2003). From 2000 to 2005, a NZD 9.8 million MFish programme to enhance marine bio-security focused on preventive pre-border and border controls, identifying six "most unwanted" marine species and putting in place a risk-based surveillance programme against them. There are still no regulations mandating vessel hull hygiene,[3] but voluntary guidelines for ballast water have been replaced by a legally enforceable Import Health Standard, requiring ballast water exchange at sea.

Control measures

Control of established *invasive animal pests* is achieved mainly through *trapping, poisoning and fencing*. As trapping is labour intensive, poisoning is often cheaper. The range of toxins used to control possums and rodents includes the anticoagulants brodifacoum, dipahacinone and pindone, and the acute poisons 1080[4]and cholecalciferol (Gillies, 2001). In recent years, 1080 has become the most used poison, as it kills target animals quickly and does not bio-accumulate. The usual method of placing poison bait is airdropping, using global positioning systems to avoid surface waters and sensitive areas. After public complaints about the widespread use of 1080, consultation before drops with landowners and other stakeholders was improved, and farmers are now advised to keep animals away from target areas. Hunters express concern that 1080 could enter wild deer meat, although comparative analysis of public health risks has suggested that its risk is lower than that posed by alternative poisons (PCE, 1998). Because of the strong public interest in and concern over 1080, in 2002 the Environmental Risk Management Authority launched a reassessment process to determine whether its use for pest control should continue to be authorised. Meanwhile, the use of non-toxic methods, such as *fencing* to keep invasive animal species out of areas where pests have been eradicated, has expanded, and is increasingly carried out on private lands. The search for less toxic options to 1080 should also be continued, as the 1996 review recommended.

Control of *invasive plant species* remains problematic. Their number increases by two per year, on average. Mechanical removal of weeds is labour intensive and slow, and thus expensive. Herbicides are widely used to control or eradicate invasive plant populations, but their use poses risks to indigenous plant communities and water bodies. The risks are managed by using selective herbicides, by targeting application of herbicide to individual plants and by regulating spraying through resource consents. During the review period, several experiments using insects to control the spread of weed species were successful. Regional pest management strategies set priorities for controlling environmental weeds; while this allows regional differences in vulnerability to weeds to be taken into account, it has also led to inconsistencies that impede comprehensive management (Williams and West, 2000).

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4. Management of Habitats and Ecosystems

Both the *representativeness and extent* of public conservation lands and waters increased during the review period through expansion of the conservation estate and greater use of conservation easements (known as covenants) on private land. As the 1996 OECD review recommended, New Zealand has greatly expanded protection of marine ecosystems, and has further developed mechanisms to involve landowners and Maori stakeholders in reaching ecosystem management objectives (OECD, 1996).

4.1 Terrestrial ecosystems

Two-thirds of New Zealand's *land area has been extensively modified* since it was settled by humans about 1 000 years ago (Reference IV). Since the mid-1980s, removal of agricultural subsidies has induced important land use changes. In particular, about 5 000 km^2 of pastureland has been converted to plantation pine forests and over 5 000 km^2 of marginal pasture on steep slopes has been left to regenerate (MAC, 2000). In 2005, pastoral farming was the biggest land use (130 000 km^2), with plantation forestry second (30 000 km^2). Together, arable and horticultural crops cover 3 300 km^2.

Although the *loss of indigenous ecosystems and habitats* likely slowed during the review period, it has not halted. Land use change analysis with satellite imagery showed a *net loss of 175 km*^{2} of indigenous land cover between 1996 and 2002, including losses of broadleaf hardwood and other indigenous forest (91 km^2), manuka and kanuka scrub (56 km^2) and tall tussock grassland (25 km^2) (Walker *et al.*, 2005). The changed land was mostly converted to forestry (77%) or pasture (22%). Collectively, wetlands and surface waters occupy less than 2% of the national land area. Although wetlands once covered 6 720 km^2, land conversion has reduced their extent by 90%. Pressures on aquatic habitats and species grew during the review period (Box 3.2).

In protected areas

Over 32% of New Zealand's land area, more than twice the OECD average, is protected through a network of parks and reserves (Figure 3.2). The 97 000 km^2 conservation estate falls into nearly 30 possible *protected area designations* under six different laws. Since 1995, the overall land and marine area having some kind of protected status has increased by 2.3%, while the area of *marine reserves* nearly doubled. The portion of protected land areas accorded IUCN protection status of either I or II (the highest protection levels) remained steady at 57.5% (Table 3.3).

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Box 3.2 **Increasing pressures on freshwater habitats from water pollution**

Dissolved nutrient concentrations in rivers are high country-wide. A 2003 study by the National Institute of Water and Atmospheric Research (NIWA) indicated that guidelines for dissolved nitrogen and phosphorus were routinely exceeded in all lowland rivers (Larned *et al.*, 2005). High nutrient levels promote the growth of nuisance aquatic plants, including water weeds and microscopic algae, and thus reduce natural and recreational values. *Eutrophication of lakes* caused by nutrient enrichment has become a major problem in New Zealand, with many lakes suffering reduced clarity due to increased algal growth, and oxygen depletion of bottom waters as organic particles settle out of the euphotic zone (the depth range within which aquatic plants can grow). Eutrophication of estuaries is also occurring, with consequent nuisance growths of sea lettuce and other weeds.

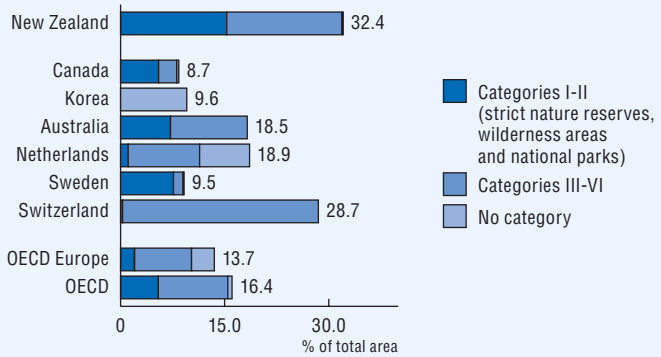
Another 2003 NIWA study showed that *water clarity in New Zealand rivers* was lower than the recommended limit of 1.6 metres (a contact recreation standard) in all low-elevation rivers (Snelder and Scarsbrook, 2003). Degraded visual clarity reduces light penetration, effectively shrinking the euphotic zone. Fine sediments also tend to settle and clog the gravel beds of rivers and streams, degrading habitat for bottom-dwelling species. In addition, sedimentation in downstream lakes and estuaries can cause considerable nuisance, smothering aquatic life.

Data regarding *microbiological contamination* of surface waters is incomplete. Available trend data for BOD_5 indicate that, although guideline values are rarely exceeded, values are highest in low-elevation rivers (Snelder and Scarsbrook, 2003). Limited monitoring of E. coli concentrations in rivers has also shown that the guideline values are most often exceeded in low-elevation river classes, particularly those in areas with relatively dry climate, and where the catchment is dominated by pastoral land. Direct access of livestock to waterways can increase concentrations of faecal micro-organisms by 20 to 35 times (according to an Environment Southland study in 2000) through disturbance of the stream bed and banks, as well as defecation into the water.

Although the *legal framework* for protected areas remains complex, with numerous governing laws and possible designations, an attempt was made in 2005 to rationalise the management of protected areas with two general policies.[5] The *General Policy for National Parks*, updating the 1983 policy of the same name, puts greater emphasis on ensuring public participation, recognising Maori interests and managing pressures from tourism. The *Conservation General Policy*[6] guides management of protected areas and mandates greater accountability. It calls on DOC to "provide conservation boards with a report (at least annually) on the

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Figure 3.2 **Protected areas,**[a] 2004



a) Terrestrial and marine areas. IUCN management categories I-VI and protected areas without IUCN category assignment. National classifications may differ.
Source: IUCN/UNEP-WCMC (2005), World Database on Protected Areas.

implementation of conservation management strategies and plans" as measured against specified "major milestones". By law, a *conservation management strategy* must be in place for each national park and conservation area, and be updated at least once every ten years. Strategies and associated plans are available on DOC's "regional publications" web page, but information about their effectiveness is scarce.

Although much effort has been directed at developing survey techniques for *monitoring ecosystem conditions*, neither standard operating procedures nor a national strategy has yet emerged. In the absence of periodically updated information about the state and functioning of ecosystems, the objectives of DOC's programmes continue to be formulated in terms of *output* (e.g. number of species recovery plans launched or consultations held) rather than *impact* (e.g. number of species restored to carrying capacity, extent of endangered habitat restored to equilibrium). This largely rules out monitoring of policy effectiveness in conserving biodiversity. Noting the increasing pressures on protected areas and the *systemic lack of information about ecosystem health*, a 2005 study called for "a comprehensive overhaul of New Zealand's biodiversity inventory and monitoring system" (Lee *et al.*, 2005).

Making the *network of protected areas more representative* of the diversity of the country's ecosystems has been a longstanding objective (OECD, 1996; DOC and MfE, 2000). A big step was made when *130 km^2 of indigenous podocarp forest* was

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Table 3.3 **Protected natural areas,** 1995 and 2005

Protection category	IUCN category	Area (ha)	
		1995	2005
TERRESTRIAL			
Protected under National Parks Act			
National parks	II	2 165 448	2 694 010
Specially protected areas[a]	Ia	55 176	55 701
Wilderness areas[a]	Ib	205 260	335 180
Subtotal[b]		2 425 884	3 084 891
Protected under Conservation Act			
Conservation parks	II	1 815 026	1 493 901
Ecological areas	Ia	215 116	156 941
Sanctuary areas	Ia	16 420	3 377
Wilderness areas	Ib	167 597	111 570
Stewardship areas	IV	2 769 683	2 806 881
Amenity areas	II	. .	9 327
Wildlife management areas	IV	. .	21 069
Marginal strips	V	. .	63 149
Subtotal[c]		4 983 842	4 666 215
Protected under Reserves Act[d]			
Nature reserves	Ia	189 472	114 384
Scientific reserves	Ia	10 368	15 778
Historic reserves	III	3 279	4 991
Scenic reserves	III	518 501	381 900
Local purpose reserves	III and IV	18 621	49 599
Recreation reserves	V	68 969	53 181
Subtotal[c]		809 210	619 833
Protected under Wildlife Act			
Wildlife refuges	IV	10 226	36
Subtotal[c, e]		10 226	36
Private land protected under:			
Conservation Act	III and IV	. .	46 213
Reserves Act	III and IV	. .	43 909
Wildlife Act	IV	. .	2 971
Other legal protection	III and IV	. .	18 792
Subtotal[c, f]		61 760	111 885
Total terrestrial protected areas		8 290 922	8 482 860
of which IUCN Category I or II (%)		*57.5*	*57.5*

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Table 3.3 **Protected natural areas,** 1995 and 2005 *(cont.)*

Protection category	IUCN category	Area (ha)	
		1995	2005
MARINE			
Protected under Marine Reserves Act and Marine Mammals Protection Act			
Marine reserves	Ia	758 277	1 269 150
Marine mammal sanctuaries[g]	Ia	335 111	673 564
Total marine protected areas		758 277	1 269 150
of which IUCN Category I or II (%)		*100.0*	*100.0*

a) Refers to six specially protected areas and seven wilderness areas located within national parks.
b) The increase in area protected in national parks is mainly due to the establishment of Kahurangi National Park (1996) and Rakiura National Park (2002). As both were previously protected under other legislation, the increase in national park area was accompanied by a decrease in other protected area classes.
c) An area with more than one type of protection is counted only once.
d) The National Reserve category reported in the previous OECD review has been eliminated here to avoid double counting, as all such reserves are also classified under another category of reserve (nature, scientific, historic, scenic or other purpose).
e) The large reduction in surface area between 1995 and 2005 reflects in part the elimination of double counting. The 2005 figure reflects the area protected solely under the Wildlife Act.
f) The subtotal for 1995 indicates private land protected under the Reserves Act and Conservation Act (IUCN III and IV), combined.
g) Both marine mammal sanctuaries are located within marine reserves.
Source: DOC, 2005b; OECD, 1996.

transferred from the state-owned Timberland forestry company to public conservation lands in 2001 (Chapter 6). Protection of *tussock grasslands* has also been expanded through the tenure review process, with some 105 km^2 added to public conservation lands since 1998 (Box 3.3). Notwithstanding this progress, a 2004 review concluded that while "large expanses of relatively unproductive sections of the country receive high levels of legal protection and are in relatively good condition… lower lying areas have generally much lower levels of legal protection, and what is protected is often not in good condition" (Rutledge *et al.*, 2004).

Outside protected areas

Local governments have major responsibilities concerning the conservation of biodiversity outside protected areas under the RMA and the Biosecurity Act, and this is reflected in their spending (Table 3.2). Land use planning and coastal zone management are almost totally in the hands of local councils. The extent to which nature conservation objectives are integrated into local spatial plans is highly

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Box 3.3 **High-country land tenure review,** 1998-2005

The *Crown Pastoral Land Act* (1998) authorised the review of tenure of 304 state-owned properties leased to farmers for livestock grazing since the 1940s. Together, the properties cover about 23 700 km^2 (9% of the national land area) in the high country of the South Island. Since the mid-1980s, the *removal of agricultural subsidies* and changes in the international wool market have reduced the profitability of the leases, which limit farmers to making pastoral use of the land. By 2005, the tenure review of 66 pastoral leases (covering about 330 km^2) had been completed, with leaseholders being granted freehold title to 55% of the land, 44% being transferred to full government ownership and the rest remaining under lease.

The *objectives of the land tenure review* are to promote ecologically sustainable land management, to protect significant inherent values while facilitating the highest economic use of the land, and to secure public access and enjoyment of high-country land. Tenure review is highly controversial; farmers seek to maintain rights to use the land for various purposes, while other stakeholders seek to maximise landscape, biodiversity and recreation values.

The newly recuperated high-country land is being used to create a *network of high-country parks*. The parcels are especially valued for their tussock grasslands, hitherto under-represented in conservation areas. In 2004, the central government authorised a NZD 79 million package to fund the establishment of the new South Island parks and reserves. For 2004-08, the package allocates NZD 61 million to Land Information New Zealand to fund the tenure review process and to pay settlements negotiated with farmers. The package allocates an additional NZD 18 million to DOC to fund its participation in the review process, including creation of the new nature parks as well as *weed and pest control* within them.

variable, however, due in part to lack of national guidance in this area (Chapter 5). The Action Bio-Community project (2001-04), a partnership between central and local government, helped increase local councils' capacity for addressing biodiversity issues in plans through Biodiversity Forums.

In recent years, regional councils have become increasingly active in *wetland conservation and restoration*, as monitoring has revealed increasing environmental pressures on aquatic habitats (Box 3.2). For example, since 2000, Northland Regional Council has funded a number of projects to promote wetland protection on private land. Hawke's Bay Regional Council administers a fund for wetland protection and restoration, and in 2003, Environment Canterbury (the Canterbury regional council) launched an "adopt a wetland programme".

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The *New Zealand Landcare Trust*, an NGO established in 1996 with funding from the MfE and corporate sponsorship by Transpower New Zealand, promotes sustainable land management and biodiversity initiatives in *rural communities*. It works with 187 grassroots land care groups on local land management issues, particularly control of plant and animal pests, restoration or conservation of threatened terrestrial ecosystems, and recovery of threatened animal or plant species (Nimmo, 2004).

Conservation on private lands is important to protecting indigenous biodiversity, as the majority of remaining under-represented ecosystems (e.g. lowland forests, dune systems, freshwater wetlands, riparian habitats) occur as remnants on private land (Davis and Cocklin, 2001). *Covenants* or conservation easements for at least part of the property are usually passed on in perpetuity on the property's title. *Funds and trusts* encourage farmers and other landowners to enter into such agreements (Box 3.4). In 2004, regional councils offered some NZD 4.3 million in "contestable funds" (competitive grants) to support nature conservation activities on private land (Lauder and Wilson, 2004). The area of private land under covenant agreements increased by 81% between 1995 and 2005, to 1 118 km^2 (Table 3.3).

4.2 Marine ecosystems

New Zealand has *diverse and extensive marine ecosystems*, as its EEZ extends from subtropical to sub-Antarctic waters and from inter-tidal estuaries to seabed trenches as deep as 10 km. The natural functioning of these ecosystems supports a range of economic activities, including fishing, aquaculture and tourism. Coastal and offshore ecosystems also serve as important breeding grounds for some 80 migratory seabird species, including albatross and petrel species (MFish, 2003).

Substantial progress was made during the review period in developing *inventories of marine organisms* from a wide range of habitats. Nevertheless, information about the country's marine biodiversity remains incomplete, with gaps in understanding of the functioning of marine ecosystems and of the impacts of human activities. In 2002, MFish launched the *National Aquatic Biodiversity Information System*, a GIS-based system accessible online, to assemble and aggregate available spatial information concerning species distribution, marine mammal and seabird breeding areas and habitats, and quota management area boundaries. The management of New Zealand's marine resources was also strengthened by the *Marine Environment Classification*, which the MfE published in 2005. It includes digital maps with information about physical, biological and ecological conditions for the entire EEZ (Snelder *et al.*, 2005; Leathwick *et al.*, 2006). The Ocean Survey 20/20, a multi-agency initiative launched in 2005, is expected to contribute to understanding of sea-bed biodiversity and habitats in the EEZ.

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Box 3.4 **The use of grant funds to encourage biodiversity protection on private land**

New Zealand real estate markets have been adapted to "unbundle" certain ecosystem services from other property uses through *perpetual conservation easements* called covenants. Such an easement represents a privately negotiated encumbrance on a designated property, which is passed on in perpetuity with the title to the property (OECD, 2004). Private landowners' participation in such agreements is encouraged by competitive grants known as contestable funds. Such approaches have been expanded since the launch in 2000 of the Biodiversity on Private Lands package, which created the Biodiversity Advice Fund and the Biodiversity Condition Fund and increased funding for several existing funds and trusts encouraging conservation on private land (e.g. Nature Heritage Fund, Nga Whenua Rahui, Queen Elizabeth II Trust).

The *Biodiversity Condition and Advice Funds* allocate money to promote pest control measures on privately held lands. The Advice Fund sponsors workshops, field days and publications to inspire landholders to protect indigenous biodiversity and facilitate best-practice sharing. The Condition Fund supports projects to improve the condition of indigenous habitats and communities on private land, notably through pest control. Since the funds' inception in 2002, about NZD 8.5 million has been allocated to some 500 projects. Nearly three-quarters of the funding has gone to small projects (i.e. less than NZD 15 000 each), many involving fencing off parts of a farm to control pests that threaten native biodiversity. Larger projects funded include establishment of a help line for rural landowners in Waikato (NZD 110 000) and measures to control kiwi predators in the far north (NZD 135 000) and invasive species on Great Barrier Island (NZD 80 000).

The *Nature Heritage Fund*, established in 1990 by the central government, provides contestable funds for the legal protection of biodiversity values on private land. Individual landowners, NGOs, local authorities and government departments submit applications for the purchasing or covenanting of land. Much of the land purchased through the fund is protected under the Reserves Act (1977) and subsequently managed by DOC or vested in councils. Landowners wishing to protect natural areas while retaining title to the land may register a Nature Heritage Fund covenant on the title. The fund then provides *assistance* with the costs of fencing, surveying and registration. Administered by an independent committee, the fund is serviced by DOC and receives annual state funding of about NZD 11 million. Priority is on proposals that meet criteria of representativeness, sustainability, landscape integrity and amenity values.

The *Nga Whenua Rahui*, a fund established in 1991 by DOC, supports the protection of native flora and fauna on Maori-owned land. It is geared to dealing with large numbers of dispersed owners, and offers the possibility to retain rights to traditional harvesting and access. Some covenants (kawenata) incorporate review options rather than being perpetual, so future generations can make their own decisions regarding the resource. In some cases, the Nga Whenua Rahui provides funding over and above the costs of protection, in consideration of forgone income opportunities. By 2005, the fund had helped protect over 1 900 km^2 of Maori-owned land at a total cost of about NZD 32 million. The bulk of the grants support the fencing off of indigenous areas from farmed land, with registration and legal costs making up the remainder.

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Box 3.4 **The use of grant funds to encourage biodiversity protection on private land** *(cont.)*

The *Matauranga Kura Taiao Fund*, a contestable fund established in 2000 and administered by the Nga Whenua Rahui committees, supports initiatives to preserve traditional Maori knowledge about biodiversity and to promote its application for sustainable management of natural resources. From 2001 to 2004, the fund disbursed NZD 2.3 million and supported 61 projects, ranging from workshops on traditional knowledge to the establishment of endemic plant reserves.

The *Queen Elizabeth II Trust*, established in 1977, is an independent organisation that promotes the protection and enhancement of natural areas on privately owned land. By forming an Open Space Covenant under the trust, private landowners may stipulate particular management practices that are registered on the title in perpetuity. The covenants are defined so that they disallow certain specified uses of the property (e.g. further building or development) or to provide only for certain specified uses (e.g. agricultural or touristic). The easement is then conveyed to the trust. In February 2005, 2 029 registered covenants were in place, covering 701 km^2. An additional 539 approved covenants were awaiting registration, for a total of 2 568 covenants covering 857 km^2 (Bayfield, 2004). This represents an increase in area covered under the trust of about 80% since 1996.

The *Landcare Trust grant programme*, established in 1996 by the MfE and Transpower, awards grants to non-profit community groups undertaking projects that enhance sustainable land management or biodiversity on private rural land. Projects have ranged from pest management to tree planting and establishment of nurseries.

The *Significant Community Based Projects Fund*, launched by the Prime Minister in 2005 with a four-year budget of NZD 32 million, supports community-based projects that contribute significantly to regional or national environmental conservation objectives. In the first round of projects, the Maungatautari Ecological Trust received NZD 5.5 million towards establishing an ecological island reserve.

In protected areas

In 2005, *marine protected areas*, all under "strict protection",[7] covered 12 690 km^2, or about 7.5% of the territorial sea.[8] The area has grown by 67% since 1995 (Table 3.3). The bulk of the increase came from the establishment of the entire territorial sea around Auckland Island (over 4 000 km^2 in the sub-Antarctic) as a reserve in 2003. The 2005 Fiordland Marine Management Act created the *South Island's Fiordland Marine Area* (more than 8 000 km^2) as a result of local activism (Chapter 6). A further eight marine reserves covering 575 km^2 have been proposed under the Marine Reserves Act and are expected to be approved by 2007. Progress

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will need to be sustained to meet the ambitious Biodiversity Strategy target of *protecting 10% of the EEZ by 2010* in marine reserves representing the full range of indigenous habitats and species.

Outside protected areas

Conservation of marine biodiversity outside marine reserves depends on sustainable management of fishing, mineral extraction, transport and other activities. Principal pressures on marine ecosystems include exploration for and extraction of oil and other minerals, dumping of dredge spoil and other materials, reclamation, aquaculture, fishing and land-based activities that cause run-off or discharges to the aquatic environment. In view of these pressures, some of which are increasing, New Zealand has taken steps since 2000 to clarify the *legislative framework* for management of marine ecosystems and resources. Responsibilities regarding the management of coastal marine resources were clarified by the passage in 2004 of the Foreshore and Seabed Act and the Aquaculture Act. A draft oceans policy went to public consultation in 2005 and finalisation is hoped for in 2006 (Chapter 7). The policy, under development since 1999, is intended to provide a framework for reconciling competing interests in the marine environment.

In 2005, the *fishing industry* began discussions with MFish regarding the potential closure of nearly one-third of the EEZ to *bottom trawling and dredging* (Seafood Industry Council, 2006). In 2006, negotiations centred on setting aside largely unmodified areas of the seabed that are representative of the benthic environment in the EEZ.

5. Sectoral Integration of Nature Conservation and Biodiversity Concerns

5.1 Tourism

The *tourism industry* is one of New Zealand's largest foreign exchange earners, an important source of employment and a major contributor to GDP (9.4%) (TRCNZ, 2005). International visitor arrivals increased by 67% between 1995 and 2004, to reach 2.25 million (TNZ, 2005). About two-thirds of visitors report that nature-based activities are a primary factor in their choice of New Zealand as a destination. In 2004, 33 million visits were made to conservation areas, with about 90% of visitors coming for day walks or short camping trips (DOC, 2004). As numbers of visitors to national parks and other conservation areas have increased, so have related *pressures on nature*. Upgraded walking trails, bigger huts and improved facilities have been opened in many parks in an attempt to reduce congestion. Since 2001, DOC has invested nearly NZD 10 million (including, for instance, NZD 1 million at Abel Tasman National Park) to upgrade toilet facilities from latrines to pump-and-treat systems in some parks.

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Visitors are asked to respect the New Zealand Environmental Care Code when in conservation areas. The code features a ten-point checklist on waste management, surface water use and respect for fragile ecosystems and cultural heritage (DOC, 2005c).

Although the *2005 General Policy for National Parks* and the 2005 Conservation General Policy recognise the need to moderate the environmental impacts of visitors and tourism concessions, they also stipulate that public access to public conservation lands and waters must remain free of charge. *Charges* for the use of accommodation, facilities and services can be levied, however, and have served as an important means of demand management since 1989. Use of such charges should be expanded, in application of the user pays principle and as a way to continue managing demand. Also, as the *New Zealand Tourism Strategy 2010* points out, there is a need to monitor and assess visitor impacts on the protected environment and to design mechanisms for reducing them, such as booking systems and one-way routes (TSG, 2001). The strategy also calls on tourism operators to make greater use of pricing strategies, especially during peak demand periods.

5.2 Fisheries

Despite an EEZ spanning 30 degrees of latitude, the world's sixth largest, New Zealand contributes only *1% of the total global fish catch*. Two-thirds of its EEZ is commercially barren, due to extreme depths and lack of nutrient-rich currents (MfE, 1997). Nonetheless, in 2004, fish products were the sixth largest export earner, contributing NZD 1.1 billion in 2005. Together, hoki, snapper, ling and orange roughy account for about 50% of the total annual commercial catch, while aquaculture is mostly based on the green-shell mussel, Pacific oyster, king salmon and abalone (StatsNZ, 2002).

Capture fisheries are managed under a *quota management system* (Chapter 4). For each target species, a total allowable catch (TAC) is established. TACs are set at levels designed to allow for sustainable harvest, and thus take into account recreational, customary and commercial fishing. The total commercial catch is allocated as individually transferable catch limits. Other measures, such as gear restrictions, are in place to mitigate potential adverse effects on non-target species. The system has successfully avoided the stock collapses that have occurred in some other OECD countries. Implementation of the 1996 Fisheries Act added an additional 50 species to the system during the review period. *Aquaculture* became the fastest growing sector of the New Zealand seafood industry during the review period (Chapter 5).

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In 2005, MFish published a *Strategy for Managing the Environmental Effects of Fishing*, laying out plans for standards to regulate the environmental effects of fisheries so as to help meet the obligation under the Fisheries Act to assure sustainable use of fish stocks as well as ecological sustainability (MFish, 2005). Measures to mitigate adverse effects of fishing on non-target populations include fishing method restrictions, observer programmes, imposition of marine mammal by-catch limits and requirements that fishing boats be equipped with by-catch mitigation devices. In 2005, MFish published two marine invertebrate guides to strengthen monitoring of the by-catch of benthic invertebrates.

Under a national plan to reduce seabird deaths related to fishing, *voluntary codes of conduct* have been introduced in key fisheries to lower seabird by-catch (MFish, 2003). In 2005, in response to reports that some squid trawlers were not complying with the code for the squid fishery, MFish directed certain vessels to return to port and pick up on-board observers. *Bird-scaring devices* were later required for all trawlers 28 metres or over, fishing in New Zealand waters.

5.3 Forestry

Since human settlement, the *indigenous forests* that covered 85% of the land area around 1 000 years ago have been reduced to 23% (about 62 000 km^2), mostly confined to mountainous areas and some low-lying remnants of the West Coast, Southland and Northland (MfE, 1997). The bulk of surviving indigenous forests (49 000 km^2) are government owned, and managed as part of conservation lands. Some 80% of indigenous forests on private land are Maori owned. In 2001, 1 300 km^2 of state-owned indigenous podocarp forests, originally earmarked for logging, were transferred to DOC for conservation.

New Zealand strove to promote *sustainable forestry practices*, particularly of remaining indigenous forest, during the review period. The amended Forests Act stipulates that indigenous timber can be produced only from forests managed so as to be maintained in perpetuity as functioning ecosystems and as economic resources for the owners (Chapter 5). *Forest certification* through the Forest Stewardship Council is widespread. In addition, by 2005, nearly 2 500 km^2 of privately owned native forests had been protected through acquisition and covenants (Box 3.4).

5.4 Agriculture

The agriculture sector is *New Zealand's largest export earner*, contributing nearly 53% of the country's total merchandise export value in 2004. Since removal of agricultural *production subsidies* in the late 1980s, *land use has undergone a*

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transformation, with many marginal grazing lands taken out of production and either converted to plantation forestry or left to revert to indigenous vegetation. As running sheep on marginal pastureland was no longer profitable, sheep numbers have fallen sharply (Chapter 5). Driven by high world prices for milk solids, dairy farming boomed, and there was a 50% increase in the number of cows (Davies-Colley *et al.*, 2003). Marginal pasture that had been pulled out of production was often converted to plantation forest, which was encouraged by fiscal instruments. While these shifts have had positive implications (e.g. protection of indigenous forests), the wholesale shift to dairy farming has strongly altered nutrient balances in lowland ecosystems (Chapters 2 and 5), with negative *consequences for aquatic ecosystems* in particular (Box 3.2).

6. International Co-operation for Nature and Biodiversity Conservation

New Zealand is party to *a number of international conventions* for the protection of nature and biodiversity (Reference II), and regularly files reports with the various secretariats. The country has been active in controlling international trade in species protected under the Convention on International Trade in Endangered Species of Wild Flora and Fauna, and has followed up on its commitments under the Convention on Biological Diversity with the issuance of the Biodiversity Strategy (Chapter 7). The country has been active in international efforts to reduce environmental damage associated with bottom trawling on the high seas. Co-operation with Australia, Chile and other countries is expected to lead to the development of a *regional fishery management organisation* involving other countries with interests in the Tasman Sea and the East Pacific. This major undertaking will address one of the last gaps in the governance of high seas fishery resources globally. New Zealand has been proactive in raising marine conservation issues during the negotiations, and together with Australia has proposed the establishment of a transboundary marine protected area in the Tasman Sea.

New Zealand has designated six *Ramsar wetlands* of global importance, which together cover nearly 400 km^2. The 1986 National Wetlands Policy was established with the objective of slowing the decline of wetlands, of which 85% had already been drained (DOC, 2005c). Three of the six wetlands designated as Ramsar sites in New Zealand are found in the Waikato region. Two of these (Whangamarino and Kopuatai) are freshwater wetlands, and the third (Firth of Thames) is tidal. In addition, New Zealand has worked to extend international protection of *migratory birds*. In particular, it supported development of the Asia-Pacific Migratory Waterbird Conservation Strategy (2001-05), which recognised three main flyways for shorebirds in Asia-Pacific and set out conservation actions for each.

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New Zealand has given priority to facilitating international co-operation on conservation of *natural ecosystems in Antarctica* through its work as a member of the Commission for the Conservation of Antarctic Marine Living Resources and the Committee on Environmental Protection under the Antarctic Treaty (Chapter 7). In particular, it supported the development of a system of marine protected areas in the Antarctic. It has also declared two large areas in the Ross Sea off limits to marine harvesting, including 10 000 square nautical miles around the Balleny Islands in an area recognised for its ecological significance in the region (Sharp, 2006), and a littoral zone designed as a buffer for important marine mammals and seabird breeding sites.

Known as the *albatross capital of the world* because 13 of the world's 24 species of albatross breed on its islands, New Zealand has a special responsibility for protecting these rare birds. Since the mid-1980s, some 65 000 albatross and petrels have died in New Zealand's EEZ diving for the baited hooks of long-line boats or caught in trawlers' nets (WWF-NZ, 2005). In June 2001, New Zealand signed the *Agreement on the Conservation of Albatrosses and Petrels* with Australia, Brazil, Chile, France, Peru and the UK. As a follow-up, New Zealand launched a National Plan of Action on Seabirds in 2004, detailing measures to reduce incidental catch of seabirds in its waters, including increasing observer coverage on fishing vessels and encouraging the use of mitigation devices by fishers.

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Notes

1. Lands under freehold as well as under traditional tenure arrangements.
2. "Threatened" covers species listed in the IUCN categories "critically endangered", "endangered" and "vulnerable".
3. Biosecurity (Hull Cleaning) Regulations released in 2002 for public consultation are pending finalisation.
4. 1080 (sodium monofluoroacetate) is a compound resembling a naturally occurring toxin found in plants in Australia, South America and South Africa.
5. A general policy is the highest level of statutory policy for DOC.
6. The Conservation General Policy is the first policy statement issued under the Conservation Act (1987). It updates previous policy concerning management of conservation areas designated under the Wildlife Act (1953), the Marine Reserves Act (1977), the Reserves Act (1977), the Wild Animal Control Act (1977) and the Marine Mammals Protection Act (1978).
7. In strictly protected zones, no fishing, shellfish gathering or other extractive activity is allowed.
8. The territorial sea is that part of the EEZ within 12 nautical miles of the coast.

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4

ECONOMY AND ENVIRONMENT*

Features

- Decoupling environmental pressures from economic growth
- Overarching goals for sustainable development
- Integrating environmental concerns into transport and energy decisions
- Environmental management in the RMA framework

* This chapter reviews progress since the previous OECD Environmental Performance Review of 1996. It also reviews progress with respect to the objective "decoupling environmental pressures from economic growth" of the 2001 OECD Environmental Strategy. It takes into account the latest OECD Economic Surveys of New Zealand.

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Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of New Zealand:

Integration of environmental concerns into economic decisions

- strengthen and extend measures to *decouple environmental pressures* from economic growth, where possible using market-based approaches to ensure that environmental costs are reflected in prices;
- further develop *economic and regulatory measures* to reduce diffuse water and air pollution from agriculture, tourism and transport;
- further strengthen measures to promote *energy efficiency* in the transport, energy and industrial sectors (e.g. energy taxation and pricing, product standards, building codes);
- augment measures to encourage improved *emission performance of motor vehicles* and to internalise the environmental costs of road transport (e.g. fuel taxes, fuel quality standards, inspection of in-use motor vehicles, road user charges);
- ensure that *national sustainable development objectives* are reflected in territorial development plans and resource consents;

Strengthening implementation of environmental policies

- accelerate the establishment of *national environmental standards* (e.g. for freshwater, waste and contaminated land) and *national policy statements* (e.g. on coastal waters and freshwater);
- review systems for *charging users for waste and waste water services*, identifying opportunities to strengthen economic incentives for resource conservation and efficiency;
- reinforce the commitment to *outcome-oriented environmental policies*, ensuring that information and data needed to assess policy effectiveness and efficiency are regularly collected and analysed;
- strengthen *monitoring of air and water quality, and waste generation and treatment*, assuring baseline consistency of methods used at local level to facilitate data aggregation and periodic reporting of key environmental indicators at national level;
- assure the effectiveness of *voluntary agreements*, requiring clear environmental performance targets, regular reporting and third-party auditing.

Conclusions

Integration of environmental concerns into economic decisions

Integration of environmental concerns into economic planning and development progressed during the review period. New Zealand has weakly *decoupled its emissions* of major air pollutants (SO_x, NO_x, NMVOCs) from its economic growth, and has

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lowered the energy intensity of its economy by 18% since 1996. Cross-subsidisation of electricity has been eliminated and higher end-user prices have strengthened incentives for conservation. *Renewable energy sources* constitute 30% of the energy supply, higher than in most OECD countries. Standards for motor vehicle fuel quality, issued in 1988, were recently revised. *Environmentally harmful subsidies* in the agriculture and fishery sectors are among the lowest in the OECD. The management of fisheries through a system of *individual transferable quotas* has helped avoid stock collapses and served as an example for other OECD countries. The *2003 Sustainable Development Programme of Action* defined a national approach to sustainable development and set out overarching principles and goals, thus giving needed guidance to territorial authorities. Supporting objectives were formulated in several national strategies (e.g. on biodiversity, waste, energy efficiency) issued since 2001. *Codes of practice* established by business associations in several sectors (e.g. tourism, fisheries, forestry) are facilitating best-practice sharing.

Despite this progress, New Zealand faces a *number of challenges* in integrating environmental concerns into economic activities. No strong decoupling of environmental pressures from GDP growth has been observed. Air emissions from power plants and mobile sources increased significantly during the review period. The use of *nitrogenous fertiliser* has outstripped GDP growth since 1996, with consequent increases in run-off to surface waters. The rate of car ownership has grown very rapidly, and is now one of the highest among OECD countries; little has been done to manage demand for private road transport in favour of less polluting modes. Although still good overall, *air quality* has deteriorated in some urban areas, due mostly to emissions from motor vehicles, home heating and industry. *Economic and fiscal instruments* (e.g. taxes, charges, deposit-refund programmes) are little used to internalise the external environmental costs of sectoral activities, although the country's commitment to using market-based solutions is deep rooted. Sustained growth in demand for electricity has led to increased use of fossil fuels for power generation, with consequent increases in *greenhouse gas (GHG) emissions*.

Strengthening implementation of environmental policies

During the review period, *local authorities* largely assumed the additional environmental management responsibilities devolved to them under the RMA. No operational regional policy statements or regional coastal plans existed at the time of the 1996 OECD review, but by 2006 all regional authorities had issued policy statements, and all but four had coastal plans in place. Overall, *local authorities* have used the RMA-based *resource consent* system to manage point sources of pollution effectively. Investment in water supply and sewerage has led to better sanitation.

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Local councils increasingly apply *user charges* for landfilling and resource consent processing. A first set of national environmental standards (concerning air quality) was issued in 2004; it includes five standards for ambient (outdoor) air quality, and seven standards banning activities that discharge toxics into the air. Additional government funding since July 2002 and development of a robust case management system have improved the functioning of the *Environment Court* and halved the backlog of cases from the 2001 level. Since 2000, the central government has issued several national strategies to help guide local government in implementing the RMA, and has worked to improve public understanding of RMA processes. After the first national state of the environment report was published in 1997, a project helped define several sets of national environmental indicators. The *Parliamentary Commissioner for the Environment* has provided independent, cross-sectoral analysis that has helped focus environmental sustainability efforts. Environmental expenditure (for pollution abatement and control as well as water supply and nature conservation) has increased in recent years, although it remains rather low (less than 1% of GDP).

Notwithstanding these achievements, there remains *room for improvement* in New Zealand's environmental management. The central government has so far provided little statutory guidance in the form of *national standards and policy statements* to local authorities regarding implementation of the RMA and monitoring of environmental conditions. Recent success in issuing national strategies concerning elements of environmental management is tempered by their non-binding nature, which makes their implementation vulnerable to changes in government. The *Environment 2010 Strategy*, adopted in 1995, was set aside a few years later. Differences in *technical capacity, knowledge, skills* and issues among local authorities translate into differences in environmental management, and businesses complain that the regulatory playing field within the country is not level. The policy mix remains focused on regulatory and voluntary approaches, with *economic instruments* underused. National-level aggregates of *data and indicators* on the state of the environment and environmental pressures are scarce, thus impeding efforts to strengthen outcome-oriented environmental policy-making. Despite recent progress, the *polluter pays principle* is not yet fully integrated into markets for environmental goods and services.

♦ ♦ ♦

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1. Progress Towards Sustainable Development

1.1 Decoupling of economic growth and environmental pressures

New Zealand's GDP[1] *has grown by 30%* since 1996 (54% since 1990), outpacing the OECD average considerably (Figure 4.1). Despite population growth, real per capita GDP has grown 19% since 1996. The economy depends heavily on international trade, with exports dominated by natural resource-based products (Box 4.1). *Major sources of environmental pressure*, including transport, agriculture, tourism and energy production and consumption, all expanded during the review period. Growth in passenger car traffic (28% since 1996) largely tracked GDP, while road freight traffic increased by 19%. Since 1996, industrial production has increased by 13% and agricultural production by 23% (Table 4.1).

Box 4.1 **Economic context**

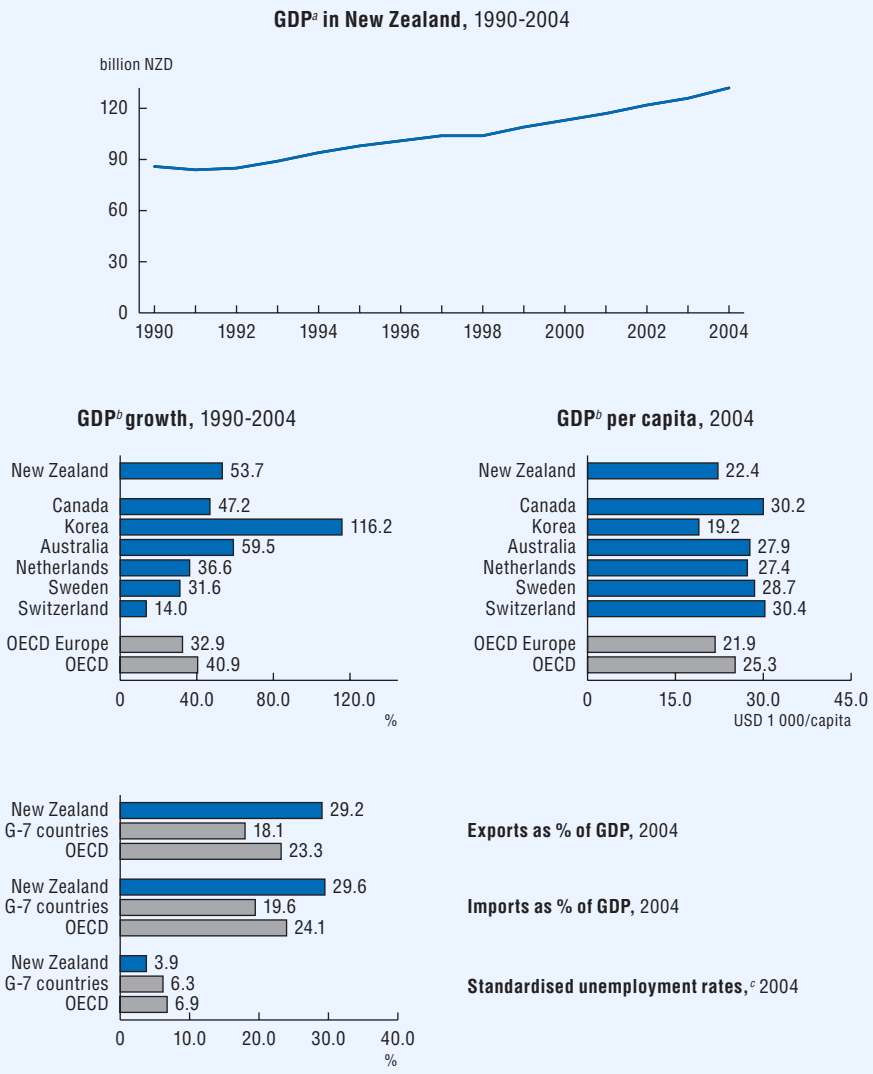
New Zealand's *economic growth* was robust during the review period. GDP (at 2000 prices and purchasing power parities) has grown by 30% since 1996. *Real per capita income* (taking into account purchasing power parities) rose for seven consecutive years, to USD 23 000 in 2005. In the OECD's comparative ranking of real GDP per person, New Zealand comes 19th out of 30 member countries and is in the "low middle income" group with, for instance, Spain, Greece, Portugal and the Republic of Korea. The *unemployment rate* steadily declined during the review period, and in 2004 was one of the lowest in the OECD at 3.9% (OECD, 2005a).

Much of New Zealand's recent economic growth can be characterised as delayed benefits from a range of *macroeconomic and structural policy reforms* initiated in the mid-1980s. These reforms transformed an essentially agrarian economy, highly dependent on concessionary UK market access, to an export-oriented free market economy competing in the global market. Over the past 20 years, the economy has gone from being one of the most regulated in the OECD to one of the most *deregulated*.

New Zealand is *dependent on international trade*. Exports equalled 29% of GDP in 2004 (compared to 23% for OECD countries overall). The current account deficit has generally fluctuated between 4% and 7% since 1996, dipping to 2.8% in 2001 (OECD, 2006). New Zealand has a relatively high reliance on natural resource-based industries, particularly agriculture, forestry, fishing and aquaculture. Both the export-oriented primary production sector and the booming tourism industry are dependant on a "*clean and green*" *image*, which is seen as helping assure *market access* and giving key New Zealand products a competitive advantage.

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Figure 4.1 **Economic structure and trends**



a) GDP at 2000 prices.
b) GDP at 2000 prices and purchasing power parities.
c) % of civilian labour force.
Source: OECD (2005), OECD Economic Outlook No. 77.

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Table 4.1 **Economic trends and environmental pressures**

(% change)

	1990-2004	1996-2004
Selected economic trends		
GDP[a]	54	30
Population	21	9
GDP[a]/capita	27	19
Agricultural production	49	23
Industrial production[b]	32	13
Road freight traffic[c, d]	46	19
Passenger car traffic[e, f]	57	28
Pollution trends		
CO_2 emissions[g]	49	24
SO_x emissions[f]	39	28
NO_x emissions[f]	16	3
Energy trends		
Total primary energy supply	28	6
Total final energy consumption	42	15
Materials trends		
Nitrogenous fertiliser use	776	186
Household waste	35[h]	8[i]

a) At 2000 prices and purchasing power parities.
b) Includes mining, quarrying and manufacturing.
c) Based on values expressed in tonne-kilometres.
d) To 2001.
e) Based on values expressed in vehicle-kilometres.
f) To 2003.
g) From energy use. Calculated on a sectoral approach, excluding marine and aviation bunkers.
h) 1990 to 1999.
i) 1995 to 1999.
Source: OECD, Environment Directorate; IEA-OECD.

Emission intensity

National *emissions of SO_x and NO_x* increased but were slightly decoupled from GDP growth during the review period. Per unit of GDP, New Zealand's emissions of SO_x are slightly below the OECD average, while its emissions of NO_x are about one-third higher (Figure 4.2). A decrease in SO_x emissions from industry has been largely offset by an increase from power stations. The bulk of the increase in NO_x

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Table 4.2 **Atmospheric emissions**[a] by source, 1996-2004

(tonnes)

		SO_2	(%)	NO_x	(%)	NMVOC	(%)	CO	(%)
Power stations	1996	2.6	*4.4*	14.2	*9.3*	0.3	*0.2*	1.8	*0.3*
	2004	16.1	*21.3*	23.6	*14.9*	0.4	*0.2*	1.6	*0.3*
Industrial combustion	1996	25.1	*42.7*	40.5	*26.4*	2.2	*1.5*	17.4	*3.2*
	2004	24.9	*32.9*	31.3	*19.8*	2.5	*1.5*	22.7	*3.6*
Non-industrial combustion	1996	4.4	*7.4*	1.8	*1.2*	1.1	*0.7*	1.2	*0.2*
	2004	4.9	*6.6*	2.5	*1.6*	1.3	*0.8*	1.4	*0.2*
Industrial processes	1996	14.5	*24.7*	3.2	*2.1*	25.4	*16.5*	32.5	*6.0*
	2004	14.2	*18.8*	2.7	*1.7*	23.8	*14.0*	39.3	*6.2*
Mobile sources	1996	12.2	*20.8*	92.9	*60.5*	94.2	*61.3*	468.8	*86.4*
	2004	15.5	*20.5*	97.3	*61.5*	109.7	*64.7*	546.6	*86.7*
Solvents	1996	–	–	–	–	30.4	*19.8*	–	–
	2004	–	–	–	–	31.9	*18.8*	–	–
Miscellaneous	1996	–	–	0.8	*0.5*	–	–	21.0	*3.9*
	2004	–	–	0.7	*0.5*	–	–	18.9	*3.0*
Total	1996	58.8		153.4		153.6		542.8	
	2004	75.5		158.2		169.7		630.4	
Change 1996-2004 (%)			*28.3*		*3.1*		*10.5*		*16.2*

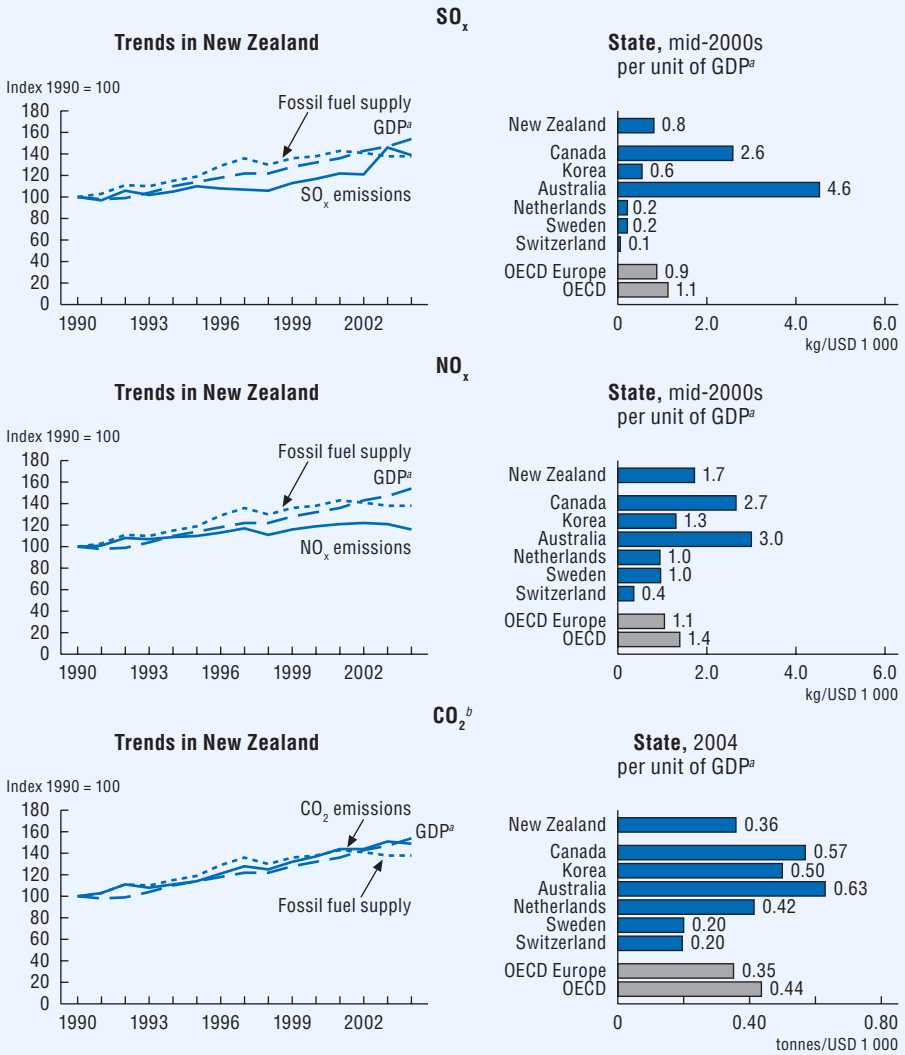
a) Excludes emissions from land use change and forestry.
Source: MfE, 2006.

emissions has come from power plants as well, although mobile sources have also contributed (Table 4.2). National emissions of *CO and non-methane VOCs* have increased by 16% and 10%, respectively, with road transport the major contributor (OECD, 2005b).

National *greenhouse gas (GHG) emissions* have increased by 10% since 1996 (23% since 1990). They thus were weakly decoupled from GDP growth in the review period. Overall *GHG intensity* of the economy remains among the highest in the OECD. Agriculture accounts for about 50% of national GHG emissions,[2] mostly in the form of methane and nitrous oxide (Chapter 7). *Emissions of CO_2* from energy use grew slightly slower than GDP during the review period (Figure 4.2). Per unit of GDP, CO_2 from energy use is about equal to the average for OECD Europe, and is about 15% lower than the overall OECD average, reflecting the relatively high share of renewable energy sources in the energy supply (Figure 4.3).

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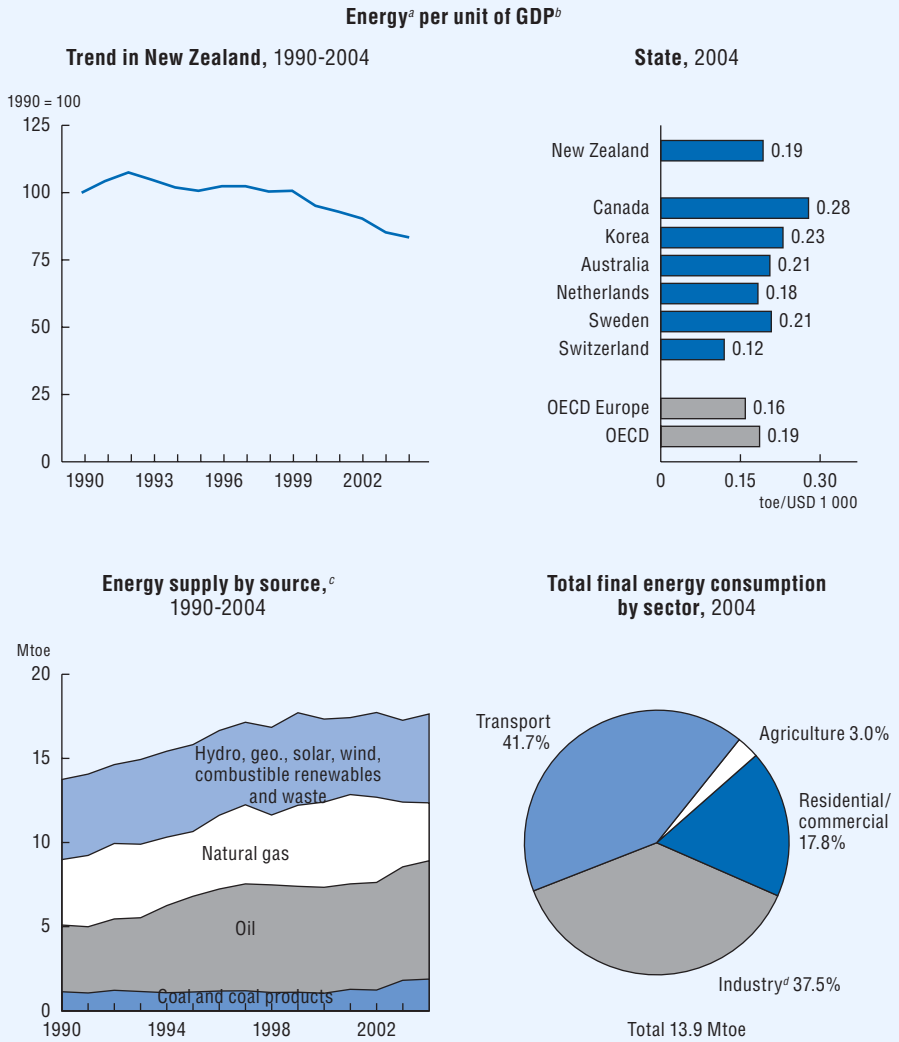
Figure 4.2 **Air pollutant emissions**



a) GDP at 2000 prices and purchasing power parities.
b) Emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.
Source: OECD, Environment Directorate; OECD-IEA (2006), CO_2 Emissions from Fuel Combustion;OECD (2005), OECD Economic Outlook No. 77; OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004.

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Figure 4.3 **Energy structure and intensity**



a) Total primary energy supply.
b) GDP at 2000 prices and purchasing power parities.
c) Breakdown excludes electricity trade.
d) Includes non-energy use in industry sector.
Source: OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004; OECD (2005), OECD Economic Outlook No. 77.

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Energy intensity

The *energy intensity*[3] of the New Zealand economy is about equal to the OECD average (Figure 4.3), after an 18% improvement since 1996. Over the review period, total energy supply rose by 6% and total final energy consumption by 15% (Table 4.1). National energy consumption is dominated by transport (42%), industry (35%) and buildings (18%). *Energy use per unit of output* has grown rapidly in the agriculture sector (though it still represents less than 3% of the total), mainly owing to expanded irrigation. Transport energy intensity is high and growing, reflecting heavy dependence on road transport for passengers and freight (MED, 2004).

Material intensity

Between 1995 and 1999, *municipal waste generation* increased by 8% while GDP increased by 12% (Table 4.1). A paucity of data on waste generation trends since 1999 precludes drawing a conclusion about the entire review period, but the 2002 Waste Strategy estimated that waste generation had continued to track GDP growth rather closely, despite increased recycling (Chapter 2). The estimated rate of municipal waste generation is 400 kg per capita, compared to the OECD average of 550 kg per capita.

The overall *intensity of water resource use*[4] remains slight, compared to other OECD countries. Nevertheless, available regional data on water abstraction suggest that the total volume abstracted likely exceeded GDP growth during the review period. *Per capita abstraction* is roughly 60% higher than the OECD average, illustrating the importance of abstraction for agricultural uses (Chapter 2).

New Zealand's *intensity of use of nitrogenous fertiliser* (tonnes per square kilometre of agricultural land) is about equal to the OECD average (Chapter 5). But growth in the use of such fertiliser has outstripped that of GDP sixfold since 1996 as dairy farms have begun fertilising pasture to increase productivity (Table 4.1). The overall *intensity of pesticide use* in agriculture is nearly 30% lower than the OECD average (Chapter 5), with the bulk of pesticides used in the rather small arable crops sector, essentially horticulture and viticulture. Total annual pesticide consumption was estimated at 3 300 tonnes in the late 1990s (Holland and Rahman, 1999), and horticulture and viticulture have grown considerably since then.

Overall assessment

During the review period, New Zealand's overall *progress towards decoupling environmental pressures from GDP growth was modest*. Air emissions of SO_x and NO_x increased at less than half the rate of GDP growth. Emissions of CO_2 from energy use, non-methane VOCs and CO increased at one-half to two-thirds the rate of GDP growth. Per unit of GDP, emissions to air of NO_x, SO_x and CO_2 are near the OECD averages. Energy intensity is now about equal to the OECD average, having fallen by 18% during

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the review period. Municipal waste generation and water abstraction have likely continued to track GDP growth since 1996. While the intensity of water and fertiliser use remains modest compared to other OECD countries, the review period saw significant increases, with consequent growth in pressure on the environment.

1.2 Sustainable development approach and institutions

During the review period, New Zealand formalised its national approach to sustainable development. The *2003 Sustainable Development Programme of Action* formally stated for the first time the country's commitment to pursuing higher economic growth while conserving natural capital (MfE, 2003a). The plan defined principles to guide government action for sustainable development and set the *overarching goals* of ensuring that: i) adequate, clean freshwater is available for all; ii) energy is delivered to all consumers in an efficient and sustainable way; iii) cities are healthy, safe and attractive places to live and do business; iv) all youth have the opportunity to develop physically and socially so as to succeed and contribute to the overall societal good; and v) monitoring and review systems are enhanced so that national progress towards sustainable development can be periodically assessed and reported.

The *Department of Prime Minister and Cabinet* is the lead institution for national sustainable development policy, and co-ordinates with a number of other ministries and agencies to contribute to a "whole of government" approach (Box 4.2). A 2003 Cabinet ruling stipulated that all government departments should consider sustainable development issues during their strategic planning processes, although it is not clear to what extent this is being done.

New Zealand has a *partnership-based approach* to sustainable development that is rooted in two laws: the Resource Management Act (RMA), which assigns to government the responsibility to safeguard the quality of soil, water and ecosystems from pressures associated with economic activities; and the Local Government Act, which gives local (subnational) authorities responsibility for achieving sustainable development. Related guidance has also been provided to these regional and territorial authorities through *national strategies*, notably the 2001 National Energy Efficiency and Conservation Strategy, 2002 Waste Strategy, 2002 Transport Strategy and 2003 Biodiversity Strategy. There is no council for sustainable development.

Overall, New Zealand made *progress in defining national priorities* for sustainable development during the review period. But it is unclear to what extent this has led to actions making economic development more environmentally sustainable. A 2002 Statistics New Zealand report on monitoring progress towards sustainable development used available data to describe major environmental, social and economic aspects of the

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Box 4.2 Government responsibilities related to sustainable development and environmental management

Central government

The *Ministry for the Environment* is one of New Zealand's smaller ministries, with a staff of 280 (full-time equivalent). It is the government's principal adviser on domestic and international environmental matters. The MfE has the power to set policy and make regulations on environmental matters of national interest by issuing national policy statements and national environmental standards. The *Department of Conservation* manages national parks, reserves and conservation areas (terrestrial and marine), protected indigenous forests, inland and coastal waters, and wildlife.

Other government departments involved in environmental management or sustainable development include the Ministries of Agriculture and Forestry, Fisheries, Foreign Affairs and Trade, Economic Development, Research, Science and Technology, and Transport. The *Environmental Risk Management Authority*, established under the 1996 HSNO Act, makes case-by-case evaluations of the risks, costs and benefits of introducing hazardous substances and new organisms, including genetically modified organisms, to New Zealand. The *Energy Efficiency and Conservation Authority*, under the aegis of the energy minister, promotes energy efficiency, energy conservation and the use of renewable sources of energy.

Local government

Local authorities have primary responsibility for spatial planning and other key sustainable development-related provisions of the RMA. *Regional councils* manage land use for the purpose of soil conservation or remediation, the maintenance of water quality and quantity, and risk avoidance related to natural hazards such as floods, earthquakes and volcanic eruptions. *Territorial authorities* regulate issues related to development, construction and noise, in conformance with district plans.

country's development (StatsNZ, 2002). While the report provided a useful benchmark, tracking progress towards the overall sustainable development goals will require clarifying objectives and designating performance indicators. This in turn should lead to periodic data collection and aggregation at regional and national level.

1.3 Integration of environmental concerns in economic sectors

Integrating environmental concerns into sectoral decisions is essential to: i) improving environmental performance and moving towards sustainable development; and ii) efficiently achieving environmental objectives, given the interplay between changes in sectors such as transport, energy and tourism and environmental conditions

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and trends.[5] After carrying out major economic and governance reforms in the mid-1980s (Chapter 4), New Zealand has since maintained its *commitment to market solutions* and minimal central government intervention, and has sought to rely on prices, rather than programmes, to integrate environmental concerns into sectoral decision-making. The country has maintained exceptionally *low levels of sectoral subsidies*. Producer support for agriculture is the lowest in the OECD, and government support for fisheries is limited to general management services (OECD, 2005a and 2005b).The country has been an OECD pioneer in the use of *tradable allowances* to manage fish stocks.

However, the use of *market-based instruments* to address market failures and internalise the environmental costs of sectoral activities progressed little during the review period. Preference has been given to the case-by-case use of *regulatory instruments* (e.g. resource consents), under the RMA, to address specific resource management and environmental pollution issues. In addition, voluntary measures have been increasingly used, sometimes on a sectoral basis (e.g. the Dairying and Clean Streams Accord). While these measures have been effective in dealing with some *environmental externalities*,[6] in certain cases the use of economic or fiscal instruments would be more efficient. For example, several studies have concluded that a *national carbon tax* would be the most economically efficient means of curbing GHG emissions (McLeod *et al.*, 2001; PCE, 2002). But in 2006, well-advanced plans to introduce a carbon tax on fossil fuels and industrial process emissions were set aside because of public opposition (Chapter 6). Overall, New Zealand's use of *environmentally related taxes* remains more limited than in most OECD countries. Essentially, they consist of excise taxes on motor vehicle fuels, motor vehicle licence fees and road user charges (Table 4.3), which make no attempt to reflect environmental externalities.

The Office of the *Parliamentary Commissioner for the Environment* (PCE) helps promote integration of environmental concerns into sectoral policy-making by providing analysis of related strategic concerns. As an independent office of Parliament with the mandate "to provide independent scrutiny, advocacy and advice for a better environment", the PCE investigates issues raised by the public that are often politically sensitive and cross-sectoral. About 5% of the 200 to 250 public requests it receives annually lead to full investigations. Of the 50 major studies carried out by the PCE since 1996, several have had a major impact on policy debates; one example is "Growing for Good: Intensive Farming, Sustainability and New Zealand's Environment" (PCE, 2004).

Transport

Economic, energy and demographic trends drove *large increases in passenger and freight transport* and related environmental pressures during the review period

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Table 4.3 **Fuel excise taxes, motor vehicle licence fees and road user charges**

Policy instrument	Rate	Remarks
Excise tax on motor vehicle fuel[a]	NZD/litre	Diesel fuel used by road vehicles is not subject to excise tax
Unleaded petrol	0.412	
Liquefied petroleum gas	0.104	
Motor vehicle licence fee	NZD/year	
Private passenger cars, fuelled by:		
Petrol	200.10	
Diesel	30.15-33.27	Differentiated according to vehicle weight and type of vehicle
Alternative fuel	271.45	
Taxis, fuelled by:		
Petrol	225.60	
Non-petrol fuel	296.95	
Light-duty trucks, fuelled by:		
Petrol	200.10-225.60	Differentiated according to engine size and type of vehicle
Non-petrol fuel	295.50-321.00	Differentiated according to engine size and type of vehicle
Motorcycles	238.35-262.35	Differentiated according to engine size
Light trailers (less than 3.5 tonnes)	35.10	
Heavy-duty vehicles (3.5 tonnes or more)	30.29-553.18	Differentiated according to engine size and type of vehicle
Heavy trailers (3.5 tonnes or more)	19.58-740.62	Differentiated according to engine size and type of vehicle
Road user charge[b]	NZD/1 000 km	Diesel-fuelled vehicles pay the charge by purchasing a road user charge (RUC) licence (sold in 1 000 km units by service stations and other authorised suppliers)
Diesel-fuelled vehicles		
Weighing less than 3.5 tonnes	29.8-31.41	RUC licence price differentiated according to vehicle weight and type
Weighing 3.5 tonnes or more	29.86-553.18	RUC licence price differentiated according to vehicle weight and type
Weighing 3.5 tonnes or more, and operated with a trailer	18.08-740.62	RUC licence price differentiated according to trailer weight and type

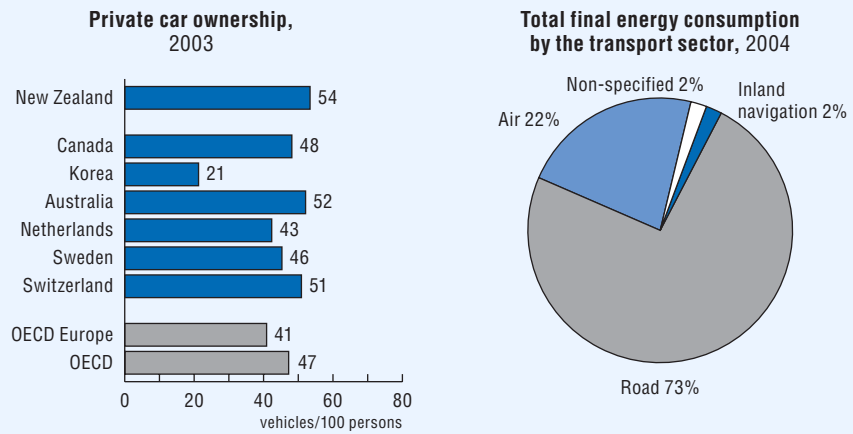
a) 54% of excise tax revenue goes to the maintenance of roads.
b) Revenue from road user charges is shared by the Road Transport Authority (53.5%), the General Treasury (44.5%) and local councils (2%).
Source: MoT, 2005; OECD, 2005a.

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(Table 4.1). Steady growth in the rate of motor vehicle ownership and in vehicle-kilometres travelled continued to push up the share of transport in energy consumption and air emissions (Figure 4.4). Transport is responsible for nearly 42% of total final energy consumption in New Zealand, and its energy use grew faster than that of any other sector during the review period. The sector is particularly *energy-intensive*, as it is almost wholly reliant on road transport and the national vehicle fleet is 50% composed of secondhand imports with an average age of 12 years (LTNZ, 2005a). The *environmental externalities of road traffic* (air pollution, water run-off and noise) are estimated to total NZD 1.2 billion per year, with about 85% of these costs incurred in urban areas (MoT, 2005). A 2002 Public Health Advisory Committee study estimated that 399 people aged 30 and over died prematurely each year in New Zealand from vehicle-related pollution (Kjellstrom and Hill, 2002). It is estimated that heavy commercial vehicles account for 65% of transport-related air pollution and private cars for 34%.

Thus far, New Zealand has made little use of *economic instruments* to address the external environmental costs of transport. The National Land Transport Fund, with revenue from road user taxes and charges,[7] finances about 50% of road construction and maintenance, and 65% of public transport (LTNZ, 2005b). Local authorities fund the balance. Road user charges are calculated to cover costs of road

Figure 4.4 **Transport sector**



Source: OECD, Environment Directorate; OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004.

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maintenance, but not to internalise the environmental costs of road transport. *Motor vehicle-related fees and charges* are differentiated by engine size and type of vehicle (Table 4.3), not to reflect their relative environmental impacts. Compared to other OECD countries, the *motor vehicle fuel taxes* are light overall (diesel used in road vehicles is exempt from excise tax), thus representing a missed opportunity to send economic signals favouring energy efficiency or conservation (Figure 4.5).

The *New Zealand Transport Strategy*, introduced in 2002, outlined a government-led approach to encourage sustainable transport, largely focused on emission inspection of imported vehicles and the upgrading of fuel standards. Air emissions from motor vehicles were unregulated until 2003, when the *Vehicle Exhaust Emissions Rule* introduced the requirement that imported motor vehicles must have been manufactured to meet the exhaust emission standards of selected OECD members (Australia, Japan, European Union, United States). Emission inspections at the time of import, and during service (including a smoke test), are also being introduced. In 2003, revised *fuel quality standards* introduced the progressive reduction of the maximum sulphur content of diesel fuel (to 50 ppm by 2006), thus harmonising with EU standards (MoT, 2002). Allowable benzene levels in petrol have been cut from 4.2% to 1%. Territorial *spatial plans* are being adjusted to integrate newly promulgated national limits on noise and storm water run-off from road transport. Increased funding is also being provided for walking and cycling infrastructure.

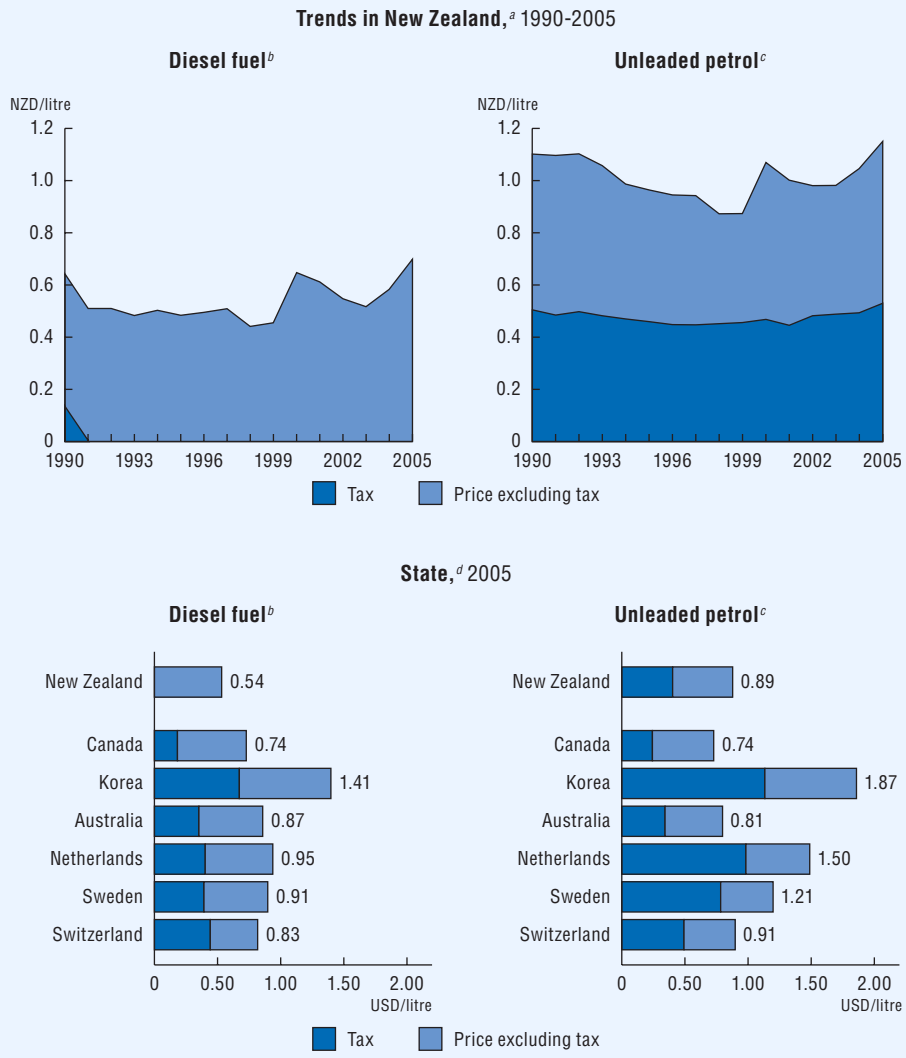
In summary, since 2003, the need to better integrate environmental concerns into transport decisions has been recognised, and related *national and regional strategies* have been put in place. Progress with implementation will largely depend on how the objectives are integrated into planning concerning housing, transport and commercial and industrial development. Little has been done since 1996 to *manage demand* for motor vehicles or encourage alternative modes of transport. The further development of *market instruments* (e.g. road tolls, fuel taxes) to better internalise the environmental costs of road transport is essential if the country is to reach its sustainable transport objectives. Especially in urban areas, further investment in public transport may be necessary to accompany these measures. Disincentives to sustainable transport need to be addressed; for example it has been estimated that rail freight users pay on average 82% of the costs they impose on society, while trucks pay on average only 56% (MoT, 2005).

Energy

The energy sector has both local *effects on the environment* (associated with energy exploration, production and distribution) and regional and global effects associated with air emissions. New Zealand has historically focused on increasing the quantity and efficiency of energy supply, with little regard for demand management

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Figure 4.5 **Road fuel prices and taxes**



a) At constant 2000 prices.
b) Automotive diesel for commercial use (non-commercial use for Australia and Korea).
c) Unleaded regular; Netherlands, Sweden, Switzerland: unleaded premium (RON 95).
d) In USD at current prices and purchasing power parities.
Source: IEA-OECD (2006), database of end-use prices.

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or energy efficiency. The country meets 75% of its total energy supply needs with indigenous sources, including coal, oil, natural gas, hydropower and geothermal power (IEA, 2006). It has large coal reserves and exports nearly 40% of its production (MED, 2005). Its oil reserves are more limited, and it imports nearly 60% of its oil supply. Renewable energy sources contribute 30% of energy supply, the bulk from hydro- and geothermal power (Figure 4.3). Energy production has declined in the 2000s as natural gas and oil fields near depletion.

Improving the *efficiency of energy use* has become a priority of energy policy since passage in 2000 of the Energy Efficiency and Conservation Act and the establishment under the Act of the Energy Efficiency and Conservation Authority (EECA). A national target has been set to increase the economy's energy efficiency by at least *20% by 2012* by improving energy efficiency in transport, industry, government and both new and existing buildings (EECA and MfE, 2001). EECA has estimated that retrofitting and behavioural changes could lead to cost-effective reductions in electricity consumption by 19% in the residential sector, 30% in the commercial sector and 20% in industry. This would translate to an improvement in energy efficiency of 2% per year to 2012 (MED, 2004). A system of monitoring and annual reporting has been established, to report on overall and sectoral progress towards the national target. Early progress was reportedly strong, but there is a long way to go. Measures to encourage energy efficiency in *transport and buildings* are especially needed. Differentiation of motor vehicle registration fees or fuel taxes to reflect relative environmental impacts, as well as incentives to scrap old vehicles, should be considered. For buildings, consideration should be given to setting minimum energy performance standards, metering energy use and creating incentives to retrofit old buildings with energy efficient equipment (e.g. water heaters, electrical appliances).

In 2000, a *major reform of the electricity market* introduced marginal cost pricing of wholesale electricity, with prices thenceforth calculated as a function of distribution costs (IEA, 2006). Although, as in most OECD countries, prices are not calculated to integrate environmental costs, the new system (along with higher natural gas prices) has led to higher end-user prices, and thus greater incentives for conservation. Electricity prices for households increased by some 50% during the review period, from 10.24 NZ cents/kWh in 1994/95 to 14.84 NZ cents/kWh in 2003/04, but are still 25% lower than the OECD average (Chapter 7). Electricity prices for industry rose by about 28%, from 5.84 NZ cents/kWh to 8.10 NZ cents/kWh, and are now about 60% of the OECD average. Cross-subsidisation among user groups has been substantially reduced, with most of the differential between household and industrial users now justified by economies of scale. Despite this progress, demand for electricity has continued to increase rapidly, so that a *fossil fuel-fired power plant* previously used only for backup has had to be operated full time since 2002, raising national emissions of SO_x, NO_x, CO and CO_2.

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In summary, the review period saw increasing *reliance on market forces* to allocate energy resources, although mechanisms to internalise environmental externalities are still largely lacking. Plans to introduce a national carbon tax were scrapped in 2006 (Chapter 7). New Zealand's energy policy prioritises a continued major contribution from renewable energy sources, and recent trends (volatility in international oil markets, declining natural gas supply, fluctuations in hydropower generation) have increased the economic feasibility of further development of renewables. In 2001, EECA set a target of developing a further 25-55 PJ of renewables by 2012. To reinforce the market competitiveness of renewables, it would be helpful to pursue full-cost pricing of conventional energy sources. Electricity market reforms since 2000 have raised *incentives for end-users to conserve energy* and led to small improvements (0.5-1% per year) in overall energy efficiency (PCE, 2003).

Fisheries

New Zealand has the world's *sixth largest EEZ* but produces less than 1% of global fisheries output, as much of the EEZ is commercially barren. Fisheries and aquaculture are New Zealand's sixth largest export sector (NZD 1.1 billion in exports in 2005) and employ over 26 000 people, directly and indirectly. Capture fisheries contribute about 80% of the sector's total production value and aquaculture the rest. New Zealand kept major exploited stocks stable during the review period through input controls (e.g. restrictions on fishing area, method or time, and minimum legal sizes) and output controls (e.g. species catch limits) (Box 4.3).

As the 2005 *Strategy for Managing the Environmental Effects of Fishing* recognises, awareness is mounting of the need to take ecosystem considerations more comprehensively into account in fishery management as fishing intensity and pressure increase (MFish, 2003 and 2005). Initiatives in recent years include research on the environmental effects of fishing, a national plan of action to reduce seabird mortality, regulatory measures to address dolphin mortality, *closure of 19 seamounts to trawling* and expansion of marine reserves and protected areas. During the review period, more than 100 seamounts were trawled each year, and many suffered significant damage (Clark and O'Driscoll, 2003).

The *aquaculture sector*, mainly based on green-shell mussel, Pacific oyster, king salmon and abalone, expanded rapidly during the review period. Regional councils have the authority to grant or refuse resource consents for aquaculture. A moratorium on new consents, imposed nationwide from 2002 to 2004, allowed the development of legislation aimed at rationalising allocation of aquaculture permits. Some regional councils are working together to develop a regime of *user charges* that would complement tendering of aquaculture sites. Further work is needed to better understand the impact of aquaculture on marine ecosystems and fisheries (Cole, 2002), and to

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Box 4.3 **The fishery quota management system**

New Zealand's fishery *quota management system* is an output control management system for commercial capture fishing. It sets an overall commercial catch limit in conjunction with individual tradable limits.[a] Allocating individual catch limits largely eliminates the race to maximise catch at the opening of the season. The resulting increased certainty gives fishers more incentive to match their investment in fishing capacity to their individual catch limits (OECD, 2005c).

New Zealand manages *more marine species* through tradable quotas than any other country: 92 species and 592 individual fish stocks. It does not exclude lower-value species but has sought to bring all commercially exploited fish into the system. Thus, catch limits for lower-value species in some cases become binding on higher-value target fisheries (Newell, 2004).

The Ministry of Fisheries estimates that 82% of commercially *exploited stocks are maintained at or near target levels* (MFish, 2006). New Zealand has largely avoided the significant stock collapses that have occurred in many fisheries. As the country does not subsidise the fishery sector, it recovers the administrative costs of the system from the commercial fishing industry.

Maori tribes assumed a much greater role in fishery management during the review period, as their share of the commercial fishing quota has grown to about 40%. In 1992, Maori negotiated with the government for "full and final settlement" of their claims to commercial fisheries. The final agreement gave Maori: i) 10% of existing individual transferable quotas; ii) 20% of the total allowable commercial catch for any additional species introduced into the system; iii) funding to purchase a 50% share of Sealord Products Ltd.,[b] roughly valued at NZD 350 million at the time; and iv) a procedure for management of traditional or customary fishing areas.

a) Commercial fishing quotas are generally tradable within the same fish stock, but not across regions, species or years. There are limits on the total quota an individual party can hold.
b) At the time of the agreement, Sealord Products held 27% by volume of the New Zealand fish quota.

define measures to address them. In 2006, the central government identified aquaculture as a priority growth industry and announced plans to strengthen policy guidance to regional authorities concerning development of the littoral zone for aquaculture.

Seafood industry operators adopted various *codes of practice* during the review period with the aim of minimising the effects of fishing on *protected species* (MFish, 2003). In particular, tuna charter vessels generally adhere to a code of conduct for avoiding seabird mortality. In the capture fishery sector, fishers follow codes of

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practice for mitigating seal, sea lion and seabird by-catch. The fishing industry helps finance information collection and research programmes (e.g. by-catch reporting systems, observer programmes), carried out by regulators in relation to protected marine species, through Fisheries Service Levies and Conservation Service Levies.

Tourism

Tourism has been growing rapidly (by about 8% per year between 1999 and 2004) and is the largest single source of foreign exchange revenue in New Zealand, accounting for NZD 6.41 billion per year (TIA, 2006). The sector employs the full-time equivalent of over 90 000 persons directly and 69 000 indirectly, contributing over NZD 15 billion per year to GDP (about 9.4%). In 2005, international visitor numbers reached 2.25 million (TRCNZ, 2006). About two-thirds of all international visitors reportedly engage in nature-based activities (Chapter 3).

The *New Zealand Tourism Strategy 2010* aims to achieve sustainable growth and establishes environmental protection as a goal (TSG, 2001). It calls for more co-operation between the Ministry for Tourism and the MfE to develop and promote initiatives encouraging resource use efficiency and adoption of environmental management systems. It also sets as a goal "to recognise the value of the natural environment and actively protect, support and promote its sustainability". In 2004, the Department of Conservation managed about 4 600 concessions for activities, including tourism, grazing and telecommunications, on public conservation lands. Before authorising concessions, the department evaluates the likely environmental effects of the proposed activity. Continuing efforts will be needed to mitigate the environmental impacts of tourism, particularly in popular national parks (Chapter 3).

The *Tourism Industry Association of New Zealand* has strongly promoted Green Globe 21 sustainable tourism certification to the industry. The number of Green Globe 21 certified operators grew from 4 in 2001 to 72 in 2003. During the review period, the central government provided funding to upgrade and expand *water supply and waste water treatment infrastructure* in communities with small populations and high tourism demand (Chapter 2). The MfE and the Ministry of Tourism promote the greening of tourism through the Environmentally Sustainable Tourism project.

2. Implementing Environmental Policy

2.1 Institutional framework

Institutional reforms

A sweeping *overhaul of subnational government*, carried out under the 1989 Local Government Amendment Act, consolidated 800 subnational authorities into

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85 local authorities: 17 regional/unitary (together referred to here as "regional") and 68 district/city (known as "territorial") authorities.[8] An equally dramatic reform of environmental management institutions was initiated with the passage in 1991 of the RMA, which replaced over 50 previous environmental statutes related to land, air and water resource management (Table 4.4), restructured the institutional framework for environmental planning and management, and *redistributed responsibility for environmental management* among the central, regional and territorial levels of government (OECD, 1996). Reflecting the RMA's guiding principle that decisions on environmental matters are best made by the communities directly concerned, most policy implementation responsibilities are vested with local authorities. The full effects of these major institutional reforms were felt only in the late 1990s, as their implementation took years.

Reforms in practice

The *central government* retains responsibility for the management of selected natural resources (e.g. marine fisheries) and environmental issues of national importance (e.g. control of invasive species). It is also meant to guide local authorities' implementation of the RMA, in particular by issuing *national policy statements and standards* regarding environmental matters. In practice, to date only one set of national environmental standards (concerning air quality, in 2004) and one policy statement (concerning coastal management, in 1994) have been issued. Weak national guidance concerning territorial implementation of the RMA raises the risks that: i) local authorities will each "reinvent the wheel" and thus bear unnecessarily high regulatory costs; ii) courts will be overburdened as standards promulgated at regional level are challenged before the Environment Court before being confirmed on a case-by-case basis; and iii) it will be difficult to monitor the effectiveness of local authorities. Indeed, businesses complain that the varying rules among authorities multiply transaction costs and makes for an uneven playing field for business at national level.

The RMA gives the 17 *regional authorities* primary responsibility for regulating the use of *natural resources* (e.g. water abstractions, discharges to air or water). These councils, which are elected government bodies, are required to develop *ten-year regional policy statements* and may develop regional plans to "achieve integrated management of natural and physical resources" in their respective regions. The RMA specifies that the plans must give effect to existing national policy statements or environmental standards. Under the Coastal Policy Statement, each regional council is also to establish a regional coastal plan. Most have done so, but a recent review revealed that coastal protection measures were not systematically integrated into local land use planning (Chapter 2). By 2006, all but one council had enacted *regional plans*, and all

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Table 4.4 **Selected national legislation related to environmental management**

1840	Treaty of Waitangi
1941	Soil Conservation and Rivers Control Act
1953	Town and Country Planning Act
	Wildlife Act
1964	Continental Shelf Act
1967	Water and Soil Conservation Act
	Agricultural Pests Destruction Act
1971	Marine Reserves Act
1972	Clean Air Act
1974	Marine Pollution Act
1975	Treaty of Waitangi Act
1977	Town and Country Planning Act (replaced the 1953 Act)
	Reserves Act
	Wild Animal Control Act
1978	Noxious Plants Act
	Marine Mammals Protection Act
1980	National Parks Act
1981	Antarctic Marine Living Resources Act
1982	Noise Act Control
1983	Fisheries Act
1986	Environment Act
	Fisheries Act Amendment
1987	Conservation Act
	Nuclear Free Zone Disarmament and Arms Control Act
1988	Customs Import Prohibition (Chlorofluorocarbons) Orders
1989	Local Government Amended Act
	Local Government Reform Act
1990	Conservation Law Reform Act
	Ozone Layer Protection Act
1991	Resource Management Act
	Crown Minerals Act
1993	Biosecurity Act
	Forests Amendment Act
1994	Ozone Layer Protection Amendment Act
	Maritime Transport Act
	Antarctica (Environmental Protection Act)
1995	Fisheries Act
1996	Hazardous Substances and New Organisms Act
	Ozone Layer Protection Amendment Act
	Fisheries Act
1998	Crown Pastoral Land Act
1999	Fisheries Act 1996 Amendment Act (No. 2)
2000	Energy Efficiency and Conservation Act
	Hazardous Substances and New Organisms Amendment Act
	Forest (West Coast Accord) Act

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Table 4.4 **Selected national legislation related to environmental management** *(cont.)*

2002	Aquaculture Moratorium Amendment Act
	Hazardous Substances and New Organisms (Genetically Modified Organisms) Amendment Act
	Energy Efficiency and Conservation Act
	Local Government Act
	Climate Change Response Act
2003	Hazardous Substances and New Organisms Amendment Act
	Land Transport Management Act
2004	Hazardous Substances and New Organisms (Transitional Provisions and Controls) Amendment Act
	Building Act
	Foreshore and Seabed Act
	Resource Management Ammendment Act (Aquaculture Reform)
2005	Fiordland Marine Management Act
	Resource Management Amendment Act
	Hazardous Substances and New Organisms (Approvals and Enforcement) Amendment Act

Source: MfE.

were administering *resource consents* for polluting activities. Overall, regional councils appear to be performing their environmental planning duties very well, though there are inconsistencies in the approaches taken by various regions, and sometimes long delays in issuing regional plans or resource consents. Recent conflicts between regional councils and the central government over *infrastructure development decisions* have led to RMA amendments aimed at streamlining certain decision-making processes.

The 68 district and city *councils* are also all elected. These territorial authorities have primary responsibility for assuring *environmental services* (e.g. water supply, municipal waste collection and disposal, sewerage, spatial planning, building regulations, storm water drainage), in addition to more general local government responsibilities. They process and enforce related resource consents, and are responsible for land use planning. Under the RMA, territorial authorities are responsible for achieving "integrated management of the effects of the *use, development or protection of land* and associated natural and physical resources" in their jurisdictions.

Perspectives

In New Zealand's *devolved system of environmental management*, much environmental responsibility lies with relatively small authorities. In some cases, there is a need to reinforce capacity and resources for environmental management at

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subnational level. Overall, environmental management at this level would be strengthened by greater guidance from the central government in the form of national environmental standards and policy statements. Without the legally binding strength of national policy statements or standards, even well-formulated national strategies can be set aside with election results. For example, the *Environment 2010 Strategy* was the first comprehensive statement by a New Zealand government on its intentions concerning the environment; launched in 1995, it was designed to be comprehensive and broad enough to frame environmental management for the next 15 years (MfE, 1995). The strategy aimed to guarantee "a clean, healthy and unique environment, sustaining nature and people's needs and aspirations". Although it set few quantitative targets, it aimed at maintaining and enhancing the net total area of indigenous forest, phasing out CFCs, reducing energy consumption to levels comparable with those in similar OECD countries and capping net CO_2 emissions at their 1990 levels by 2000. It was essentially set aside in 1999, however, with a change of government, although its objectives are largely harmonised with present policy.

2.2 Enforcement of legislation and regulation

Resource management planning

Under the RMA, local authorities must issue *plans setting forth objectives and approaches* for the management of the natural resources in their jurisdiction. The plans identify significant resource management issues, state how they will be dealt with and indicate the desired environmental outcome. Draft plans are submitted for extensive public consultation. Policies and plans are structured within a hierarchy, and documents must give effect to those above them. National policy statements issued by the central government are at the top, followed by regional policy statements and plans and then district or city plans. The RMA requires assessments of environmental effects to be carried out, to identify likely environmental impacts and to evaluate options in a cost-benefit framework. The public has the right to be heard in planning processes, including commenting on proposed plans and regional policy statements.

In practice, *the process for making plans is long*. After 12 years, some water-short regions do not have water plans, one regional council lacks an air quality plan and some local plans are still not finalised. Nearly 20% of councils missed the June 2005 statutory deadline for the preparation of waste management plans, and a few have not produced plans at all (Chapter 2). An independent government-funded research programme, "Planning Under a Co-operative Mandate (PUCM)", studied the quality of plans in 1995-98 and concluded that both regional policy statements and district plans were, by and large, deficient (Ericksen *et al.*, 2001). The capacity of two-thirds of local authorities, in terms of staff, resources and funds, was rated

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medium to low for planning, and most planners reportedly found key sections of the RMA unclear. In its second phase (1998-2002), the PUCM study looked at the implementation of plans through consents, and concluded that the link between plan quality and implementation quality was weak (Day *et al.*, 2003).

The central government has put considerable effort into *building the capacity of local authorities* for improved resource planning under the RMA. Since the mid-1990s, the MfE has developed guidance material and facilitated "good practice" sharing among authorities. In 2001, it introduced a quality planning website (www.qualityplanning.org.nz) to provide best-practice information to councils and practitioners; the site had more than 18 000 visits per month in 2006. Emphasis is now on training programmes, workshops and seminars, with a focus on improving the second generation of policy statements and plans. A one-on-one assistance programme is aimed at those authorities with fewer resources, primarily to aid in resource consent processing. Capacity building for local authorities should be continued to ensure that their skills match the size and scale of the issues they face. Territorial authorities with small tax bases may have difficulty fulfilling their whole range of RMA responsibilities. Inter-authority co-operation could yield efficiency gains on certain issues (Chapter 2).

A 2004 review of RMA implementation identified a need for better balance between *national and local interests*. Specific proposals included greater use of national policy statements and environmental standards. A number of draft policy statements have been issued for public review, as well as draft standards for drinking water source protection and remediation of contaminated land, and are still undergoing consultation. Priority has been given to managing environmental issues associated with the construction of major infrastructure (e.g. for electricity generation and transmission, telecommunications and road transport). The 2005 RMA Amendments also aimed to improve decision-making at local government level, introducing mandatory training in good decision-making. A recent review of the effectiveness of the national *Coastal Policy Statement* concluded that it was reflected in regional policy statements and regional coastal plans, but that its translation into district plans and conditions of resource consents had been weak (Rosier, 2004). Although it is too early to assess the overall impact of the national environmental standards issued in 2004, some territorial authorities have launched compliance assurance measures (Box 4.4).

Resource consents

Resource consents are issued by both regional councils and territorial authorities. The number of consents issued has increased rapidly in recent years (Figure 4.6). There are five types of consents: for land use, land subdivision, water use, pollutant

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Box 4.4 **Tackling air quality problems in Christchurch**

Although air quality is good in New Zealand as a whole, *some urban areas* experienced air quality problems during the review period. Christchurch, the second largest city, faces degraded air quality, primarily associated with elevated levels of fine particles (PM_{10}). In 2004, new national air quality standards specified a maximum allowable ambient concentration of fine particles at 50 $\mu g/m^3$ for a 24-hour average (to be exceeded no more than once in 12 months). In Christchurch, this level has been exceeded for an average of 30 to 55 days per year since 1996 (MfE, 2003b). Studies have associated these elevated levels of particles with respiratory health effects (Chapter 6).

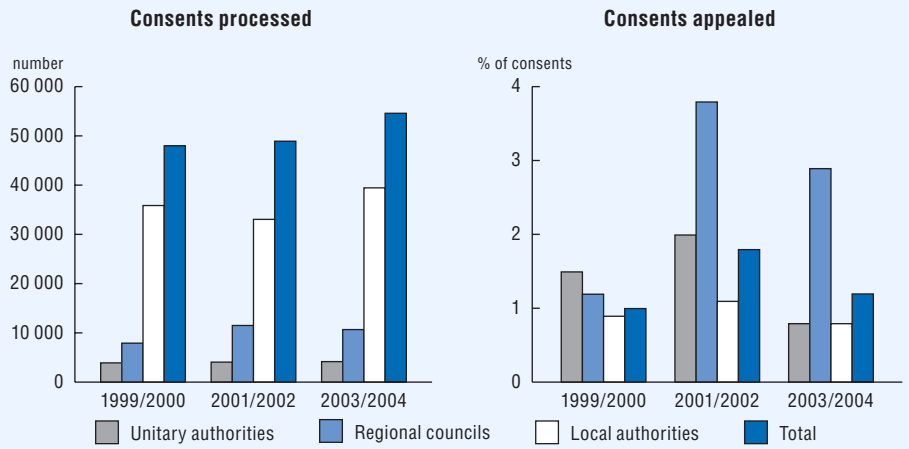
Under the national environmental standards for air quality issued in 2004, the *regional council, Environment Canterbury*, must *decline applications for resource consents* for activities involving significant emissions of fine particulates until it is sure that the additional activity will not further aggravate air quality. In response, the council has put in place a set of regulatory and non-regulatory policy measures. The *Canterbury regional plan* (still in draft form) has been modified to include targeted reductions from the major sources of PM_{10}, including domestic fireplaces, industrial boilers, motor vehicles and outdoor burning. Some activities are being prohibited or restricted. A national emission design standard for wood-burning appliances in houses is also being applied.

Efforts have also been made to reduce emissions from *existing sources*, such as the domestic fireplaces estimated to contribute 80% of Canterbury's particle emissions in winter. In 2003, Environment Canterbury launched a NZD 38 million project called Clean Heat, aimed at upgrading heating equipment and improving insulation in 26 000 homes in the Christchurch airshed by 2010. The project *offsets the cost of heating appliances and insulation*, providing assistance based on level of household income. Despite some initial logistical challenges, about 3 000 homes had been successfully converted to cleaner forms of heating by 2005.

discharge and coastal resource use. Regional and district plans indicate whether resource consents are required for various activities. *Conditions* may be attached to a resource consent to avoid, remedy or mitigate any adverse effects associated with the activity. These conditions are legally binding and enforceable, and must be consistent with any national environmental standards. Applications for resource consents are processed by local authorities, and are either publicly notified, limited-notified (i.e. via publication and/or notices sent to affected parties) or non-notified. Anyone can submit comments on applications notified to the general public, but for limited notification processes only those identified as adversely affected parties can do so.

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Figure 4.6 **Resource consent trends**



Source: RMA (1999/2000, 2001/2002), Surveys of local authorities.

The RMA allows local authorities to arrange pre-hearing meetings among applicants and other interested parties to clarify, mediate or facilitate a resolution. Hearings are not required in all cases but are held when the local authority considers it necessary or an applicant or submitter asks to be heard.

Each year, local authorities decide on about *50 000 resource consent applications* and the number of requests is rising (Figure 4.6). In 2003/04, 77% of all resource consent applications were processed within the statutory time limit (MfE, 2005). Finalisation of further *national environmental standards* (e.g. concerning receiving waters, source waters, contaminated land and waste) could help expedite territorial authorities' handling of resource consents, particularly those that are of national significance (e.g. related to power supply, telecommunications, radio communication or roads) or raise overarching environmental concerns (e.g. on biodiversity, wetlands or water allocation). National standards would also help assure a level national playing field for businesses and help reduce transaction costs associated with regional regulation. At present, when planning infrastructure construction projects that cross local authority boundaries, businesses encounter *variable environmental requirements* in resource consents due to differences in territorial standards. This leads to investment uncertainty and extra costs, as evidenced in recent debates about telecommunications networks.

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Enforcement and compliance

Local authorities are responsible for *assuring compliance with policies, plans and consents* they issue under the RMA (Box 4.2). A recent survey found that, in 2003/04, 60% of resource consents requiring compliance monitoring were in fact monitored (MfE, 2005). Of those, 74% were found to comply with all consent conditions, while 9 137 breaches of consent conditions were recorded. Breaches requiring formal resolution included seven enforcement orders, 678 abatement notices, 390 infringement notices and eight prosecutions. The *decentralisation of enforcement and inspection* engenders a risk of development interests overriding environmental considerations, particularly where responsibility for the issuance of resource consents and the inspection and enforcement of compliance lies with a single authority.

The *Environment Court*, set up in 1996 under the RMA, is a specialist court that hears appeals against decisions on resource consents, proposed district and regional plans, proposed regional policy statements, abatement notices, designations, heritage protection orders and enforcement orders. It also conducts inquiries related to restricted coastal activities and water conservation orders. Appeals of resource consents, plans and policy statements make up the bulk of its caseload. The caseload *more than quadrupled* between 1992 and 2001, and a backlog of cases resulted. After a 2003 review revealed that average waiting time had grown to 23 months, reforms were instituted. Since 2002, the court has received an additional NZD 1.2 million per year and thus has been able to increase the number of its judges and commissioners, reinforce administrative support and improve case prioritisation. By June 2004 the number of cases awaiting hearing had dropped to 1 460 and delays had more than halved since 2001 (Chapter 6).

Environmental monitoring

A lack of complete data and indicator sets concerning the state of the environment and environmental pressure at local and national level impedes efforts to make policy more result-focused. Environmental monitoring at local level should at least rely on a minimum common set of measurements, which would facilitate aggregation for key national indicator development. Although 80% of regional councils monitor the state of the environment, only 31% of territorial authorities do so (Table 4.5). Priority should be given to monitoring and reporting on policy effectiveness and changes in the condition of and pressures on the environment. Without such data, New Zealand as a whole is missing opportunities to "feed forward" and "feed back" input into policy making. Priority should be given to putting into operation the core set of national environmental indicators that has been developed since the late 1990s.

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Table 4.5 **Environmental monitoring and reporting by local authorities,** 2003/04

(% authorities)

	State of the environment	Effectiveness of plans and policies	Compliance with resource consents
Regional	80	80	92
Territorial	31	29	71
Unitary	60	–	60
Total	39	33	73

Source: MfE, 2005.

2.3 Economic instruments

Water management

In general, there is *no charge for water abstraction* from natural surface or groundwater sources. Under the RMA, regional councils issue resource consents for water abstraction to users on a first-come, first-served basis. Most councils charge applicants a fee for processing water abstraction consents, and for monitoring compliance with them. Although the RMA allows for the transfer of water permits, such transfers have remained very rare. One exception is in the Waikato region, where a transferable permit programme is being introduced for the management of nitrogen run-off from land in the Lake Taupo catchment (Chapter 2).

Municipal and industrial water services (e.g. supply, sewerage reticulation and waste water treatment) are generally financed through a uniform annual charge or one based on house or land area and/or capital value. Concerning *water supply*, authorities often charge industrial users a volumetric charge for reticulated water supply, while households pay a flat annual charge. A few councils have attempted to charge individual users on a volumetric basis via metering, but such attempts have invariably led to resistance. However, some local authorities are applying volumetric charges, notably Auckland, with 1.5 million inhabitants. Waste water collection and treatment services are seldom charged based on flows or nutrient loading.

Waste management

The provision of *waste services to households* is funded in a variety of ways, including full community-good funding (through property tax), full "pay-as-you-

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throw" systems for residual waste and a combination of approaches. *Waste services to business or industry* are generally provided on a commercial basis. Local authorities operating landfills are now supposed to recover the full costs of the landfill operation and investment costs by introducing *user charges* (Chapter 2). The New Zealand Waste Strategy set a December 2005 target for operators of all landfills and waste water treatment plants to be administering user charges calculated to enable full cost recovery. Although the target was missed, *considerable progress* has been made.

Other economic instruments

Local authorities collect *administrative charges* for receiving, processing and granting resource consents. In practice, the degree to which the user pays varies from authority to authority, but applicants must generally cover costs of environmental impact assessments, and charges can also be imposed on applicants requesting changes to plans. The RMA also provides for tendering of the right to occupy coastal space, and for the introduction of *royalty regimes* for the extraction of natural resources (e.g. sand). The Hazardous Substances and New Organisms (HSNO) Act has provisions allowing local authorities to set charges for performing regulatory functions.

Perspectives

The 1996 OECD review recommended fuller implementation of the *polluter pays*[9] and *user pays*[10] principles as basic principles of domestic environmental law. The polluter pays principle aims at internalising externalities so as to correct market failures relating to pollution and to avoid distortions in international trade. While New Zealand applies the user pays principle in a few environmental management areas, little progress has been made in applying the polluter pays principle, for instance in the form of charges or regulations for diffuse pollution.

2.4 Other instruments

Voluntary approaches

During the review period, business showed a *growing interest in making a transition to environmentally responsible performance*, both as a means of assuring access to international markets and to demonstrate good practice in corporate governance. For example, large timber companies have moved to develop Forest Stewardship Council certification for their plantations (Chapter 5), and the New Zealand Chemical Industry Council has promoted Responsible Care. Other business organisations, such as the New Zealand Business Council for Sustainable Development and the Sustainable Business Network, are promoting environmentally responsible performance. The Sustainability Interest Group of the Institute of

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Chartered Accountants of New Zealand has a task force on sustainable development reporting. However, environmental reporting by industry is still at an early stage, with only 50 enterprises regularly issuing environment reports (Chapter 6).

A number of *partnerships* between government and industry target specific environmental improvements. Examples include the Dairying and Clean Streams Accord, the Packaging Accord and the Tyre Track initiative (Chapter 2). The MfE has stimulated cleaner production initiatives through funding for the Business Care Trust and the Sustainable Management Fund. Some large companies use the ISO 14 000 system. Small and medium-sized enterprises have increasingly adopted Enviro-Mark NZ, a system promoting integrated health, safety and environmental management. Extended producer responsibility has so far been introduced on a very small scale. Although interest is growing, the cleaner production or eco-efficiency approach is still not widely used in the business sector.

Environmental impact assessment

Assessments of environmental effects (AEEs), New Zealand's equivalent of environmental impact assessments, are part of the statutory planning framework under the RMA, for both projects and policies. For projects, applicants must submit AEEs with applications for resource consents. For policies and plans, while the RMA requires AEEs to be carried out, the first generation of plans was rarely accompanied by explicit AEEs. A recent review concluded that additional *guidance on how to carry out an AEE* would be helpful for local authorities (Dixon, 2004).

Greening of government procurement

Greening of government procurement is still in its *early stages* in New Zealand. No specific policy or government target has been formulated regarding greening of purchasing policies, nor are sustainability criteria part of government procurement policy, a responsibility of the Ministry of Economic Development. Government agencies are expected to ensure, however, that their procurement is consistent with national environmental policies. In 2003, the MfE launched the *Govt 3 programme*, aimed in part at motivating central government agencies to improve the sustainability of their purchasing. By 2006, all core government departments were participating in the programme, and incorporating sustainability criteria into procurement policies, particularly regarding cleaning services, office supplies and laptop computers (MfE, 2004). The Govt 3 programme promotes the purchase of eco-labelled products, such as office furniture using wood that has been legally logged from sustainably managed forests.

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2.5 Environmental expenditure

Public environmental expenditure

Public environmental protection expenditure, monitored since 2001 through national accounts, totalled NZD 1.27 billion in 2003, or roughly 0.9% of GDP (Table 4.6). The total covers: i) pollution abatement and control expenditure for water, waste, soil and air management; and ii) environmental expenditure on inland water management activities aimed at sustainable use (e.g. water supply, protection of biodiversity). Operating costs represent 71.5% of the total and capital expenditure makes up the rest.

Local authorities accounts for 75% of environmental protection expenditure and 99% of pollution abatement and control expenditure (Chapter 2). The major items of local authority expenditure are waste water management (64%) and waste management (22%), while the bulk of central government expenditure is for biodiversity and landscape (66%) and research and development (23%).

Private environmental expenditure

Although not yet systematically surveyed, *private environmental expenditure* is estimated at NZD 200-300 million per year, equivalent to 16-24% of public environmental protection expenditure (StatsNZ, 2005). The *business sector* claims

Table 4.6 **Public environmental expenditure,**[a, b] 2001-03

(NZD 000)

	2001	2002	2003
Total current expenditure by:	852 170	859 322	906 116
Local authorities	566 400	547 125	585 965
Central government	285 770	312 197	320 151
Total capital expenditure by:	313 115	390 304	361 397
Local authorities	307 164	386 555	354 862
Central government	5 951	3 749	6 535
Total expenditure	1 165 285	1 249 626	1 267 513
% of GDP	*1.0*	*1.0*	*0.9*

a) Pollution abatement and control expenditure as well as expenditure on protection of biodiversity and landscape.
b) At current prices.
Source: StatsNZ, 2005; OECD, 2006.

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that RMA compliance costs, as well as costs and delays associated with getting resource consents, frustrate infrastructure investment (MfE and LGNZ, 2002). Although comparative studies on costs and delays have been carried out, they have been based on small-scale case studies that do not allow general conclusions to be drawn. Some examples show, however, that *costs and uncertainties associated with getting or renewing a resource consent for a project*, coupled with inconsistency in regions' environmental standards, lead to high costs and long delays (NZBCSD, 2004). In 2005, amendments to the RMA introduced changes designed to *reduce costs and delays*, through improved mediation, while reinforcing and strengthening the role of national policy statements and environmental standards in the making of local policies and plans (Benson-Pope, 2005).

Notes

1. At 2000 prices and purchasing power parities.
2. As measured in CO_2 equivalents (global warming potential).
3. Total primary energy supply per unit of GDP.
4. Measured as the percentage abstracted from available resources; Figure 2.1 depicts the trend.
5. Integration of environmental concerns into agriculture and forestry is dealt with in Chapter 5.
6. Environmental externalities are impacts on the environment that are side-effects of processes of production or consumption and that do not enter into the calculations of those responsible for the processes.
7. Essentially, 50% of total revenue from the excise taxes on petrol and liquefied petroleum gas, plus road user charges and the part of motor vehicle registration fees not used for accident compensation.
8. There are 57 rural district councils, 11 city councils, five unitary councils and 12 regional councils. Unitary councils are responsible for the sparsely populated districts of Gisborne, Marlborough, Tasman, and the Chatham Islands, and the city of Nelson. They assume both regional and district/city environmental management functions designated under the RMA.
9. New Zealand has subscribed to the polluter pays principle under related OECD Council Acts.
10. Reference to full cost recovery in providing environmental services appears in, for example, the 2002 Waste Strategy.

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5

AGRICULTURE, FORESTRY AND THE ENVIRONMENT*

Features

- Sustainable management approaches
- Environmental implications of subsidy removal
- Environmental performance and market access
- Greenhouse gas emission intensity

* This chapter reviews progress since the previous OECD Environmental Performance Review of 1996. It also reviews progress with respect to objectives of the 2001 OECD Environmental Strategy.

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Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of New Zealand:

- further apply *sustainable land and forest management* approaches (e.g. environmental farm planning, nutrient budgeting, application of sustainable forest management practices) and assess their effectiveness in reducing pressures on the environment;
- strengthen compliance with the *environmental conditions set in resource consents and permits* (e.g. concerning disposal of dairy effluents, timber harvest in private indigenous forests) through increased inspection and enforcement;
- define and implement measures to reduce net *GHG emissions from the agriculture and forestry sectors*, prioritising those that also meet other environmental objectives (e.g. flood protection, nature conservation) so as to capture "win-win" opportunities;
- assure independent evaluation of the *effectiveness of voluntary agreements and covenants* in reducing environmental pressures from agriculture and forestry activities.

Conclusions

Considerable progress was made during the review period in integrating environmental concerns into the daily management of agriculture and forestry operations. The *removal of agricultural subsidies* in the late 1980s catalysed the conversion of marginal pastoral land to plantation forests or back to native bush. Environmental risks posed by accumulation of *unwanted, old or obsolete agrochemicals* on farms have been reduced through collection and disposal campaigns by regional councils and the Ministry for the Environment (MfE). Some 320 km^2 of highly erosion-prone pastureland has been reforested since 1992 through the East Coast Forestry Project, advancing nature conservation and erosion control objectives. *Conservation of indigenous forests* has been strengthened through the progressive uptake of sustainable forest management practices by private forestry operators, and the permanent conservation of 1 300 km^2 of state-owned indigenous forests on the West Coast. Forestry and horticulture operations have increasingly adopted *environmental management systems*, some to assure access to markets. The area of land used for organic farming more than tripled during the review period, and an official organic assurance system was introduced. The Dairying and Clean Streams Accord has helped restrict run-off of urine from dairy stock to surface waters. The process of *land tenure review* in the South Island has helped reduce the impact of grazing on fragile high-country ecosystems.

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Despite these advances, the agriculture and forestry sectors still face challenges with respect to better integration of environmental concerns. In contrast to many OECD countries, *GHG emissions* from agriculture (e.g. methane and nitrous oxide) account for some 50% of the national total, and are rising. *Changes in agricultural production* have led to increased intensity of inputs, including fertiliser and irrigation water, with consequent increases in environmental pressures. There is considerable potential to internalise related external costs through use of market-based instruments (e.g. taxes, charges, trading). The use of on-farm *nutrient budgeting* is still the exception rather than the rule, though it is growing. Diffuse pollution from agriculture is associated with elevated levels of *pathogens and nitrates* in lowland water bodies. Farmer compliance with resource consents for the disposal of *dairy shed effluent* is highly variable, with some farmers still spreading manure close to waterways. The scale of environmental pressures generated by intensification of agriculture during the review period, particularly as evidenced by the *deterioration of surface water quality in lowland areas*, warrants consideration of economic or fiscal instruments aimed at rationalising the use of agricultural inputs and encouraging sustainable land management practices. Land use change imagery has confirmed that clearing of native forests continues, in some instances without required resource consents.

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1. Objectives Related to the Environment

Agriculture and forestry are *key sectors* of the New Zealand economy, together contributing nearly *16% of GDP and over 60% of exports by value* (mostly meat, dairy and timber products). New Zealand is the world's largest single-country exporter of dairy products, sheep meat and farmed venison, and is a significant supplier of pip fruit, kiwifruit and wool. *Farming directly contributed 5% of GDP in 2005*, with related processing and manufacturing adding another 4%. The agriculture sector employs some 78 000 persons on farms, 56 000 in food processing and 23 000 in agricultural services – about 9% of national employment in all (MAF, 2005a). A major agricultural reform was initiated in the mid-1980s, with wide-ranging economic and environmental implications (Box 5.1).

The *dominance of agriculture and forestry* in land use (74% of land area),water use (70% of the total), water pollution (e.g. 75% of total nitrogen loading to waterways) and greenhouse gas (GHG) accounting (agriculture contributes 50% of national GHG emissions, for instance, and forests are the country's main carbon sink) makes these sectors significant determinants of environmental outcomes. About *44%*

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Box 5.1 **Structural changes in the agriculture sector**

A *sweeping reform of the agriculture sector* in the mid-1980s removed all producer subsidies. The reform was born out of concern over an economic situation characterised most notably by high unemployment, rising inflation, stagnant per capita GDP, a growing fiscal deficit and a chronic current account deficit. New Zealand's agricultural producer subsidy equivalent peaked at 34% of production value in 1983, when support equalled roughly 4% of GDP (Vangelis, 2006). The sector showed signs of the distortionary effects of subsidisation, including a disconnect between supply and demand, inflated product prices and overuse of inputs, including land and agrochemicals. Although transitional assistance to groups affected by sectoral reform is increasingly seen as a standard economic tool to ease reform, New Zealand used such measures sparingly (i.e. farmers were offered debt rescheduling and restructuring). *Ex ante analysis* of likely environmental impacts was not carried out, and flanking measures were not developed, largely because the reforms were carried out so rapidly, reflecting the severity of the economic situation.

The *phase-out of agricultural support* catalysed the conversion of pastoral land to plantation forest, as market conditions increased the relative returns from forestry compared to pastoral agriculture. Between 1997 and 2001, about 595 km^2 of forest was planted per year, mostly on former agricultural land (MAF, 2003a). Remaining agricultural land is increasingly used for intensive dairy farming or high-value horticulture. Overall, as the extent of agricultural land has shrunk, its productivity has grown, with farmers increasingly taking advantage of economies of scale (average farm size has grown by 19% since 1997) and using off-farm inputs such as irrigation water and fertiliser. This intensification of agricultural operations was associated with a shift from *sheep to dairy farming* (Figure 5.1). From a peak of 70 million in 1983, the sheep population has dropped to 39 million; since 1996, sheep numbers have declined by about 19% (StatsNZ, 2002a). Dairy cow numbers have risen from 3.1 million in 1983 to 4.2 million in 1996, and 5.4 million in 2005.

New Zealand's agriculture sector is highly reactive to changes in *international commodity prices, exchange rates and market conditions*, because it is fundamentally oriented towards export and its level of subsidisation is very low (Chapter 5). It is estimated that the Uruguay round of multilateral trade negotiations created market conditions (e.g. greater access, lower tariffs) that increased New Zealand's agricultural exports by NZD 6.13 billion over 1995-2004 (MAF and MFAT, 2006). Sensitivity to international market forces increased, following the *dramatic decline in agricultural producer support* from a peak of over 30% of farm receipts in the mid-1980s to a low of 2% in 2005[a] (OECD, 2005). By comparison, the OECD average was 31% in 2005.

Sectoral reforms have been associated with *large shifts in land use and stock intensity*, with implications for soil and water quality (PCE, 2004). Thousands of hectares of marginal pasture previously used for subsidised sheep grazing are now in forest production or have been left to regenerate as native bush (Figure 5.1). The sharp increase in dairy farm productivity during the 1990s was very similar to what occurred in the highly supported European Union (3.3% and 3% per year, respectively, measured as milk solids produced per hectare). In Europe, productivity gains stemmed almost entirely from increased milk production per cow. While this was also the main driver in New Zealand, an increase in *stock intensity (cows per hectare)* contributed one-third of the increase (OECD, 2004).

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Box 5.1 **Structural changes in the agriculture sector** *(cont.)*

As the area farmed has fallen, *agricultural productivity has increased*. Between 1990 and 2003, the area of farmland fell by 15% while production increased by 38%.[b] Factors contributing to the increase in production include improved animal husbandry and breeding, technological change and scale economies through expansion of average farm and orchard size. From 1994 to 2004, the number of cows per hectare increased by 19% and milk solids per hectare by 34%. Even in the sheep industry, where numbers have fallen, significant productivity improvements have resulted in higher lambing percentages and higher carcass weights, both up by 25% since 1980.

Arable crop farming has become increasingly focused on producing maize silage for dairy production; it is now the biggest single arable crop. The area of land in horticulture has increased, with about 40% of it used for fruit production and 60% for vegetables. The number of vineyards rose from 190 in 1994 to 421 in 2003, and the area planted in grapes grew by 142%.

a) Remaining budgetary support for agriculture is for research, pest and disease control and climatic disaster relief, with small but increasing payments made to farmers undertaking agri-environmental measures to protect indigenous biodiversity.
b) Production as measured by the FAO agricultural production index.

of the national land area (118 000 km^2) is used for agricultural production, with 97.5% devoted to grazing and the rest to arable crops (1.4%) and horticulture and viticulture (1.1%). Forests cover about *30% of the land area*, or 83 000 km^2. Of this, 65 000 km^2 is indigenous and the remainder is planted. The two types of forest differ fundamentally in their biological characteristics, the management regimes applied and the roles and national objectives attributed to them (Box 5.2). About 77% of indigenous forest is part of the conservation estate as national park, forest park or reserve land, while 94% of plantation forest is privately owned.

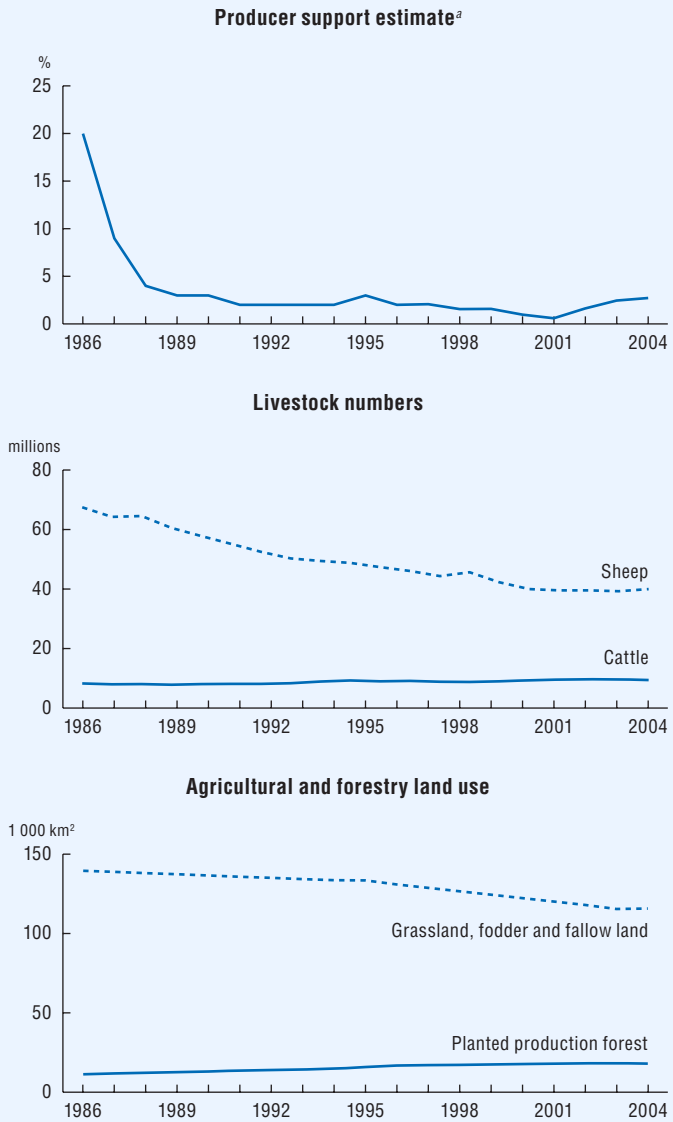
1.1 Sectoral policy objectives related to the environment

Concerning sustainable agriculture and forestry management

The 2003 *Sustainable Development Programme of Action* establishes a number of objectives that are relevant to the agriculture and forestry sectors. In particular, it calls for "decoupling economic growth from pressures on the environment" and "respecting environmental limits, protecting ecosystems and promoting the integrated management of land, water and living resources". Concerning freshwater

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Figure 5.1 **Agricultural subsidies and land use trends**



a) PSE (Total producer support estimate), as calculated by OECD: transfers to farmers as a percentage of their gross receipts.

Source: OECD PSE/CSE database, 2006; MAF 2005; FAO 2006; SNZ 2005.

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Box 5.2 **Key features of the forestry sector**

In 2005, *forestry product exports totalled NZD 3.3 billion, and forestry contributed about 3.3% of GDP* and about 1% of national employment (23 500 jobs). The country has a modest share of world trade in forest products at 1.1% (compared with Sweden at 8.8% or Canada with 18.8%). *National timber production* rose from 11 million m^3 per year in the early 1990s (of which 6 million m^3 in roundwood equivalent terms was exported) to 20.4 million m^3 in 2004 (14.5 million m^3 of it exported) (MAF, 2005b).

Remaining *indigenous forest* is primarily located in mountainous areas, particularly on the west coast of the *South Island* (StatsNZ, 2002b). Very few remnants of lowland forest remain. Most indigenous forest is state property. The Department of Conservation manages 77% of the indigenous forest area for conservation, heritage and recreational purposes. No timber is produced from the conservation estate. Privately owned indigenous forest (21% of the total) is subject to sustainable management provisions under the Forests Act. The main threats to indigenous forest are introduced animals and plants. Extensive campaigns aimed at eradicating rats, possums and deer helped reduce pressure from these pests during the review period.

For historical reasons, some 200 km^2 of *Maori-owned indigenous forest* established under the South Island Landless Natives Act (1906), commonly known as *SILNA land*, is exempt from sustainable forest management provisions of the Forests Act. These lands are located predominately in Southland and Stewart Island, with smaller areas located on the west coast and in Otago, Marlborough and Nelson. In 2002, the government launched a NZD 16.1 million, seven year effort to negotiate conservation settlements on SILNA forest blocks that are considered priorities for protection from logging. Support will also be offered to SILNA forest owners willing to submit their holdings to the sustainable harvesting plans and permits required of other private owners.

The area of *plantation forest* increased from 15 400 km^2 in 1996 to 18 200 km^2 in 2004 (StatsNZ, 2005). Primarily composed of exotic species (90% is radiata pine), plantation forest accounts for over 99% of the forestry sector's annual production volume. It is predominately located in the *North Island* (70% by area). In contrast to indigenous forest, the planted forest estate is 94% privately owned. Government-owned plantation forest was progressively sold to private companies from 1987 to 1995. Since 1990, new forest planting has added over 500 km^2 per year, on average, but the annual net planting rate declined from a peak in 1995 (900 km^2) to a net loss of 50 km^2 in 2004 (StatsNZ, 2005). While this is in part due to harvesting of some forests that have reached maturity, it may also relate to diminishing economic incentives to plant (Chapter 7).

management, the programme identifies as "desired outcomes": i) freshwater is sustainably, efficiently and equitably allocated and used; ii) freshwater quality is maintained at sufficient levels to meet all appropriate needs; and iii) water bodies of nationally significant natural, social or cultural value are protected.

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New Zealand has a number of objectives related to *sustainable forest management*. Through its involvement in the *Montreal Process*,[1] it has made a commitment to conserving and sustainably managing its forests, both indigenous and planted. The *1993 Amendments to the Forests Act* introduced the requirement that all indigenous forests be sustainably managed (regardless of ownership), so as to maintain them in perpetuity, both as functioning ecosystems and as economic resources. Before being eligible to harvest indigenous timber, private owners must have approved *sustainable forest management plans and harvesting permits*, both administered by the Indigenous Forestry Unit in the Ministry of Agriculture and Forestry (MAF), which sets sustainable harvesting limits. Many territorial authorities set additional controls under district plans. In 2002, Standards and Guidelines for Sustainable Management of Indigenous Forests were published, offering practical guidance to territorial authorities and applicants alike on how to implement plan and permit requirements set out by the 1993 amendments (MAF, 2002).

The government has broadly defined *sustainable agriculture* as an operating principle, calling for management approaches that maintain or enhance: i) the natural resource base of agriculture; ii) other ecosystems influenced by agricultural activities; iii) the economic viability of agriculture; iv) the ability of people and communities to provide for their social and cultural well-being; and v) the quality and safety of food and fibre (Ministry of Agriculture and Fisheries, 1991). Among "desired outcomes" identified by MAF are several related to environmental management: i) adoption on management practices that maintain or enhance the quality of waterways, groundwater and coastal water with respect to suspended sediments, nutrients, harmful micro-organisms and other contaminants; ii) maintenance of catchments to provide high-quality water resources for downstream users and users of coastal space; iii) avoidance, mitigation and remedying of the impacts of land-related hazards, including flooding, subsidence and erosion; and iv) maintenance of esthetic, ecological and conservation values related to land and water. The national *Sustainable Land Management Strategy* (1996) embraced these objectives and prioritised action on erosion in highland pastoral areas and on land use impacts on aquatic ecosystems.

Sustainability in agriculture and forestry is underpinned by responsible *management of ecosystems* and biodiversity. The national *Biodiversity Strategy* (2002) set several goals relevant to the agriculture and forestry sectors, including maintaining and restoring a full range of remaining natural habitats and ecosystems to a healthy functioning state and maintaining genetic resources of introduced species that are important for economic, biological and cultural reasons. Building on the 1993 Biosecurity Act, the *2003 Biosecurity Strategy* set three overarching goals for management of weeds, animal pests and other invasive species: i) prevent the entry of pests capable of causing significant harm to the economy, environment or public

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health; ii) reinforce surveillance and response mechanisms to assure early detection, assessment and containment of new pests; and iii) extend work to eradicate, contain and control established pests (Chapter 3).

Concerning management of environmental impacts of agriculture and forestry

Environmental impacts of agriculture and forestry are managed in the framework of the 1991 *Resource Management Act (RMA)*. Under the RMA, territorial councils regulate land use and establish objectives for soil conservation in their jurisdiction. For example, Auckland Regional Council's land objectives include avoiding, remedying or mitigating adverse effects of activities that result in soil degradation, and minimising the effects of soil degradation on receiving water quality. Regional authorities also monitor and regulate water withdrawals, as well as pollution discharges to water, land and air, through resource consents (Chapters 2 and 4).

Concerning *GHG emissions*, New Zealand is committed to returning its net emissions to 1990 levels by 2008-12 under the Kyoto Protocol (Chapter 7). Although agriculture accounts for 50% of national GHG emissions, no sectoral targets have yet been set regarding emission reductions. However, MAF has set objectives for research to identify means of reducing the sector's GHG emission intensity (Leslie and O'Hara, 2003).

1.2 Recommendations of the 1996 Environmental Performance Review

Performance can be further assessed against the recommendations of the *1996 OECD Environmental Performance Review* regarding agriculture:

- seek further integration of environmental concerns (soil erosion, water resource management, impact of agrochemical use and animal wastes, emissions of greenhouse gases, protection of wildlife habitats) into actions taken by the agriculture sector;
- increase emphasis on mitigating the environmental effects of traditional forms of land use, particularly pastoral agriculture;
- develop the use of economic and other instruments, in order to internalise damages created by polluting activities related to agriculture;
- accelerate development of indicators of land and water quality in order to monitor the results of agricultural management and assess the feasibility of new approaches to environmental management;
- reassess the research and extension process with regard to agriculture and the environment so as to improve the access of landholders and regional and district officers to technical and scientific information;
- maintain efforts in possum and rabbit control and find alternatives to the use of Compound 1080.

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2. Management of Land and Soil Quality

Soil erosion is one of the most important long-term environmental issues related to agriculture and forestry. Agricultural activities are responsible for about 34% of national soil loss (some 227 million tonnes per year).The bulk of erosion occurs in indigenous forest and native tussock areas on the west coast of the South Island, due to natural ecological and geologic conditions. Another area with a high proportion of very erosion-prone land is the east coast of the North Island in the Gisborne district, where thin soil overlays soft tertiary argillite deposits.

During the review period, the *Sustainable Land Management Strategy* guided soil management. MAF and the Ministry for the Environment (MfE) jointly sponsored development of a Soil Conservation Technical Handbook to assist farmers and other landowners in dealing with erosion. Regional councils promote sustainable land management practices, working with land care groups and farmers. The *Landcare Trust* was established to promote sustainable land management through land care groups, training, research and information (Chapter 3). Financial support for research and extension has been provided through the Sustainable Farming Fund (Box 5.3).

2.1 Agricultural soil

The total land area farmed decreased from 145 000 km^2 in 1984 to 119 000 km^2 in 2004. The declining trend was sustained during the review period, with some 6 000 km^2 of pastoral land taken out of production. This land was diverted to forest production, converted to residential development or left to revert to scrubland and native bush.

The *annual suspended sediment yield from agriculture* is estimated to be 76.8 million tonnes, or an average annual loss of about 6 tonnes per hectare. Since 1980, around 1.2% of agricultural land (1 640 km^2) has been subject to *severe erosion*, losing over 33 tonnes per hectare per year (Landcare Research, 2004). A further 1% has suffered high erosion (22-32.9 tonnes/ha), 3% moderate erosion (11-21.9 tonnes/ha) and 5% slightly elevated erosion (6-10.9 tonnes/ha). On the remaining 89.5%, the estimated annual erosion rate is deemed acceptable at less than 6 tonnes/ha. Of the agricultural land on which erosion levels were more than this, all but around 0.1% was pasture rather than arable or horticultural land.

Recent data suggest that the adverse effects of *soil compaction* surpass those of erosion (Sparling, 2004). Data from 600 sites throughout New Zealand found that soil bulk density was highest on cropping and horticultural land while macroporosity was lowest on dairy pasture – the former due to tractor use, the latter due to stock density. Prolonged rainfall and wet soil conditions, combined with high stocking density on

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Box 5.3 **Sustainable Farming Fund**

The Sustainable Farming Fund (SFF), established by MAF in 2000, supports projects that help agricultural producers *reconcile economic, social and environmental objectives*. Funds are allocated through annual contestable funding (competitive grants) to projects lasting from one to three years. Projects must be producer-led, representative of a community of interest and provide partnership funding. Funds cannot be used for capital expenditure, to support commercial entities or to benefit a single organisation or company. Project teams have to report progress on agreed work programmes.

By 2006, the SFF had funded over *400 projects* in several allocation rounds (Steel, 2005). Funding ranged from NZD 1 300 to NZD 600 000 per project, with an average grant size of NZD 130 000. The SFF received NZD 24 million for its first three years of operation (2000/01 to 2002/03), to cover both administrative costs and grant payments. Following a successful review, the budget allocation for the second three years (2003/04 to 2005/06) was increased to NZD 28.5 million, and it is NZD 29.6 million for the three years beginning in 2006/07.

An *initial evaluation* of the SFF in 2002 was based on questionnaire-driven interviews with managers and sponsors of 33 projects, as well as interviews with key industry and sector organisation personnel and local government managers. Because the projects were very recent or still going on, the resulting assessment was preliminary. Nevertheless, it elicited useful feedback from project managers that provided input for subsequent improvements to the fund's financial, management and reporting systems.

A *more comprehensive evaluation* in 2004, led by an independent consultancy, categorised the 257 projects sponsored according to: i) major stakeholder (primary sector, processing, communities); ii) predominant outcome (knowledge, application, transfer); and iii) range and type of benefits (economic, environmental, social). It revealed that the SFF project portfolio was fairly balanced and diverse. More detailed analysis of specific groups of projects was carried out to quantify benefits. Analysis of seven groups comprising 106 projects indicated potential economic return to GDP (or farm-gate production) in the range of NZD 330-530 million per year. Realising these benefits will require further investment and other resources to enable or facilitate adoption. Potential environmental benefits were noted but not quantified.

paddocks, provide the ideal conditions for soil damage from *pugging and soil compaction*, leading to more run-off of topsoil and contaminants to waterways (OECD, 2004).

Elevated levels of *agrochemical residue* have been discovered in some soil at former sheep dip sites, timber treatment sites, and old orchards and pastures. For example, recent research into old horticultural soil in Hawke's Bay found evidence of organochlorines, especially DDT and heavy-metal-based pesticides, particularly copper. On average, old pip-fruit orchards had DDT levels eight times above

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guidelines (some up to 20 times) while old stone-fruit plots had DDT levels twice the guideline values (HBRC, 2004). Territorial authorities have begun a register of potentially contaminated sites in their areas, although arrangements for their eventual clean-up are not yet clear (Chapter 2). The MfE and territorial authorities have worked together to collect and dispose of unwanted, old or obsolete agrochemicals; most councils provide transfer stations, and some provide pickup service (Chapter 2).

2.2 Forests

Forest planting helped *reduce erosion* during the review period. For example, it was estimated that, where forests were present, the extent of landslides during a major storm in the Manawatu-Wanganui region was reduced by 90% (Landcare Research, 2004). Some regional councils provide seedlings at favourable prices to encourage landowners to plant trees. Trees for Survival, a charitable trust, matches schools with farmers willing to retire part of their land and let students plant it with native trees to prevent erosion, improve water quality and increase biodiversity.

In 1992, the central government launched the *East Coast Forestry Project* to reduce erosion in the North Island's Gisborne district. Until June 1999, the objective was to plant 2 000 km^2 of commercial forest on severely eroding and potentially erodible land by 2020, or about 70 km^2 per year. From 1993 to 2000, some 260 km^2 was planted, an average of 32 km^2 per year. Following a review in 1999, the project's objective was reformulated, with the emphasis on planting 600 km^2 of the land most at risk by 2020 (MAF, 2005c). In 2003, planting was carried out on 41 km^2. However, declining forestry returns (relative to pastoral farming) and the receivership of the largest commercial forest company in the region may make it difficult to meet the 2020 goal.

3. Management of Impacts on Water

3.1 Water quality

Trends

Agriculture and forestry contribute to *water pollution* in the form of nutrients, microbiological contaminants and chemicals. Data from regional reports show that agriculture has become the largest source of *nutrient pollution* of natural waters (Chapter 2). A report on water quality trends in the Waikato River basin showed that levels of suspended solids, total nitrogen, ammonia, total phosphorus and dissolved reactive phosphorus were significantly correlated with the proportion of the catchment area that was in pasture (Vant and Smith, 2004). A number of pathogens found in polluted surface waters pose risks to livestock health (Table 5.1). In Taranaki, water

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bodies in lower catchment areas consistently had elevated nitrate concentrations and enhanced algal growth (TRC, 2004). Trend analysis of groundwater quality in the Canterbury region showed increasing concentrations of nitrates in two-thirds of wells (Hanson, 2002). *Expansion of the area planted in forests* has helped maintain surface water quality in some areas, and the draft national standards to protect headwaters of drinking water sources call for additional planting in such areas (Chapter 2).

The *use of off-farm inputs increased* as farming became more intensive during the review period. Nitrogenous fertiliser use has more than doubled since 1996 (Chapter 4). Of the 2.3 million tonnes of synthetic fertiliser used in 2002, 53% was phosphate, 33% nitrogen and 15% potassium. Consumption of urea rose from 120 000 tonnes in 1999 to 311 400 tonnes in 2004 (StatsNZ, 2006). The use of urea and other nitrogenous fertiliser was increased in part to offset a fall in nitrogen fixation from white clover resulting from infestation by the clover root weevil.[2] While the intensity of fertiliser use per hectare has increased, it remains well below the OECD average (Figure 5.2).

The biggest sources of *nitrogen leaching* in New Zealand are livestock *urine and manure*. The OECD nitrogen soil balance shows that nitrogen fertiliser contributed only 4.2% to total nitrogen input, while manure contributed 42%. It has been estimated that the waste generated by the 3 000 dairy herds in the Waikato River catchment is equivalent to the waste from 5 million people, or nearly 50 cities the size of Hamilton, the region's largest city (Environment Waikato, 2005). *Stock access to waterways*, for drinking or during movement to the milking shed, is a source not only of nitrogen but also of microbiological contaminants such as faecal coliforms and campylobacter. Most lowland waterway and some coastal areas adjoining farmland do not meet national microbiologicals guidelines (Chapter 2). A recent survey of

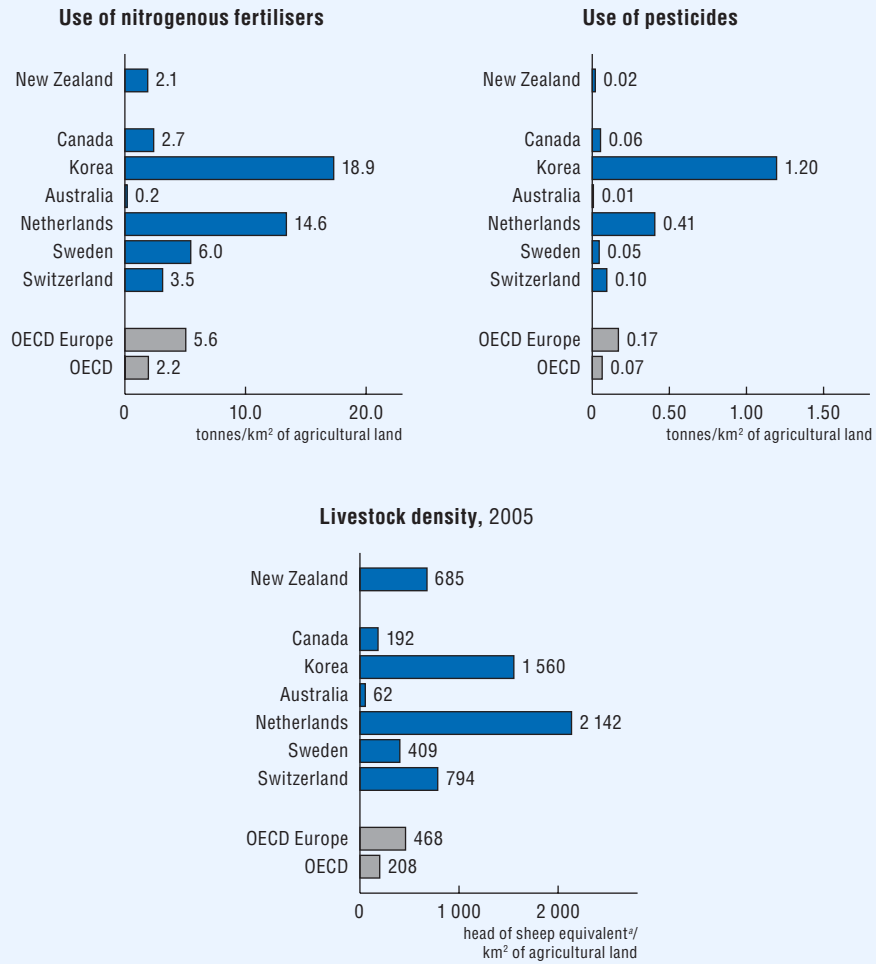
Table 5.1 **Waterborne pathogens affecting livestock health**

Pathogen	Relevance/impact in New Zealand
Mycobacterium bovis	2 314 bovine tuberculosis cases and 1 590 cervine cases in 2001
M. paratuberculosis	Johnes disease in 12-60% of dairy herds
Campylobacter	Causes abortion in livestock (25-70% of cattle abortions)
Salmonella (esp. S. brandenberg)	Causes low weight gain and abortion in sheep (and increasingly in cattle)
Giardia	Causes low weight gain
Cryptosporidium parvum	Causes severe diarrhoea, resulting in 30% mortality in young beef cattle
Cryptosporidium muris	Causes reduced milk production (about 13%)

Source: Davies-Colley *et. al.*, 2003.

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Figure 5.2 **Selected agricultural indicators,** early 2000s



a) Based on equivalent coefficients in terms of manure: 1 horse = 4.8 sheep; 1 pig = 1 goat = 1 sheep; 1 hen = 0.1 sheep; 1 cow = 6 sheep.

Source: FAO (2006), FAOSTAT data; OECD, Environment Directorate.

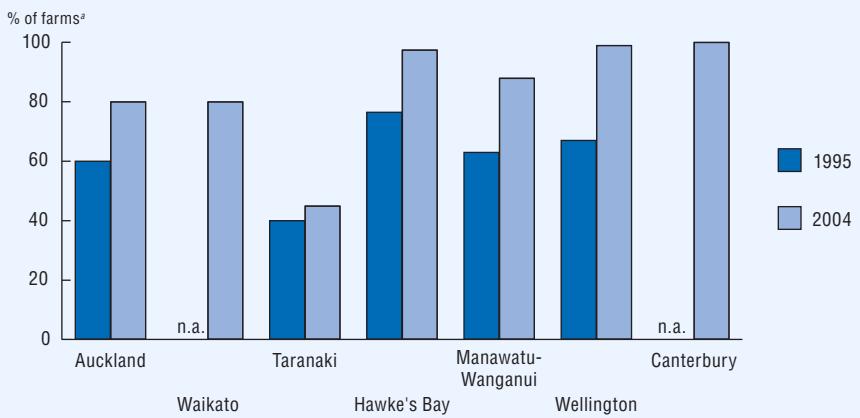
livestock in the Waikato region also showed significant quantities of *oestrogen* being excreted in urine and faeces from all species, but concentrations from dairy cows were generally higher than from pigs and goats (Sarmah, 2004).

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Since 1996, the disposal of *dairy shed effluent* (wash water and manure) has largely been shifted from water to land as a result of regulation under the RMA (Figure 5.3). Some regional councils no longer allow any discharge to waterways. Others allow it, if it has been through primary treatment. Soil, slope and climatic conditions in several areas do not favour land disposal. Some councils (e.g. Taranaki) require a resource consent for all dairy shed discharges, while others (e.g. Waikato) allow certain discharges, provided some conditions are met. In either case, all councils require a *buffer distance* between land discharge and watercourses (usually 20-50 metres from water used for human or stock consumption), and most have limits on nitrate loadings from effluent (usually 150 kg N/ha/year) (NZWWA, 2003). The shift away from water to land discharge has led to some noticeable improvements in stream quality (e.g. the Waitohu stream in the Wellington region). A recent OECD study comparing costs of manure management options (storage, disposal, land application) in six countries showed that the additional cost imposed by environmental regulations on manure management did not significantly affect New Zealand's competitiveness in world markets (OECD, 2004).

Monitoring of *pesticide and herbicide levels* in water bodies, carried out by regional authorities, has thus far not found any public health concerns. The overall intensity of use of agrochemical inputs remains low because of the dominance of

Figure 5.3 **Dairy farms using land disposal of shed effluent,** 1995-2004



a) Percentage of dairy farms in selected regions using recommended land disposal practices to manage shed effluent.
Source: Landcare Research (2004) and Taranaki Regional Council (2003); OECD (2004).

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pastoral farming (Figure 5.2). A survey in Hawke's Bay of 12 groundwaterand 28 surface water sites in 2001 found pesticides in 11 streams, but none in concentrations above drinking water or ecological guidelines (Rout, 2002). Pesticide residue was found in 75% of groundwater supplies tested in the Waikato region, but concentrations were generally low, with minimum acceptable values for dieldrin exceeded only at two former sheep dip sites (Kim, 2004).

Policy responses

A range of *voluntary agreements and partnership approaches* has been used to address water pollution concerns in the primary production sectors. For example, in response to public concerns about the environmental impact of dairy farming, the *Dairying and Clean Streams Accord* was agreed in 2003 among the largest dairy co-operative (Fonterra, which controls some 96% of the milk supply), regional councils and the central government (Chapter 2). Voluntary programmes have also been initiated at local level. One of the most comprehensive is the *Riparian Management Programme in Taranaki*, which promotes revegetation of river and stream banks to enhance water quality, with spillover biodiversity benefits. It involves the preparation of a riparian plan for each farm, outlining fencing, land retirement and planting options. In 1993, there were just 10 plans; by 2004, over 700 had been prepared, covering 2 500 km of banks on almost one-third of the Taranaki region's dairy farms. Landholders meet the cost of implementing the plans, with the council providing seedlings at low cost. Landholders have contributed over NZD 1.1 million in riparian management, or about NZD 10 for every NZD 1 the council spends (TRC, 2004).

Increasing numbers of farm and forest operators adopted *environmental management systems* during the review period. Many have used such systems for some years, and in some cases they have become a condition of supply. While some environmental benefits have been noted, such management systems tend not to involve the operators causing the most environmental harm or farming in the more fragile environments. In general, the systems were developed earlier in *forestry and horticulture* than in pastoral farming, and have been taken up by more operators in those industries. Factors contributing to this phenomenon may include greater potential for marketing opportunities, stronger awareness of individual growers' contribution to marketing as a result of their closer involvement in managing phytosanitary requirements, and the closer proximity of horticultural operations to towns. A number of major horticultural groups have compulsory environmental management systems that minimise and carefully control agrochemical use (Box 5.4). Similarly, about one-third of commercial plantation forests (38% by area, 33% by harvested volume) are managed to *Forest Stewardship Council standards*, and negotiations are almost complete on an equivalent national standard.

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Box 5.4 **Environmental management systems in the agriculture sector**

Sustainable Winegrowing New Zealand, established by five vineyards in August 1995 as an industry initiative directed through New Zealand Winegrowers, has been adopted by growers from all of the country's grape growing regions. It addresses agrochemical use, soil health, water availability and quality, and biodiversity. Growers conduct a self-audit each year, and an independent auditor conducts random controls every three years on average. In June 2006, SWNZ had 490 members representing 130 km^2 out of a total wine production area of 200 km^2. Although growers do not receive a price premium, cost savings have resulted through more efficient spraying. During the review period, the use of broad-spectrum organophosphate pesticides has steadily decreased, while the use of more targeted insect growth regulators has risen.

The *KiwiGreen* programme began in 1992 and was made a condition of kiwifruit supply in 1997. While it began as a quality assurance programme relating to food safety and quality, it provided environmental benefits by shifting growers to less toxic chemical use. The area covered by KiwiGreen increased from about 60 km^2 in 1994 to 115 km^2 in 2003; of this, around 5 km^2 is in organic production (MAF, 2001).

The area covered by integrated pest management in *apple production* rose from 70 km^2 in the late 1990s to 120 km^2 in the early 2000s. It involves monitoring for pests and diseases, responding only where thresholds are exceeded, using non-chemical control such as canopies, sticky bands, biological control and pheromones, and using "soft" chemicals.

Livestock farmers are involved in several environmental management system initiatives. *Market Focused* was introduced in 2001 to help dairy farmers address environmental management issues (Dexcel Partners, 2005). Project Green was initiated in 2001 to develop a minimum voluntary standard for sustainable production of sheep, beef cattle, deer and goats. Through a series of farm trials, plans covering animal management, land and environment, and social responsibility, along with associated software, have been developed. The *New Zealand Deer Farmer's Landcare Manual* was launched in June 2004, gathering and documenting knowledge from deer farmers on the effects of deer on the farm environment and successful ways to deal with these effects.

The government has facilitated efforts to certify organic agriculture, primarily to assure market access for producers. At the request of organic exporters, the New Zealand Food Safety Authority established the *Official Organic Assurance Programme*. The initial objective was to provide assurance that organic product exports met EU requirements. The programme was recently extended to cover access to the United States and Japan. As of 2003, around 800 farms were either certified as or converting to organic. The area concerned totals 460 km^2, nearly quadruple the area in 1994. While the vast majority of farms concerned are horticultural operations, almost half the area (over 210 km^2) is in sheep and/or beef production.

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Codes of practice and vocational training have also been used to moderate the environmental impacts of primary production. Since 1998, the major fertiliser manufacturers have promoted a code of practice for fertiliser application and offered training in fertiliser use for advisers and end-users. The code, updated in 2002 and 2005, incorporates the use of a software tool called the Overseer nutrient budget model. The New Zealand Agrichemical Education Trust also operates an extensive training and accreditation programme, called Growsafe, with funding from the Sustainable Farming Fund, territorial authorities and horticultural industry organisations. The programme offers training for users of agrochemicals in how to rank products according to short- and long-term soil build-up and leaching risk (depending on their local climate, soil conditions and crop).

New Zealand maintains a diverse *research programme* oriented towards better understanding of the environmental impact of agricultural activities. For example, a project launched in 2002 is assessing the impact of intensive dairying and management practices in four catchments, located in Waikato, Canterbury, Southland and Taranaki. Other research is assessing pathways of micro-organisms and their impact on water quality, developing models to assess the impact of land use change on water quality and improving Overseer and other nutrient budget models. Research into *nitrogen inhibitors* indicates that they could provide both environmental benefits (e.g. potential to reduce nitrate leaching by 30-60%) and economic benefits (i.e. improved pasture growth); three such products were commercially available in 2006. Agri-environmental research represents the largest category of environmental expenditure in the agriculture and forestry sectors (Table 5.2).

3.2 Water withdrawals and allocation

Current resource allocations indicate that *agricultural irrigation is the country's largest consumer of water*, accounting for some 77% of abstractions, although the amount varies significantly by region (Table 5.3). Data on the quantity of water abstracted for agriculture or forestry is not available because, historically, most consents issued for abstraction did not require metering. In recent years, several regional councils have begun requiring metering for new large consents, which is consistent with the Sustainable Water Programme of Action (Chapter 2). Only areas on the eastern side of both islands have large shares of water allocated to irrigation (e.g. Gisborne and Hawke's Bay in the North; Canterbury, Otago, Marlborough and Tasman in the South). Over 60% of the total water allocated for irrigation is used in Canterbury.

Between 1985 and 2002, the *area under irrigation increased* from 2 600 km^2 to 4 675 km^2, or 10% per year. Two-thirds of this increase took place in the Canterbury region, where the area under irrigation increased from 1 500 km^2 in 1985 to 2 900 km^2

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in 2002. Where formerly farmers regarded irrigation as "insurance", now they use it to increase productivity, allowing higher stocking rates. Furthermore, a policy change in 1999 providing financial assistance to explore the feasibility of large irrigation projects led to a rush of investigations. From 1999 to 2006, water allocation doubled in the Bay of Plenty, Waikato, Wellington and Marlborough regions (Aqualine Research, 2006). In Taranaki, the quantity of water allocated for pasture irrigation has risen 350% since 1996. As demand for irrigation water continues to grow, it will be important to develop resource pricing to optimise allocation among user groups. In regions where abstraction has increased very rapidly during the review period, it is also important to ensure that resource consents take into account sustainable yield levels based on aquifer modelling.

Table 5.2 **Public expenditure addressing environmental effects of agriculture and forestry,** 1997-2004[a, b]

(million NZD)

	1997	1998	1999	2000	2001	2002	2003	2004
East Coast Forestry Project	2.64	3.50	3.91	3.35	2.14	2.39	3.96	4.07
Organics Initiative	. .	. .	. .	. .	0.33	0.25	0	0
Soil conservation	10.66	10.29	9.38	12.67	11.99	15.44	12.79	12.12
Sustainable forestry management	1.27	0.39	1.04	1.49	1.42	1.38	1.48	2.01
Contestable Water Fund	0	0	0	2.25	1.35	0	0	0
Disaster relief	0.43	0.49	0.09	5.02	0.19	0	0.01	5.65
Flood control and land drainage programmes	5.99	7.04	7.18	6.91	13.74	12.72	13.17	14.60
Land-care groups	0.25	0.37	0.40	0.40	0.40	0.40	0.40	0.40
Agri-environmental research[c]	79.48	79.11	79.11	90.70	89.58	96.48	90.03	88.98
Sustainable Farming Fund[d]	. .	. .	. .	. .	0.51	2.95	3.97	3.53
Sustainable Management Fund	1.10	1.10	0.94	0.94	1.19	0.30	0.10	1.30
Pest management	34.45	39.44	38.79	37.84	44.89	50.74	52.77	60.30
Total	136.30	141.75	140.87	161.61	167.79	183.07	178.71	193.00

a) Including goods and services tax of 12.5%.
b) Financial years ending 30 June.
c) Includes funding from the Foundation for Research, Science and Technology (Public Good Science and Technology Fund) and Royal Society (Marsden Fund).
d) Established in September 2000.
Source: MAF, 2005d.

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At national level, *water resource use intensity* remains lower than in most OECD countries (Chapter 2). The environmental effects of increased water abstraction are not yet well understood, though it is evident that there is considerable *pressure on some smaller rivers* during the summer. In the Tasman region, abstraction from some groundwater aquifers has been restricted as there was evidence of *saltwater intrusion* in places. Irrigation may also be contributing to water quality deterioration by allowing farmers to increase stocking rates and fertiliser use. In some places, particularly in Canterbury, shelterbelts planted to prevent wind erosion have been removed to permit installation of large centre-pivot irrigation systems.

The *abstraction of water* from surface or groundwater sources for all purposes, including irrigation, is regulated via resource consents specifying limits on the amount abstracted (Chapter 2). Many councils have set ceilings of 10-20 m^3 per day, with larger volumes subject to conditions regarding crop, soil and climate data. Although regional councils increasingly require new consent holders to install water meters, the majority of existing resource consents have no metering requirements. *Minimum flow conditions* are increasingly integrated into regulations, allowing councils to reduce abstraction

Table 5.3 **Irrigation as part of water allocation**, regional level[a]

	Weekly water allocation		Irrigation share (%)	Share of total irrigation (%)
	Total[b] (m^3/s)	Irrigation (m^3/s)		
Northland	7.9	3.9	*46*	*1*
Auckland	8.1	2.1	*26*	*1*
Waikato	10.3	3.3	*32*	*1*
Bay of Plenty	8.9	3.6	*40*	*1*
Gisborne	1.4	1.2	*86*	–
Hawke's Bay	16.8	11.4	*68*	*3*
Taranaki	3.4	0.4	*13*	–
Manawatu-Wanganui	5.2	2.0	*39*	*1*
Wellington	9.8	3.9	*40*	*1*
Tasman	6.7	5.8	*87*	*2*
Marlborough	8.2	6.5	*79*	*2*
Canterbury	249.8	209.8	*84*	*63*
Otago	90.0	75.8	*85*	*23*
Southland	2.4	0.5	*21*	–
New Zealand	428.9	331.8	*77*[b]	*100*

a) Water allocated by regional authorities from groundwater, natural surface water and storage bodies (reservoir lakes, dams).
b) Includes water used for industrial and public water supply, and irrigation.
Source: Lincoln Environmental, 2000.

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during shortages. For example, restrictions on surface water abstraction are imposed during most summers in Canterbury. Councils are increasingly using the Internet to update irrigators regarding water levels and abstraction rates. Plantation forestry is being restricted in the Canterbury and Nelson regions because it has increased the frequency, severity and duration of low flows.

Some councils increased *regulatory flexibility* for abstractions during the review period. For example, in Canterbury, "water groups" allow individual users to take more water than would otherwise be permissible during periods of restriction as long as the total taken by the group remains the same. The Marlborough and Canterbury regions operate "A" and "B" permit systems where holders of "B" permits (issued after a certain date) face restrictions before those holding "A" permits. These efforts are helpful, but given the increasing use of irrigation and the consequent pressure on water resources, other policy instruments, such as water trading, should be considered to optimise environmental and economic outcomes (Chapter 2).

4. Management of Impacts on Biodiversity

4.1 Indigenous biodiversity

While the traditional focus of biodiversity policy has been on public conservation areas, increased attention was given during the review period to encouraging *private owners* to conserve biodiversity. Farmers and forest owners have become increasingly involved in biodiversity and bio-security measures (Chapter 3).

District plans are sometimes used to limit private property rights in the interest of protecting indigenous biodiversity. For example, in Waikato all wetlands are now designated as protected, even those on private land. Enforcement is difficult, however, and there is evidence that some wetland clearing is still occurring. Regional councils also provide *incentives* to farmers for biodiversity management. For example, Environment Canterbury administers an annual NZD 150 000 fund to protect and enhance waterways, wetlands, dunes and native vegetation on private lands, providing up to NZD 5 000 per farm to help offset costs associated with fencing and pest control. At national level, a number of funds encourage private landowners to protect indigenous ecosystems on their land (Chapter 3). About 70% of the funding goes to projects involving less than NZD 15 000, to assist individual farmers in pest control or fencing. Farmers are increasingly making use of the *Queen Elizabeth II National Trust*, which allows them to enter into covenants to protect part of their land while retaining ownership. Between 1996 and 2005, the total area of private land which had some type of protection for biodiversity conservation increased from 61 700 hectares to 112 000 hectares (i.e. about 1.3% of total protected areas in the country (Chapter 3).

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Indigenous forests are subject to special management requirements because of their rich biodiversity. Although management conditions vary depending on the potential products involved and the amenities and natural values of each forest, in general only single trees and small groups of trees can be felled for timber. Sustainable forest management requirements (in force since 1993), together with the cessation of harvesting of state-owned indigenous forests in 2001, resulted in the reduction of roundwood removals from native forests, from 357 000 m^3 in 1990 to 32 000 m^3 in 2004. Around 1 130 km^2 of privately owned indigenous forest (about 40% of total area) is now covered by sustainable forest management plans or permits (58%), and thus could be legally logged, under the Forests Act.

Actions have also been taken to increase government *control over agricultural or forest land* with high conservation value. Since 1996, the *Nature Heritage Fund*, which protects indigenous ecosystems by facilitating their purchase and transfer to the conservation estate (Chapter 3), has helped conserve over 1 670 km^2 of indigenous ecosystems. In 2001, the protection of remaining *indigenous forest* was greatly reinforced when the government halted logging on 1 300 km^2 of state-owned podocarp forest. Around 300 km^2 of the tract, located on the west coast of the South Island, were transferred into either national parks or reserves, with the remainder added to the general conservation estate managed by the Department of Conservation. The government paid NZD 120 million to the communities involved as compensation for potential loss of employment. Under the process of *tenure review*, over 100 km^2 of South Island high country formerly used for grazing has been added to the conservation estate (Chapter 3).

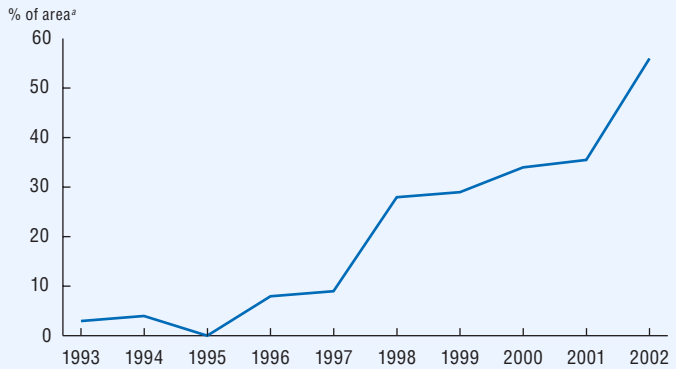
4.2 Bio-security

Invasive animals and plants affect both the environment and the production capacity of agriculture and forests. Landowners have primary responsibility for pest and weed control on their land. Rabbit numbers have fallen in recent years, resulting in biodiversity benefits such as a dramatic improvement in tussock regeneration in the McKenzie basin. A major cause of the fall was the illegal introduction in 1997 of the rabbit haemorrhagic disease virus, which is now being used deliberately. However, some local rabbit populations have always been resistant to it, and others are becoming increasingly resistant, requiring the continued use of toxic bait such as 1080.

As the 1996 OECD review noted, *possum control* is a high bio-security priority. Considerable progress has been made through more efficient and extensive management approaches (Figure 5.4). About NZD 89 million per year is spent on possum control.[3] While the main aim is to control bovine tuberculosis, much of the work has indirect benefits for biodiversity. Around 25% is spent on aerial operations

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Figure 5.4 **Conservation forest subject to possum control**



a) Per cent of DOC-managed indigenous forest area (approximately 49 000 km^2 or 77% of total indigenous forests), where possum density has been reduced to minimum.
Source: MAF (2003a), New Zealand Country Report to the Montreal Process.

to spread bait mixed with 1080 and the rest is spent on ground-based control (Rosevear, 2003). In addition, NZD 13 million per year is spent on possum research, split between controlling tuberculosis, improving existing control methods and developing new methods of possum control. Improved control methods have been introduced, including the use of GPS to eliminate gaps in baiting coverage and an improved methodology for monitoring possum populations. These have led to an increase in the area under active control and a reduction in the use of 1080 per hectare, both positive for the environment. The Animal Health Board has set the objective of achieving official freedom from bovine tuberculosis by 2012/13; in practice, this will require reducing the prevalence of infected herds to 0.2% (about 50 herds at the current national herd level).

While some achievements have been made in *eradicating other pests*, such as the white-spotted tussock moth, new invasive species have become established since the last review, including the painted apple moth and the varrora bee mite. *Bio-security risks are increasing* as a result of international visitors and trade, up 93% and 76%, respectively, since 1995. The Biosecurity Strategy, launched in 2003, extends the traditional focus on protecting primary production, putting more emphasis on protecting human health and indigenous biodiversity (Chapter 3). A new agency, Biosecurity New Zealand, has been given overall responsibility for all bio-security functions, with an increase in funding to NZD 40 million for the four years from 2004/05. Key

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challenges, particularly since the agency is still attached to MAF, remain to clarify roles and accountability among various agencies and government levels, and to develop a method for prioritising the economic, environmental and social objectives of the strategy in decision-making.

5. Management of GHG Emissions

5.1 Trends

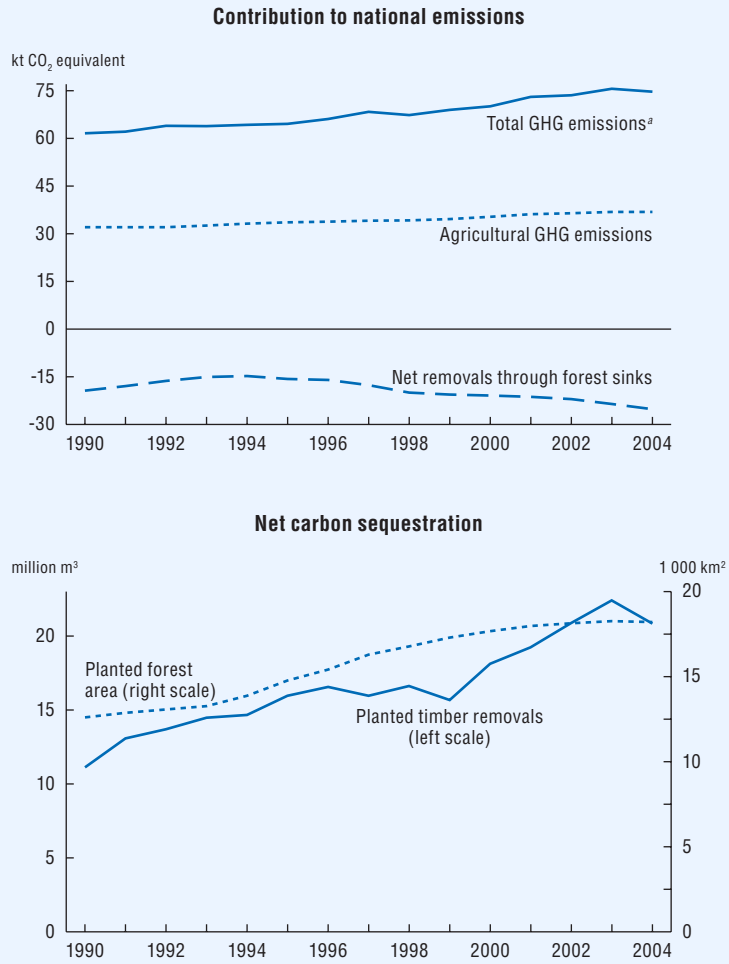
Agriculture accounts for about 50% of New Zealand's *GHG emissions*, primarily in the form of methane (CH_4) and nitrous oxide (N_2O). Because animals are farmed outside all year in New Zealand, relatively little CH_4 and N_2O are produced during anaerobic decomposition and storage of manure. The national GHG inventory estimates that 95% of emissions occur during grazing. In 2003, CH_4 represented 63.4% of total agricultural emissions of GHG, and N_2O 34.9% (out of 37.2 million tonnes of CO_2 equivalent). Since the beginning of the Kyoto period in 1990, agricultural emissions have risen by 15.6%, with CH_4 emissions increasing by 9.6% and N_2O emissions by 29.4% (Chapter 7). *Carbon sequestration in forests*, a key factor in New Zealand's GHG accounting since 1990, is likely to diminish over time as planted forests reach maturity and are harvested (Figure 5.5).

A notable change has taken place in the *sources of methane* in agriculture; emissions from dairy cattle have increased 70.3% since 1990 while emissions from sheep have fallen by 18.9%, reflecting changes in animal numbers. Estimated emissions per animal have also increased as a result of rising animal weight and dry matter intake. For example, between 1990 and 2003, the applied emission factor (kg NH_3 per animal per year) increased from 70.8 to 79.1 per dairy cow (an 11% increase) and from 8.9 to 10.6 per sheep (19%). The estimate of nitrogen excreted per animal increased from 106.2 kg per dairy cow in 1990 to 116.9 kg in 2003, while the corresponding numbers for sheep were 12.2 kg and 14.6 kg. The bulk of the remaining N_2O emissions come from nitrogenous fertiliser, application of which rose from 59 000 tonnes in 1990 to 342 000 tonnes in 2003 (Li, 2005).

Mainly as a result of the conversion of pasture to forest, net removal of CO_2 through *forest sinks* increased from 21.4 million tonnes of CO_2 in 1990 to 22.9 million tonnes in 2003, equalling *30% of GHG emissions* in 2003 (MfE, 2005). Between 1990 and 2004, New Zealand *added 6 600 km*^{2} of forest. Because the *area of plantation forest is increasing* and many trees have yet to reach maturity, the national planted forest estate is absorbing carbon from the atmosphere and thus is a carbon sink under the Kyoto Protocol. Annual sequestration, net of harvesting, fluctuates owing to the uneven age structure of the forests and yearly variations in harvesting rates. Using a three-year rolling average, it was estimated that

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Figure 5.5 **Agriculture and forestry in national GHG accounting**



a) Excluding emissions/removals from land use change and forestry.
Source: NZ Report to UNFCCC, April 2006; MAF 2005; FAO 2006; SNZ 2005.

6.3 million tonnes of carbon were sequestered in 1990 (MAF 2003a). In 2002, carbon sequestration by plantation forests was estimated to reach *6.5 million tonnes* (three-year rolling average). However, sequestration is expected to decline over the next

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decade, as large areas of the plantation forest estate reach maturity and are harvested. By 2010, annual sequestration (net of harvesting) is projected to decline to 3.0 million tonnes and it will be necessary to find other means of reducing net emissions to meet climate protection goals (Chapter 7).

5.2 Policy measures

The 2002 *climate protection policy package* aimed at meeting the Kyoto Protocol target proposed introducing a *carbon tax* in 2006. The plan has since been dropped, in part due to opposition from primary producers (Chapter 7). MAF had estimated that the tax would increase dairy farmers' total energy costs by 4.7% if carbon was priced at NZD 10 per tonne, or 11.8% if at NZD 25 per tonne (MAF, 2003a). Although non-carbon GHG emissions are significant and relatively easy to identify, they were to be exempt from taxation because reducing animal numbers is currently the only effective way farmers can reduce these emission levels.

To develop other management options, the government and the pastoral agriculture industry (including Fonterra and fertiliser manufacturers) signed a *partnership agreement*, the Pastoral Greenhouse Gas Research Strategy, to oversee research and development on technologies and practices to reduce GHG emissions from animals and farming. It was originally proposed that the research be funded through a levy on livestock producers equivalent to NZD 0.72 per cow per year. This idea was abandoned in favour of a *joint government-industry funding arrangement*. The strategy is co-ordinated by the Pastoral Greenhouse Gas Consortium, which has set a goal for 2012 of reducing ruminant CH_4 and N_2O emissions by at least 20% from the "business as usual" level. While an overall reduction in emissions per animal is the long-term goal, the immediate goal is to reduce emissions per unit of agricultural production (MAF, 2003b). This may prove ambitious, as agricultural GHG emissions rose despite an estimated 20% decrease in emissions per unit of output over 1990-2003.[4]

Recognising that permanent reforestation creates *forest sinks* of enduring value, the government has announced a *Permanent Forest Sink Initiative* letting landowners claim Kyoto-compliant emission credits for permanent forests planted since 1990. The forest owner will be required to meet the costs of administration, monitoring, auditing and compliance, and will be responsible for maintaining the carbon sinks. Limited harvesting will be allowed, on a continuous canopy cover basis. Enabling legislation, regulations and standards are being drafted (MAF, 2005e). If plantation forestry is to continue to play a major role in GHG accounting in New Zealand, the decision to retain all resulting carbon sink credits and liabilities in government hands should be reconsidered (Chapter 7).

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Notes

1. New Zealand is a member of the Montreal Process Working Group on Criteria and Indicators for Conservation and Sustainable Management of Temperate and Boreal Forests.
2. First observed in Waikato in 1996, the weevil (Sitona lepidus) has since spread throughout the North Island. It is estimated to reduce clover nitrogen fixation by around 50%.
3. Expenditure on possum control is mostly by the Animal Health Board (NZD 53 million per year), the Department of Conservation (NZD 21 million) and regional councils (NZD 15 million).
4. Estimate based on dividing total agricultural emissions (in CO_2 equivalent) by the 2003 Food and Agriculture Organization (FAO) index of total agricultural production; production has increased by 45% while GHG emissions have increased by 16%.

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6

ENVIRONMENTAL-SOCIAL INTERFACE*

Features

- Environmental data and indicators
- Effective consultation
- Indoor air quality and health
- Pesticide spray drift

* This chapter reviews progress since the previous OECD Environmental Performance Review of 1996. It also reviews progress with respect to the objectives "social and environmental interface" and "improving information and decision-making" of the 2001 OECD Environmental Strategy.

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Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of New Zealand:

- expand availability of quantitative *indicators and time series data related to environmental quality*, assuring policy relevance and public access;
- develop and implement a national *environmental health plan* (as called for in the national Health Strategy), setting quantified targets for reducing related public health costs and for minimising differences in exposure among various population groups;
- expand measures to reduce health risks associated with *poor indoor air quality*, substandard housing and unsafe heating;
- strengthen measures to prevent human exposure to *harmful levels of pesticides* through pesticide spray drift, residues in food and improper disposal;
- continue to promote the integration of *environmental education* in school curricula and in occupational training.

Conclusions

Within a well-developed institutional framework for *sustainable development*, New Zealand has made considerable progress towards integrating and balancing environmental and social concerns. Greater *public participation and consultation* under the RMA has increased stakeholder input to environmental management and policy formulation. *Maori* have become more involved in environmental management through expanded natural resource rights and greater representation on regional and territorial councils. Access to judicial processes has significantly improved with the operation of the *Environment Court* since 1996, and a boost in its funding since 2002 that helped accelerate treatment of cases. Access to justice has been further facilitated through the Environmental Legal Assistance Fund, which provides funding to stakeholders wishing to bring environmental cases to court. Public awareness of environmental issues has increased and *environmental education* has been reinvigorated through the national Strategy for Environmental Education and its implementing guidelines for teachers.

Despite these gains, areas for improvement remain. Consistent *environmental indicators and trend data* that can be aggregated at national level are scarce, and the sole national state of the environment report was published in 1997. Although *public consultation* as part of RMA processes is extensive, it could be rendered more efficient in certain cases. Indeed, NGOs, Maori, businesses and other stakeholders complain of "consultation fatigue" and report that they must sometimes drop out of

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lengthy consultation processes when they become too costly. There is increasing public concern that New Zealand's "*clean and green*" *image* is waning; nevertheless, surveys show that this concern is not matched by a willingness to take personal action or accept the costs of measures to improve the environment. Poor *indoor air quality* and drinking water that does not comply with guidelines entail health risks, with socio-economically disadvantaged and Maori households disproportionately affected. New Zealand has a high rate of *waterborne disease* compared to other OECD countries. Ambient air quality in large urban areas has deteriorated, posing health risks. In agricultural areas, exposure to *pesticides from spray drift* is a public concern.

♦ ♦ ♦

1. Objectives and Policy Framework

1.1 Sustainable development framework

Since the late 1990s, New Zealand has made an effort to translate its commitment to sustainable development into action, striving to simultaneously meet a range of objectives related to its *social, cultural, economic and environmental development* (Chapter 4). The population has continued to grow at nearly double the average OECD rate, while unemployment has decreased, per capita income increased and educational attainment continued to improve (Box 6.1). These *socio-economic trends* have accompanied a shift in policy focus from assuring "sustainable economic growth" to achieving "sustainable development". The Ministry of Social Development (MSD) was established in 2001 to provide cross-sectoral leadership, and in 2003 the government published a national programme for sustainable development, with a set of principles to guide government policy- and decision-making (DPRC, 2003). Within this context, increasing priority during the review period was put on *integrating environmental and social policy* whenever possible by tapping potential synergies (e.g. health benefits from high environmental quality) while avoiding undesired outcomes (e.g. socio-economic disparities in exposure to environmental risks).

Practical responsibility for managing many issues at the environmental-social interface lies with *regional councils and territorial authorities*. These local authorities have responsibilities for community environmental services (i.e. water supply and waste water treatment) and environmental health (i.e. building codes, flood protection). In 2002, the Local Government Act (LGA) extended local councils' powers and granted greater flexibility in meeting community needs. The LGA instructs local authorities to take a "sustainable development approach", promoting the social, economic, environmental and cultural well-being of communities through *Long Term Council*

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Box 6.1 **Social context**

New Zealand has the third smallest *population* in the OECD, numbering 4.06 million in 2004, and a national territory of 268 000 km^2 (slightly larger than the United Kingdom). Over 80% of the population is of European descent, 14.7% Maori, 6.5% Pacific Islanders, 6.6% Asian and 0.7% other ethnicity.* StatsNZ projects that the population will reach 4.5 million by 2021 (StatsNZ, 2005a).

The *rate of growth* of the population, 20.8% between 1990 and 2004, was nearly double the OECD average (Figure 6.1). Although the fertility rate has declined since 1993, it remains one of the highest in the OECD at 1.90 in 2003. Since 2001, net migration has increased to about 1% of the population per year. Nearly 20% of the resident population is foreign-born. New Zealand's population is ageing, but not as quickly as those of most OECD countries; the ratio of those over 64 to those under 15 is 0.55, compared to an OECD average of 0.69.

National *population density* (15 inhabitants per km^2) is less than half the OECD average (33). Nevertheless, the average New Zealander is an urban dweller. Mainly located in coastal areas, *urban centres* are led in size by Auckland (30.2% of national population), Wellington (9.1%) and Christchurch (8.9%). Urbanisation continued during the review period. For example, while the national population has grown by 3.3% since 1996, that of the Auckland region has risen by 8.4%.

Real per capita income (taking into account purchasing power parities) has risen every year since 1998, and exceeded USD 21 000 in 2004. The OECD's latest comparative ranking of real GDP per person places New Zealand in the "low middle income group" of member countries, along with Spain, Greece, Portugal and the Republic of Korea, among others. Increasing per capita GDP is an oft-cited national policy goal.

Over the review period, *real consumer expenditure* generally increased, and rising expenditure on durable goods signaled growth in consumer confidence. Private *car ownership* is 15% higher than the OECD average at 56 out of every 100 people. According to the 2000/01 household expenditure survey, 47% of households had a computer, up from 33% in 1997/98 and 10% in 1987/88.

The *unemployment rate* has more than halved since 1990; in 2005, it was 3.7% (Figure 6.1). About 20% of jobless persons have been unemployed longer than six months and 1% longer than five years. Substantial ethnic differences in unemployment rates exist. In 2006, 8.5% of Maori, 6.2% of Pacific people and 2.6% of European-descent New Zealanders were unemployed. Unemployment is higher in rural than in urban areas, with the highest unemployment in Northland (5% of population in 2006).

Educational attainment is higher than the OECD average (OECD, 2005). Over 75% of people aged 25 to 64 have attained upper secondary or higher levels of education, compared to the OECD average of 65%. Between 1997 and 2000, the number of tertiary qualifications completed by Maori and Pacific Island students increased by 26% and 16%, respectively, while the increase during the same period for European-descent students was 7%. Providing incentives for graduates to remain in New Zealand has become a concern, since 24% of the population with tertiary degrees resides overseas.

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Box 6.1 **Social context** *(cont.)*

Major public health issues include elevated rates of cancer and *rising obesity*. Obesity levels are at 10% among children and 21% in the adult population. Elevated skin cancer rates are associated with increased solar radiation due to stratospheric ozone depletion. Certain environmental health issues disproportionately affect *lower-income communities*, such as waterborne diseases and respiratory conditions and allergic reactions associated with indoor air pollution.

* The total exceeds 100% as some people identify themselves as being in more than one category.

Community Plans. A 2005 survey of senior local authority staff members indicated that 40% considered the LGA objectives regarding sustainable development to be adequately clear, but 24% wanted further central government guidance on what "taking a sustainable development approach" should entail (Borrie and Memon, 2005).

1.2 Recommendations of the 1996 OECD Environmental Performance Review

The *1996 OECD Environmental Performance Review* made the following recommendations related to the environmental-social interface:

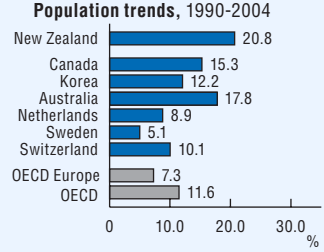
- take additional measures to ensure that environmental organisations and community groups have opportunities to participate in environmental decision-making; in particular, ensure that any costs they bear are not impediments to participation in resource planning and consent legal procedures;
- tailor environmental monitoring and reporting systems to the implementation needs of the RMA [Resource Management Act] and ensure that they are nationally consistent; extend systems to include information about economic aspects of environmental policies;
- make greater use of multi-stakeholder decision-making processes and voluntary agreements so as to encourage constructive conflict resolution and facilitate the work of the Planning Tribunal;
- give high priority to completion of the first national state of the environment report and the development of a set of environmental indicators; appropriate Maori-inspired indicators should also be developed to support protection of Maori values.

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Figure 6.1 **Social indicators**

Population and ageing

Population trends, 1990-2004



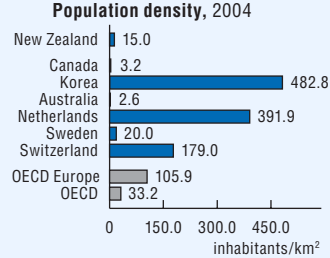
Population change		1996	2005
natural increase	‰	7.8	7.6
net migration	‰	6.6	1.7

		1996	2004
Foreign-born population	%	16.2	18.8

Ageing		1996	2005
over 64/under 15	ratios	0.50	0.57

Settlement and mobility

Population density, 2004

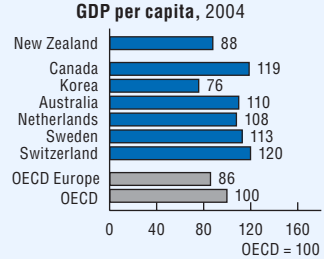


Population by type of region		Late 1990s	
	% population	% area	density
urban	40.7	4.9	109
intermediate	55.5	90.3	8
rural	3.8	4.8	10

Mobility		1996	2005
car ownership	veh./100 inh.	46	56

Income and employment

GDP per capita, 2004



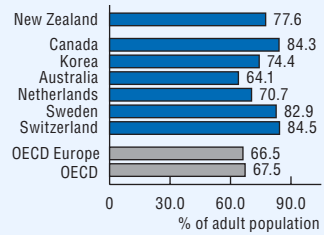
Regional disparities		1996
income/inh.	variation coefficient	11.7

Labour force participation (% pop. 15-64)		1996	2005
total rate	%	76.8	79.4
female rate	%	68.1	72.3

Unemployment (standardised rates)		1996	2005
total rate	%	6.1	3.7
female rate	%	6.1	4.0

Health and education

Upper secondary or higher education, 2004



Education attainment		1996	2004
upper secondary	%	. .	77.6

Life expectancy			1996	2004
at birth:	total	years	77.1	79.2
	female	years	79.7	81.3
at age 65:	male	years	15.6	17.1
	female	years	19.1	20.1

Source: OECD Environment Directorate.

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2. Environmental Information

2.1 Availability of environmental information and data

Responsibility for collecting and aggregating environment-related data is shared among national, regional and local authorities. The 1991 Resource Management Act (RMA) requires the Ministry for the Environment (MfE) to monitor the Act's implementation and effects, as well as other matters of environmental significance. The Department of Conservation (DOC) is to monitor the implementation of coastal policy statements and permits. Statistics New Zealand (StatsNZ) and the Department of Survey and Land Information (also known as Land Information New Zealand) have complementary responsibilities for collecting data related to the environment.

However, primary *responsibility for environmental monitoring* lies with regional councils and territorial authorities, which are required to monitor relevant aspects of the environment in their jurisdictions. The 2004 amendments to the RMA introduced a new requirement that each local authority make available to the public a review of the results of its environmental monitoring at least every five years. Since 2000, all regional authorities have signed Environmental Information Sharing Protocols with the MfE, agreeing to share environmental data and information for national reporting.

National level

To monitor progress towards its sustainable development objectives, the government has begun building up *knowledge bases at the environmental-social interface*. For example, the condition of the physical environment is one of ten "domains" monitored in the MSD's annual *Social Report*, through a range of national indicators (MSD, 2005). Since 1999, the Quality of Life Survey has provided updates of a range of environmental indicators relevant to quality of life in the largest cities.[1] In 2002, StatsNZ released *Monitoring Progress Towards a Sustainable New Zealand* (StatsNZ, 2002), containing a selection of *economic, social and environmental indicators* related to the country's sustainable development goals. The report was a first attempt to consolidate available information at national level. Unfortunately, its data were rather piecemeal and there has been little progress in developing social-environmental databases and indicators since.

The *Environment 2010 Strategy*, released as a follow-up to the 1992 Earth Summit,[2] emphasised the importance of environmental data to inform policy decisions[3] (MfE, 1995). In particular, it called for the central government and local authorities to jointly develop a *core set of environmental indicators* for use in monitoring environmental quality, and recognised the need to standardise related measuring techniques and databases (MfE, 1996). Designation of environmental indicators progressed during the review period, albeit slowly. Indicators on climate

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change were developed in 1998, waste in 2000 and the marine environment in 2005. Indicators on air, freshwater, biodiversity and land are pending. Further indicators being confirmed and developed relate to energy, toxins, animal pests, weeds, and Maori and amenity values. Although some progress has been made in *designating environmental indicators*, it will take time and further effort to put them into operation, as required data collection and aggregation are not yet carried out. Further, the work thus far has not fully assimilated the pressure-state-response framework; the indicators are heavily biased towards the "state" stage. One consequence is that no pressure reduction targets have been set and few pressure data are available.

The Environment 2010 Strategy also announced the establishment of a *state of the environment reporting* system intended to produce reports every four years. So far only one national State of the Environment Report has been published, in 1997 (MfE, 1997), and the objective of regular publication appears to have been forgotten. This is unfortunate, as the lack of nationally aggregated data and indicators makes monitoring policy effectiveness difficult and impedes evidence-based policy-making.

Knowledge bases at the *environment-economy interface* remain limited, with data on the economic dimensions of natural resource use even scarcer than general environmental data. New Zealand published its first set of environmental protection expenditure accounts for the public sector in 2002, estimating total expenditure at NZD 1.2 billion in the 12 months to June 2001. Despite the announced intention to publish such accounts annually, the second set was released in 2005 (StatsNZ, 2005b). It estimated expenditure in 2002/03 to have increased by 8.8% over 2000/01 (Chapter 4).

Overall, a serious *lack of nationally aggregated data and trends data* remains in most environmental areas, and stakeholders have expressed frustrations in this regard. The lack of data makes it difficult to use the existing indicators to gauge the state of New Zealand's environment and prioritise actions to improve or conserve it. Indeed, one reason given for delays in developing national environmental standards is that there is insufficient data to convince people such standards are required. Publication of the 1997 State of the Environment Report was a positive step, but needs to be followed up with more streamlined periodic reporting to enable result-oriented policy-making. The publication in 2002 of the first set of national environmental accounts was also an important step, and should be pursued. Since 2003, an attempt has been made to revitalise environmental data work, starting with the establishment by StatsNZ of an Environment Statistics Strategy and the formation of an Environment Statistics User Group to facilitate communication between StatsNZ and statistics users.

MfE established a *Reporting and Review Group* in early 2005 to identify key environmental information needs and ensure that they are met. The group is working to put in place the data collection systems necessary to assure regular publication of a

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small core set of environmental indicators, distilled from those developed between 1996 and 2002. In doing so, it is drawing on classification systems[4] developed during the review period for land, freshwater and marine environmental parameters, as well as digital tools and databases (e.g. national Land Cover Database). It remains to be seen if these initiatives produce more results than did the previous effort to develop core environmental indicators, launched in 1996.

Regional level

Since implementation of the RMA, most *regional authorities* have published at least one environmental report, synthesising monitoring data and summarising recent environmental quality trends. With little national guidance, the type, form and quality of environmental information gathered at regional and local levels is highly variable, making national aggregation impossible in most cases. Some local authorities bemoan a lack of national-level guidance about what measurements to make and how to report the results. Increased guidance would help assure the aggregation of key data at national level, avoid the heavy transaction costs of each council developing its own system and allow councils to benchmark environmental performance in the interest of assuring a level playing field (Chapter 4).

Private sector

Environmental reporting by industry is at an early stage. The Business Council for Sustainable Development promotes triple bottom line (TBL) reporting by industry, and about 30 companies periodically release TBL reports, with summary information about their social and environmental performance (Chapman and Milne, 2003). The MfE estimates that 50 enterprises regularly issue environment reports. Several recent studies have suggested that, while the number of New Zealand companies undertaking TBL or environmental reporting is rising slightly, the standard of reporting trails best practices in other OECD countries (Milne *et al.*, 2000). In particular, the level of detail and completeness of information regarding environmental performance, targets and achievements was found to be generally deficient, and very few companies engage independent auditors to verify their reports.

New Zealand has no *Pollutant Release and Transfer Register* (PRTR), despite the 1996 OECD Council Recommendation on PRTRs, which calls for member countries to establish such registers and make them publicly available. The government considered developing a PRTR but decided not to because pollutants are legislatively controlled. Experiences of other OECD countries suggest that such a register would, at a minimum, provide a useful database of industrial releases to air, water and soil, and of waste transported to treatment and disposal sites.

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2.2 Access to environmental information and data

Public access to official information is governed by the Official Information Act (1982) and the Local Government Official Information and Meetings Act (1987), under which information must be made available unless doing so is deemed not in the public interest. Virtually all environmental data and information held by government at central and local level is considered official information to be made available upon request. This includes environmental monitoring data and information collected while implementing various laws and regulations. By law, all requests for official information must be processed within 20 working days. Since 2000, the MfE has handled about *1 500 requests for information per year*, and it treats about 80% of them within the required time frame. In 2003, the MfE began charging for information that takes more than one hour of staff time to compile (NZD 76 per hour, excluding the first hour) or requires more than 20 pages of photocopying (20 cents per page). Since then, about 5% of requests have incurred charges.

Information technology has changed the way the public gets access to environmental information. In 2004, 79% of New Zealanders had web access. Environmental information is increasingly obtained via websites operated by public agencies, the private sector, NGOs and private interest groups. New Zealand has set a range of objectives aiming to ensure that government effectively harnesses the potential of the Internet to facilitate public access to information. The national *e-government Strategy* (2001, updated in 2003) introduced a framework for service and content delivery and established a government web portal to facilitate access to national and local information. The national *Digital Strategy* (2005) set a number of targets related to facilitating broad public access to digital information, including environmental information (MED, 2005). *Web guidelines*, established since 2001, set standards for public sector websites to help assure access for those operating older and less powerful computers.

3. Public Participation and Consultation

A strong culture of *public participation and consultation* concerning environmental and natural resource matters exists in New Zealand, and stakeholder involvement in related policy-making is significant. In 2001, the government approved a Statement of Government Intentions for an Improved Community-Government Relationship, envisaging "strong and respectful relationships between government and community, voluntary and Maori organisations".

Maori tribes (iwi) recognise the importance of participating in democratic processes concerning the environment. For example, in its 2003 environmental management plan, the Ngai Tahu tribe put a high priority on participating in consultative processes for policy development and resource consent hearings so as to ensure that Maori views are reflected in decisions (Ngai Tahu, 2002).

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3.1 Engagement with public and Maori

Extensive consultation of stakeholders has become a routine step in environmental policy-making, with environmental and community groups, as well as industry, widely consulted. The degree of co-ordination and collaboration within and among levels of government has also increased, with *joint decision-making* increasingly seen as the norm rather than the exception. Provisions for consultation with and involvement of the community and Maori in environmental conservation were formalised in several policies during the review period: for example, the General Policy for National Parks (2005), the Conservation General Policy (2005) and the Conservation with Communities Strategy (2003) feature provisions to improve DOC's consultation with communities and stakeholders in achieving nature conservation objectives. During the review period, citizens' groups took a greater role in local conservation initiatives, as in Whangamata and the Fiordland area (Box 6.2).

The *MfE* has institutionalised public consultation requirements, actively seeking stakeholder input during decision-making stages and providing information on upcoming and past consultations with the wider community. Input from the community, business and Maori is solicited on key MfE projects. For example, in 2003-05, the *Talk Environment Roadshow*, a public consultation mechanism involving visits by MfE outreach officers to the main population centres, increased the MfE's understanding of stakeholder views on policies being developed, in particular concerning flood mitigation and waste management. The MfE also actively engages stakeholders in the development of *positions and strategies*, such as the Rio+10 Community Programme, launched in May 2001 as part of New Zealand's preparations for the World Summit on Sustainable Development. Consultation included seeking views on progress in addressing key environmental problems and priorities for the future, distributing 13 000 information packs and holding eight community debates and many meetings.

Consultation and engagement with Maori stems from the 1840 Treaty of Waitangi, between Queen Victoria and Maori chiefs. Under the treaty, in return for ceding sovereignty to the crown, Maori leaders and people were guaranteed "exclusive and undisturbed possession of their lands and estates, forests, fisheries and other properties". To recognise the unique relationship of Maori to the natural environment (Box 6.3), the principles of the treaty are referred to in the RMA, the 1986 Environment Act and other *key environmental legislation*. Treaty provisions were included in a range of new legislation that entered into force during the review period, including the1996 Hazardous Substances and New Organisms (HSNO) Act, the 1996 Fisheries Act and the 2002 LGA. Central and territorial government agencies commonly use meetings (hui), workshops (wanaga) and advisory groups to consult with Maori. Most government agencies have internal liaison and relationship management staff members maintaining contact with Maori representatives.

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Box 6.2 **Case study: Fiordland multi-stakeholder participation in marine management**

In the South Island, the *Fiordland* terrestrial area has long been recognised for its exceptional natural value. Fiordland National Park, covering 12 000 km^2, was created in 1952. The fiords have become national icons and attract large numbers of tourists.

In 1995, a group of stakeholders concerned about the impact of human activities on Fiordland's marine environment formed the *Guardians of Fiordland's Fisheries and Marine Environment*. They were interested in promoting sustainable development of the area's marine resources, but also in conserving its biodiversity, such as the black and red corals that are usually found only in very deep water but occur in relatively shallow water there. The Guardians included commercial and recreational fishers, environmentalists, charter boat and tourism operators, scientists and Ngai Tahu. In 2002, they produced a draft *Fiordland Marine Conservation Strategy* calling for greater environmental protection for sensitive and representative marine areas, changes to fishery bag limits, increased risk mitigation and greater recognition of Maori stewardship of the marine resources.

The Guardians undertook extensive *public consultation* on the draft strategy, including 24 daylong meetings and 12 information sessions with stakeholders and decision-makers. The draft was revised to reflect feedback received at these meetings and in 450 written submissions. It was then presented to the environment and fisheries ministers in September 2003. The ministers committed the government to implementing the strategy by September 2005. Accordingly, Parliament passed the *Fiordland Marine Management Act* in April 2005, recognising for the first time the national importance of the Fiordland marine environment and establishing the 9 280 km^2 Fiordland Marine Area, where special sustainable management provisions will be implemented (e.g. for fisheries and tourism). The Act also established eight new marine reserves, totalling 94.3 km^2, for strict protection (Chapter 3).

This is an example of a *multi-stakeholder community group* initiating significant changes in the management of special ecosystems. The government and Parliament were receptive to the Guardians' initiative, and in the new law and management system recognised the value of the community's attachment to and knowledge of the Fiordland area. A strong spirit of goodwill and co-operation among stakeholders underpinned this successful effort, and will be essential in assuring the sustainable management of the Fiordland's marine area.

Local authority engagement with Maori increased substantially over the review period. A 2004 survey of council practices showed increased involvement of Maori in council activities since 1997 (Ministry of Maori Development and LGNZ, 2004). All 16 regional councils used formal consultation processes in 2004, compared with three in 1997, and while no councils held informal consultations in 1997, 11 did so in 2004. In addition, all nine metropolitan councils have used both formal and

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Box 6.3 **Maori culture and environmental management**

Maori have a deep *spiritual and cultural relationship* with the entire landscape of New Zealand that is based on a holistic view of the environment. Traditional values such as whakapapa (ancestral lineage) place Maori in an environmental context with all flora and fauna, natural resources and ecological systems. Kaitiakitanga (guardianship of natural resources by Maori, in accordance with custom and tradition) defines the role of Maori as *temporary guardians* of the richness of all life and matter. In the Kaitiakitanga world view, people do not own natural resources to exploit but are temporarily supported by Papatuanuku (Mother Earth) in a very interdependent way.

Maori land amounts to about 15 000 km^2, or *about 6% of the total land area*. Ownership of that land is divided into more than 2.3 million interests, a figure comparable to the number of ownership interests for the remaining 94% of the country. On average, there are 62 owners per Maori land title (New Zealand Controller and Auditor General, 2004). While about 10% of Maori properties have a single owner, another 10% have on average 425 owners.

Maori continue to assert *claims of ownership and customary rights* over natural resources within their tribal areas through the courts and the Waitangi Tribunal, which handles claims by Maori that the government has breached the treaty. Recent Maori claims over rights in the *foreshore and seabed* resulted in the government clarifying ownership and establishing a statutory framework recognising customary rights. The 2004 Foreshore and Seabed Act preserves the foreshore and seabed as common heritage, belonging to the state, but recognises Maori rights to engage in certain customary activities or uses (Chapter 3).

Maori values are systematically taken into account by decision-makers in New Zealand and have a strong influence on natural resource management. The MfE has produced a number of guidebooks to promote best practices in consultation of Maori (MfE, 2000a, 2000b and 2003a). *DOC* has a policy of recognising and providing for Maori *customary use* of natural resources, consistent with the concept of Kaitiakitanga and conservation legislation. A significant advance during the review period was the government's settlement on a Ngai Tahu treaty claim dating back to the 19th century. The *Ngai Tahu settlement*, finalised in 1998, included a state apology; return of title to Aoraki, a mountain of special significance to Ngai Tahu people; economic redress totalling NZD 170 million in cash plus the right to buy certain state assets; and restoration of ownership of certain land (Ngai Tahu, 1998).

informal consultation, and six of them employ staff dedicated to iwi liaison (MfE, 2000a). Nearly two-thirds of district councils conduct formal consultation processes, and most engage in informal consultation and information sharing with Maori. However, the *effectiveness of consultation with Maori* varies. Key issues for Maori include engagement at too late a stage in the process and a perception that

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central and local government lack understanding of Maori issues and insufficiently reflect Maori concerns in policies. Some Maori groups also complain of "consultation fatigue", where extended consultations strain capacity and resources.

3.2 Public input to environmental regulatory processes

Extensive *consultation in support of environmental decision-making* is provided for under all key environmental legislation (Chapter 4). For example, under the RMA, resource consent applications may be publicly notified (although most are not) where proposals might have "more than a minor" effect on the environment. If a proposal is publicly notified, anyone may make a submission on it, and a public hearing is usually held.

In May 2004, the government announced a *review of the RMA* whose aims included streamlining consultation processes (Chapter 4). This led to the Resource Management Amendment Act, which took effect in August 2005. The changes included providing greater certainty on when Maori should be consulted, which tribes should be consulted and how. There is some concern that some changes aimed at making the Act more workable could also *reduce public input to environmental decision-making* under the RMA. For instance, a "halfway house" between full public notification and non-notification for resource consent applications has been introduced. Where applicants have been unable to obtain approval from all affected parties and the effects are minor, the council can notify only those deemed to be affected.

The *HSNO Act* has strong provisions for *public input* into its decision-making and control-setting processes. Certain applications must be publicly notified, and the Environment Risk Management Authority (ERMA), a statutory body established under the Act, has the discretion to publicly notify others if it considers public interest likely to be significant. Any person may make a submission on publicly notified applications and request a public hearing of the application by ERMA. Public input was also essential in shaping the *2003 amendments* to the Act concerning regulation of new organisms, through consultations carried out by the Royal Commission on Genetic Modification. From 2000 to 2001, the commission considered over 10 000 written submissions and heard presentations from 330 "interested persons" during 17 public meetings. The government accepted 47 of the commission's 49 recommendations, and the HSNO Act was amended accordingly.

4. Access to Judicial Processes

The *Environment Court*, set up under the 1996 Resource Management Amendment Act, considers appeals related to resource consent applications and cases related to regional and district statements and plans. Reforms have been introduced

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since a report in 2003 concluded that the court was one of the most costly and time-consuming components of the resource management system, with some 2 500 cases pending and an average waiting time of 23 months from filing to resolution (MfE, 2003b). A system to channel cases into "standard", "complex" or "hold" tracks has helped reduce processing time. Additional funding of NZD 1.2 million per year over 2002-06 allowed more judges and commissioners to be hired and administrative and record-keeping systems to be upgraded. By June 2006, the backlog was down to 1 375 cases and average processing time was six months.

Changes in how cases are handled are also helping improve processing efficiency. In particular, Environment Court commissioners, who undergo advanced mediation training, try whenever possible to resolve cases without going to a hearing. Mediation remains voluntary but parties are encouraged to use it, and mediation in the Environment Court is increasingly viewed as a viable alternative to a hearing. The 2005 Resource Management Amendment Act encourages consent authorities to initiate mediation and negotiation at an early stage, which is expected to help further reduce the number of appeals cases going to the court. The court has also begun awarding costs to discourage frivolous claims.

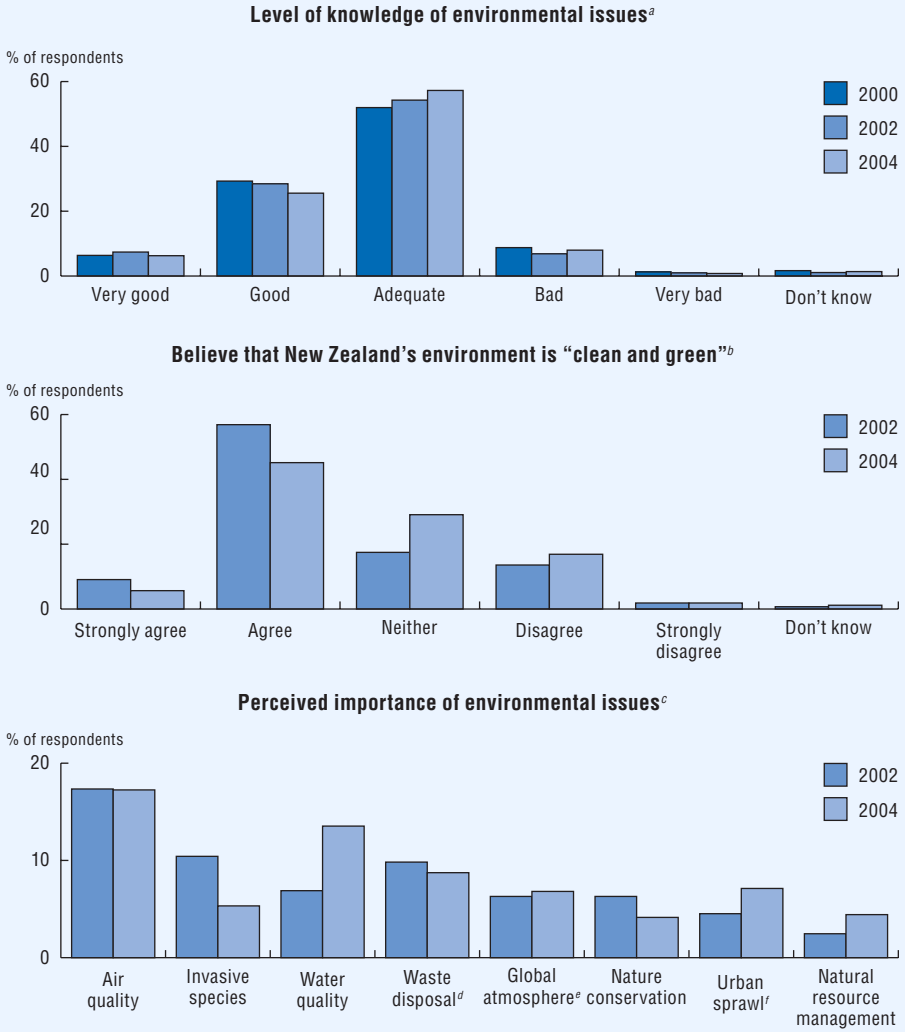
To help assure access to judicial processes, *funding and legal advice* are available to community groups wishing to file environmental cases. The MfE's *Environmental Legal Assistance Fund* provides up to NZD 30 000 to environmental and social NGOs and to iwi and Maori subtribes (hapu) so they may participate more fully in RMA processes, including Environment Court cases. Since the fund's inception in 2001, around NZD 1 million per year has been disbursed to about *200 groups* active on matters including lake, river and coastal management; industrial, residential and infrastructure development; and urban environmental amenities. The *Education and Advisory Services Fund*, also established in 2001, provides legal advice to community-based groups regarding resource and environmental management and has disbursed nearly NZD 1.4 million to a total of 43 organisations.

5. Environmental Education and Awareness

Public awareness of and concern about environmental issues increased in the review period. While New Zealanders generally think their environment is well managed, their perceptions of the quality of the environment have decreased in recent years: just over half reported believing their environment was clean and green in 2004, compared with two-thirds in 2002 (Hughey *et al.*, 2003, 2004). Overall, New Zealanders are most concerned about *water and air quality*, with waste management and invasive species also ranked high (Figure 6.2). A 2005 survey of Ngai Tahu people showed that environmental issues of highest concern to them included overfishing, water and air pollution (Ngai Tahu, 2005).

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Figure 6.2 **Public awareness and perceptions of the environment**



a) Based on respondents' own assessment, in response to survey question.
b) Reflects per cent of respondents agreeing that New Zealand's environment is "clean and green".
c) Reflects percentage of respondents who perceive a particular environmental issue as being most important.
d) Includes industrial pollution.
e) Includes climate change and ozone depletion.
f) Includes pressures from tourism and population centres.
Source: Adapted from Hughey *et al.*, 2004.

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Community environment centres play an important role in promoting public awareness of environmental issues and providing sustainable development information, especially to students. Since 2000, the Environment Centre Fund has provided NZD 1.8 million in grants to defray the costs of running 26 such centres (Table 6.1). The MfE promotes public awareness of environmental issues through

Table 6.1 **Environment centre funding,** 2000-05

Organisation	Funding (000 NZD)
Christchurch Environment Centre	140
Dunedin Environment Centre	107
Gisborne Environment Centre	50
Kaipatiki Environmental Education Centre	151
Nelson Environment Centre	100
Northland Information Centre for the Environment Inc.	105
Stewart Island Environment Centre	20
Thames Coast Environment Centre	10
The Green Bee Hive	40
Wellington Environment Centre	6700
Golden Bay Environment Centre	29
Hamilton City Community Environmental Programme	69
Invercargill Environment Centre	66
Papatuanuku Environment Centre (Coromandel)	5
Peel Forest Environment Centre	36
Pirirakau Environment Centre	60
Sustainable Living Centre (New Lynn – Waitakere)	13
Tauranga Environment Centre	71
Te Ao Turoa – Palmerston North Environment Centre	60
Waitaki Environment Centre	23
South Coast Environment Centre	138
Taupo Environment Centre	20
Whaingaroa Environment Centre	108
Hawkes Bay Environment Centre	75
Far North Environment Centre	113
Taranaki Environment Centre	85
Total funding[a]	
2000/01	308
2001/02	299
2002/03	600
2003/04	300
2004/05	300
Total 2000-05	1 808

a) For budget years starting in July.
Source: MfE, 2005.

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regular *information campaigns*. Since 2002, campaigns have focused on waste management ("Reduce Your Rubbish") and climate change ("4 Million Careful Owners!"). Award programmes, such as the annual *Green Ribbon Awards* distributed by the environment minister, also raise public awareness about community-level capacity to restore or maintain environmental quality.

A *national Strategy for Environmental Education*, adopted in 1998, set a goal of ensuring that "individuals and communities have the knowledge, skills and attitudes that enable them to take informed decisions affecting the environment" (MfE, 1998). The strategy identified six areas as priorities and set out actions for each, giving needed direction to environmental education at national level. A 2001 MfE assessment of environmental education initiatives in local government found that all *regional authorities* had undertaken some initiatives and most had designated clear environmental education objectives (PCE, 2004). Regional authorities have also established mechanisms allowing environmental education staff to share information and best practices across regions. The country's eight *universities and many of its polytechnics* offer interdisciplinary environmental study programmes.

In 1999, the Ministry of Education (MOE) issued *Guidelines for Environmental Education* in New Zealand schools to support the Strategy for Environmental Education. The guidelines help teachers identify opportunities to integrate environmental education into the required national curriculum. An associated professional development programme has been implemented through 85 schools. Since 2000, the MOE has disbursed over NZD 2.8 million to encourage implementation of the guidelines. In addition, *Enviroschools*, a sustainable schools programme set up as a community-based pilot in 1993 and launched nationwide in 2001, promotes a "whole school" approach, integrating environmental education into all aspects of the curriculum. By 2005, over 200 of New Zealand's 2 600 schools were participating in the programme. In a recent assessment of environmental education, the MOE recognised such "whole school" approaches as the most effective (MOE, 2004).

6. Environment and Health

Under the 1956 Health Act, the Ministry of Health (MoH) is responsible for promoting and protecting public health, and local authorities have a number of related duties. The 2000 *Public Health and Disability Act* gives District Health Boards responsibility "to promote the reduction of adverse *social and environmental effects* on people and communities". In parallel, the national *Health Strategy 2000* made a commitment to "reduce adverse environmental effects" under the overall goal of "a healthy physical environment". It also called for the development of a national *Environmental Health Plan*, which is under way, with implementation expected

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from 2007. Although some data are available on the health damage associated with particular pollutants or environmental hazards, no attempt has been made to evaluate overall costs or consider the benefits of prevention.

6.1 Estimated public health costs associated with pollutant exposure

The overall *contribution of environmental factors to the total burden of disease* (i.e. the "environmental burden of disease") has not been quantified in New Zealand, although estimates have been made for certain environmental risks. A 2002 report by the Public Health Advisory Committee (PHAC), an effort to evaluate the impact of environmental factors on the health of New Zealanders, concluded that *monitoring of environmental risks to public health* was inadequate (PHAC, 2002). As the available data are highly patchy, it is difficult to prioritise environmental health issues or set risk reduction targets. Although the PHAC report made a range of recommendations on strengthening the monitoring of health risks in water, air and the coastal zone, follow-up has been quite uneven.

New Zealand has a high rate of *waterborne diseases* compared with other OECD countries (PHAC, 2002). While most of the population receives drinking water of goodquality, New Zealand has some of the highest incidence ratesof campylobacteriosis[5] and cryptosporidiosis in the industrialisedworld (e.g. 327 cases of camplyobacteriosis per 100 000 inhabitants, compared to 117 in Australia, in 2004) (Lake, 2006). New MoH drinking water standards took effect in 2006, but there is still no statutory requirement to comply with them (Chapter 2). Waterborne disease is estimated to cost the economy NZD 15 million per year (MoH, 2005). Populations in *small rural communities* are less likely to have access to safe water than those in urban areas. Low-income communities tend to be at highest risk from unsafe water supplies, and Maori are over-represented in such communities.

Ambient air pollution is associated with an estimated 970 premature deaths each year in people over age 30. About 400 of these deaths are attributed to vehicle emissions (MoT, 2004). Children, elderly people and those with respiratory diseases are more vulnerable to air pollution, and low-income communities have greater excess mortality associated with air pollution. Monitoring data in some urban areas (e.g. Christchurch, Nelson, Alexandra) show that PM_{10} concentrations frequently breach the national ambient air quality standards (MfE, 2003c). Exceedances are often associated with the use of solid fuels for domestic heating (Chapter 4). In 2003, Environment Canterbury launched a NZD 38 million project called Clean Heat to convert 26 400 Christchurch homes to cleaner forms of heating. As of June 2005, heating systems in 3 000 houses had been upgraded, with assistance levels varying with household income.

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Poor *indoor air quality* is associated with the exacerbation of respiratory conditions and allergic and toxic reactions, particularly among older people, young children and Maori. Secondhand tobacco smoke is a major indoor pollutant, estimated to lead to about 400 deaths per year (PHAC, 2002). Other sources of indoor pollutants include poor quality housing and unvented gas heaters. According to the latest available official statistics, for 1997/98, 31% of New Zealand homes used unvented gas heaters, many burning bottled gas (StatsNZ, 2000). The health risks associated with this type of heating fall disproportionately on lower socio-economic groups and older people who spend most of their time at home. *Fatal house fires* associated with gas heaters and wood fires disproportionately affect Maori in rural areas: the age-standardised death rates for Maori in unintentional house fires exceed those for non-Maori by a factor of seven (Duncanson *et al.*, 2000).

Older *uninsulated housing* is often damp, cold and mouldy, contributing to poor health. The Energy Efficiency Conservation Authority (EECA) estimates that 600 000 houses built prior to 1977 (when building standards did not require insulation) are in use. They tend to be occupied by low-income families, whose members have poorer health than the general population (Saville-Smith, 1999). EECA provides Energy Wise Home Grants to insulate pre-1977 homes, with low-income households given first priority. By mid-2006, some 17 000 houses had been retrofitted with insulation. A study by the Wellington School of Medicine and Public Health determined that the benefits of insulating older houses outweighed the cost by a factor of two: an investment of about NZD 1 800 per house resulted in avoided health costs and energy savings totalling NZD 3 640. Significant improvements in inhabitants' health resulted in fewer hospitalisations for respiratory conditions and reduced absenteeism from work or school (Howden-Chapman *et al.*, 2004).

Exposure to *pesticides and persistent organic pollutants* is a cause for concern. Pesticide spray drift poses health risks in *agricultural regions*. Regulation of pesticide handling was reinforced by the HSNO Act, which replaced the 1979 Pesticides Act and other laws. Under the RMA, some regional councils have air plans, which can detail restrictions on spray practices and seek to avoid conflict where zoning permits adjacent residential and horticultural land use. "*Growsafe*" *courses* in safe pesticide management are offered for those who routinely work with agricultural chemicals.

A 2001 study showed the level of *dioxin* in the blood of New Zealanders to be toward the low end of the range found in OECD countries (MfE, 2001). However, one report links long-term chronic health effects from chemical exposure with 237 to 425 deaths per year from occupational cancer and 200 to 205 work-related deaths from respiratory diseases (NOHSAC, 2004). To reduce *dioxin emissions*, in 2004 the MfE banned landfill fires, open-air burning of insulated copper wire, oil, tyres and road seal, and low-temperature waste incineration in schools and hospitals. New Zealand's most

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significant remaining sources of dioxin emissions are medical and quarantine waste incinerators, secondary metallurgical processes and domestic combustion activities such as open-air waste burning (Chapter 2).

6.2 Benefits of access to nature, recreational areas and other environmental amenities

Under national legislation on nature conservation, *public access to nature conservation areas* must be free of charge (Chapter 3). Parks and conservation areas cover some 32% of the national territory, and are primary tourist attractions. A 2002 DOC study of the *benefits of conservation and recreation management* identified positive social outcomes ranging from improved physical and mental health (leading to reduced health care costs) to heightened appreciation of special places, increased perceived quality of life, strengthened environmental ethics and more environmentally sound behaviour (Booth *et al.*, 2002). In recent years, nature tourism has grown quickly and some popular places in parks have suffered environmental damage from tourism activities (Chapter 3).

Access to private land for recreation is an important part of New Zealand's lifestyle and culture. Public access has traditionally been assured to the "Queen's Chain" of water margin land along rivers, streams, lakes and seas. Historically, the land forming the Queen's Chain has been linked by walkways, some officially declared and others simply grandfathered. Under the 1975 and 1990 Walkways Acts, over 150 such paths are in use, many not yet formally surveyed or declared in the government gazette ("gazetted"). Most official walkways cross public land, which entails fewer legal hurdles and management issues, and lower costs (establishing walkways on private land requires costly surveying). For walkways crossing *private land*, gazetting provides landowners with legally enforceable rights and enables compensation to be paid if losses occur due to use of the walkway. Without gazetting, no such rights are conferred, and user access depends on landowners' goodwill.

During the review period, much public debate took place about how to guarantee *access to water margins* when this entails crossing private land. In 2003, a ministerial reference group was appointed to evaluate whether the arrangements for walkers' access to water margins, public land and private rural land were sufficient. Its report (Acland *et al.*, 2003) proposed a *New Zealand Land Access Strategy* to provide clarity and enduring access. It would have aimed to assure access to a five metre walking strip along parts of the *coast, rivers, lakes and other water bodies* that have been identified as having significant "access value". In 2005, plans to initiate mapping to establish the location of the walking strip were abandoned, and a new panel was appointed to review access to and along water margins. Although there is general support for assuring access, how to do this remains the subject of heated debate, with farmers in particular raising concerns over bio-security and legal liability for any damage done by walkers.

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Notes

1. The Quality of Life Project, begun in 1999 by a coalition of city governments, later joined by MSD, published social, economic and environmental indicators of quality of life in New Zealand's eight largest cities in 2001 and 2003.
2. Rio Principle 10 says governments should facilitate public environmental awareness by making information widely available.
3. Goal 8.4 of the strategy, "Build up the Information Base", states that "Adequate monitoring is essential in understanding the effects of economic activities and the trends in environmental quality" and emphasises that the government "has a role in encouraging standard approaches that provide an accurate picture at the national level".
4. The systems are Land Environments New Zealand, River Environment Classification and Marine Environment Classification.
5. Although camplyobacteriosis is primarily a waterborne disease, in New Zealand contaminated food is also considered a significant vector.

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7

INTERNATIONAL CO-OPERATION*

Features

- Greenhouse gas accounting
- Endangered wildlife and trade
- Management of shared fish stocks
- Protecting the Antarctic environment

* This chapter reviews progress since the previous OECD Environmental Performance Review of 1996. It also reviews progress with respect to the objective "global environmental interdependence" of the 2001 OECD Environmental Strategy. International commitments concerning nature conservation and biodiversity are also discussed in Chapter 3.

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Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of New Zealand:

- adopt and implement a clear and comprehensive *package of climate change policy measures* (e.g. economic instruments, flexible mechanisms) to meet New Zealand's international commitments, giving consideration to setting sectoral targets; develop strategies for future climate protection commitments in line with guidelines of the Intergovernmental Panel on Climate Change;
- give consideration to allocating *carbon sink credits* and liabilities to forest owners, and ensure that the agriculture sector reduces its GHG emissions through low-cost practice changes and efficiency gains (e.g. energy efficiency improvements, increased biogas recovery);
- review and adjust fines and sanctions for smuggling of *CITES-protected species* or derived products, to ensure that they are dissuasive relative to the potential gains from smuggling;
- finalise and implement the *ocean policy* and pursue the further expansion of marine reserves and the strengthening of regional co-operation for the management of *high seas fish stocks*;
- increase levels of *official development assistance* and continue to mainstream environmental concerns into ODA.

Conclusions

New Zealand continues to give *high priority to international co-operation* for environmental protection, both to reduce pressures on shared natural resources and to maintain a level playing field in the context of expanding international economic integration and competition. Since 1996, New Zealand has ratified and begun implementing a number of international conventions related to *marine issues*, as recommended in the previous OECD review. It has also worked actively to promote international co-operation for the conservation of biodiversity and seabirds. A range of measures has been introduced to comply with the UN Fish Stocks Agreement regarding flag state control of fishing vessels on the high seas, and the industry has initiated negotiations with the central government to ban *destructive fishing practices* in one-third of New Zealand's offshore waters. The country has met all of its port state control requirements under the Tokyo Memorandum of Understanding. Concerning *ozone-depleting substances*, New Zealand has complied fully, and often before international deadlines, with phase-out timetables established under the Vienna Convention's

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protocols. Surveillance at the borders for illegally transported CITES-protected items is strong, although fines and sanctions are sometimes too low to be dissuasive. Within the South Pacific region, New Zealand has provided technical assistance on trade and environment and marine conservation issues. Environmental considerations are systematically taken into account in *official development assistance* projects. Concerning the *Antarctic*, New Zealand produced the first state of the environment report of the Ross Sea Region and worked with the United States to establish the first Antarctic Specially Managed Area. Regulatory requirements for *seabird scaring devices* on fishing boats have helped reduce seabird mortality, although more than 5 000 seabirds per year are still killed as by-catch in New Zealand waters.

Despite these achievements, there is a need for further progress on several fronts. The *GHG intensity* of the New Zealand economy is the fourth highest in the OECD, and GHG emissions continued to grow during the review period. A domestic target for 2000, concerning reduction of CO_2 emissions, was not met. *Carbon sequestration in forests*, a key factor in New Zealand's GHG accounting since 1990, is likely to diminish over time as planted forests reach maturity, and government retention of forestry carbon sink credits may have contributed to the weakening of incentives to expand plantations. The suspension of the *climate change policy package* in 2005 (including its planned carbon tax) has created great uncertainty about how New Zealand will meet its *Kyoto target*. The country has acquired relatively little experience using Kyoto flexible mechanisms, although their use will likely be required to meet the Protocol target. The *energy intensity* of the industrial sector is high, and the carbon intensity of the electricity supply, although still low, is increasing. Low taxation of motor vehicle fuels (or nonexistent in the case of diesel) translates into relatively low prices at the pump, giving little incentive for fuel conservation. To meet the phytosanitary requirements of importing countries, New Zealand still depends heavily on *methyl bromide* (a strong ozone-depleting substance) for the fumigation of export forest products and strawberries. Development of a national *ocean policy* has been slow, and the management of some high seas fish stocks remains challenging. Consideration should be given to increasing domestic or international protection of certain endemic insect species which are heavily affected by international trade.

♦ ♦ ♦

1. Climate Protection

New Zealand accounts for less than 1% of the world's greenhouse gas (GHG) emissions, and its emissions are now growing at less than half the rate of its GDP. But

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the GHG intensity of the economy (GHG emissions per unit of GDP) is nevertheless the fourth highest in the OECD, after Canada, the US and Australia.

1.1 Commitments and trends

New Zealand ratified the *Kyoto Protocol* in 2002, committing to return its net annual GHG emissions to 1990 levels during the first commitment period (2008-12) by reducing emissions, using emission credits from its forest sinks, buying emission credits on the international market, or some combination of these approaches. Trends during the review period show that domestic measures (emission reductions, carbon sinks) will not be sufficient to *meet the Kyoto target*. Indeed, in 2004 New Zealand's GHG emissions totalled 75.3 million tonnes of CO_2 equivalent (Mt CO_2e), 21.3% above the 1990 baseline level (62 Mt CO_2e). Since 1996, national GHG emissions have grown by over 13%. The latest government projections suggest that net emissions during 2008-12 are likely to exceed 1990 levels by about 30%, although sequestration from forestry may offset 10-15% of these emissions (Ministerial Group on Climate Change, 2005; MfE, 2006a).

New Zealand's *GHG emissions are dominated by emissions from agriculture* (50% of total), mostly methane from livestock and nitrous oxide from soil and fertiliser (Chapter 5). The country also stands out for the large role carbon sequestration plays in national GHG accounting. Sequestration due to land use change and forest growth counterbalanced 23% of national GHG emissions in 1996 and 33% in 2004 (Table 7.1). But while GHG emissions from agriculture and other sectors continue to increase, carbon sequestration from forests has peaked, and is expected to decline towards 2020, as recently planted forests reach maturity and are harvested. Emissions from landfills have decreased by 29% since 1990 with increased use of gas recovery systems (Chapter 2).

As part of its Environment 2010 Strategy (1995), New Zealand adopted as a target "to return *net emissions of* CO_2 to no more than the 1990 level by 2000 and maintain emissions at that level thereafter". This *domestic target* was not met. Since 1996, the most significant increase in GHG emissions has come from the *energy sector* (Table 7.1), mainly because of growth in CO_2 emissions from motor vehicles and power plants. Growing demand for electricity led to increasing reliance on fossil fuel power generation during the review period. Overall, GHG emissions from electricity generation have increased by 83% since 1990. The carbon intensity of the energy supply remains below the OECD Europe average, however (Figure 7.1), reflecting the large share of hydropower in electricity production (about two-thirds of supply). The motor vehicle fleet has expanded rapidly, partly through imports of secondhand cars. The vehicle ownership rate is now among the highest in the OECD

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(54 vehicles per hundred inhabitants), and CO_2 emissions from road transport have increased by nearly 60% since 1990 (Chapter 4). The *energy intensity* of the transport sector is high, as is that of manufacturing. Although per capita energy use in homes is relatively low, it is expected to increase as heating standards are raised.

1.2 Policy approach and effectiveness

New Zealand has worked to define a policy approach to climate protection. The *2002 Climate Change Response Act* established a national inventory agency to estimate and report GHG emissions and a registry to record holdings and transfers of

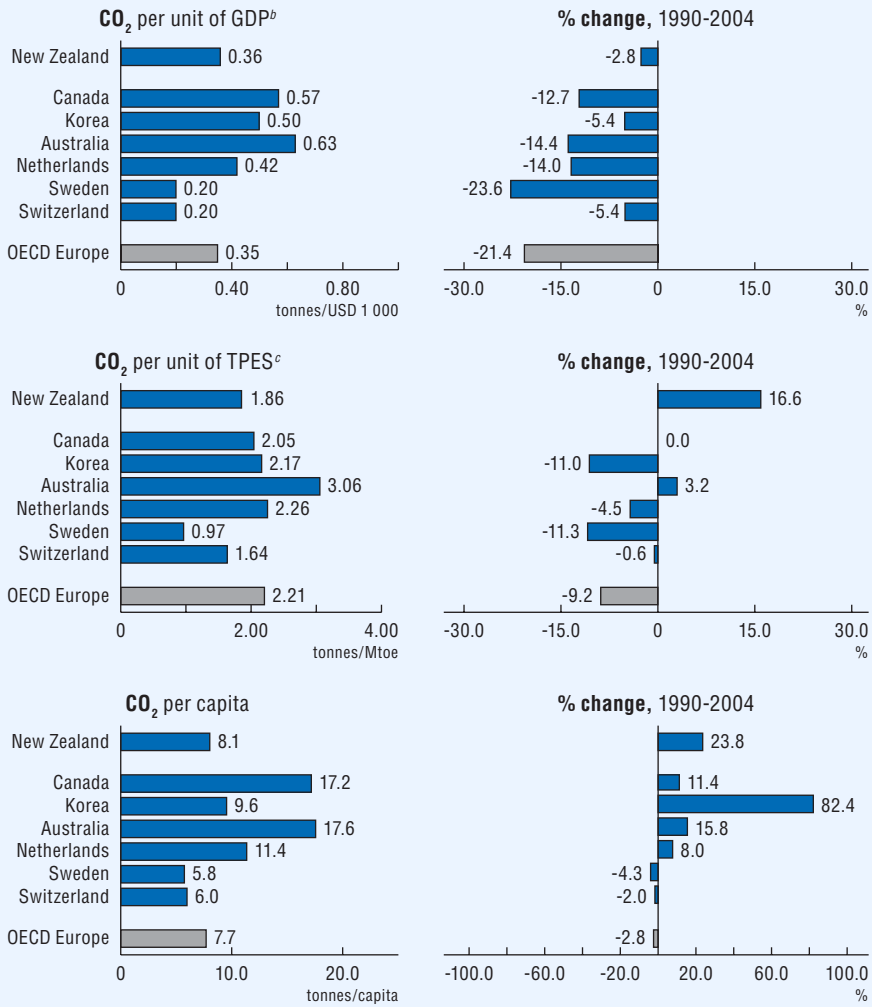
Table 7.1 **National GHG emissions by gas and by source,** 1990-2004

	Emissions ('000 Gg CO_2 equivalent)			Change (%)		
	1990	1996	2004	1990-96	1996-2004	1990-2004
By gas						
CO_2	25 373.4	28 222.2	34 038.9	*11.2*	*20.6*	*34.2*
CH_4	25 665.2	26 300.1	27 160.8	*2.5*	*3.3*	*5.8*
N_2O	10 429.5	11 383.5	13 264.9	*9.1*	*16.5*	*27.2*
HFCs	. .	225.0	597.1	. .	. .	. .
PFCs	515.6	265.4	87.7	*–48.5*	*–67.0*	*–83.0*
SF_6	12.3	14.8	21.5	*20.0*	*45.2*	*74.2*
Total	61 996.0	66 411.0	75 171.0	*7.1*	*13.2*	*21.3*
By source						
Energy use[a]	23 655.1	26 169.5	31 647.9	*10.6*	*20.9*	*33.8*
Industrial processes	3 214.6	3 576.5	4 202.5	*11.3*	*17.5*	*30.7*
Solvent use	41.5	45.9	48.4	*10.4*	*5.4*	*16.4*
Agriculture	32 498.9	34 172.0	37 349.6	*5.1*	*9.3*	*14.9*
LULUCF[b]	–18 977.9	–15 396.9	–24 482.6	*–18.9*	*59.0*	*29.0*
Waste	2 482.8	2 282.3	1 840.0	*–8.1*	*–19.4*	*–25.9*
Gross emissions	61 996.0	66 411.0	75 171.0	*7.1*	*13.2*	*21.3*
Net emissions	42 915.1	50 849.2	50 605.6	*18.5*	*–0.5*	*17.9*
(% carbon sinks)	*30.8*	*23.4*	*32.7*			

a) Includes transport (about 43% of total), thermal electricity generation (20%) and manufacturing and construction (18%).
b) Land use and land use change from forestry.
Source: NZCCO, 2005; MfE, 2005a, MfE, 2006a.

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Figure 7.1 **CO_2 emission intensities,**[a] 2004



a) Includes CO_2 emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.
b) At 2000 prices and purchasing power parities.
c) Total primary energy supply.
Source: OECD-IEA (2006), CO_2 Emissions from Fuel Combustion; OECD (2005), OECD Economic Outlook No. 77; OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004.

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emission units. A climate change policy package adopted in late 2002 set out policies designed to: i) make significant and permanent reductions in GHG emissions; and ii) enable New Zealand to meet its Kyoto target or take responsibility for any exceedance by purchasing emission reduction credits on international markets. The policy package set a *national target* of putting gross emissions of GHG on a downward path by 2012; it builds on laws, policies and strategies covering energy efficiency, transport, waste, growth and innovation, and sustainable energy. For example, the *Energy Efficiency and Conservation Act* (2000) and Strategy (2001) set economy-wide, non-binding targets for 2012 to improve energy efficiency and develop renewable energy supplies, aiming to reduce CO_2 emissions by between 4.5 Mt and 20 Mt annually (Chapter 4).

The *climate change policy package* included a *carbon tax* (from which agriculture and "competitiveness-at-risk" companies were to be exempt). A 2005 review of New Zealand's climate change policies recommended dropping this tax, which was to have been introduced in 2007 (Box 7.1). However, plans in the package to devolve carbon credits and liabilities to owners of forests continued to advance with draft legislation developed in 2006. Although some *voluntary measures* in the package were also continued, the suspension of the planned carbon tax is disappointing. Incorporating a carbon price signal into the energy market would have been a cost-effective means of reducing GHG emissions and would likely also have helped in reaching energy efficiency targets (IEA, 2006a). The planned tax was in line with New Zealand's general approach of relying on prices, rather than programmes, to achieve policy goals.

New Zealand has made little use of *economic or fiscal instruments* to encourage either energy efficiency or process changes leading to lower emission intensity. Energy prices for industry and households are about average compared to other OECD countries (Table 7.2), but taxation of motor vehicle fuels is low (Chapter 4). Economic incentives for energy conservation could be strengthened with market-based instruments. The removal of agricultural subsidies, coupled with international market conditions, led to increased forest planting rates during the review period (Chapter 5). Carbon sequestration from plantation forests will decrease towards 2020, however, as forests reach maturity and are harvested, and incentives to plant are weakened. In this context, the government's decision to retain credits and liabilities for carbon sinks may have contributed to the slowdown in the planting rate (Box 7.2). The few measures implemented in the energy conservation and climate change programmes will likely be insufficient to meet the Kyoto target (Office of the Minister Responsible for Climate Change Issues, 2005). Higher priority should thus be placed on acquiring experience with using the Kyoto flexible mechanisms.

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Box 7.1 **The suspended climate change package**

The *climate change policy package* adopted in late 2002 had three major components: a carbon tax, negotiated GHG agreements and projects to reduce emissions. The New Zealand Climate Change Office, since integrated into the MfE, elaborated these measures in co-ordination with other ministries.

The *carbon tax* was to have been introduced in 2007 on fossil fuels at a level that would cap the price of carbon at NZD 25 per tonne of CO_2 equivalent. The plan was to apply it at point of first sale of a given fuel (e.g. at the border for imports). Agriculture and other energy-intensive industries that are heavily exposed to international competition were to be exempt. In December 2005, the *tax was cancelled* over concern that it might place a burden on New Zealand industries and that it had insufficient parliamentary support. Estimates had shown that it would have added 3.5 NZ cents per litre to the cost of petrol, raising the pump price by about 2% (IEA, 2006a). A review panel is assessing options for a more narrowly based tax or a carbon trading programme, coupled with voluntary agreements.

The *negotiated GHG agreements* were formulated to accompany the proposed carbon tax, in recognition of the increase in operating costs that the tax would have meant for energy-intensive industries. Companies entering into the agreements would have been at least partially exempted from the tax. In exchange, they would commit to adopting the world's best practices in GHG emission management. This component of the package, whose implementation had begun in anticipation of the carbon tax, is now under review, and is likely to be scrapped.

The *projects to reduce emissions* were intended to provide incentives for reductions in GHG emissions through process changes, technology development and joint implementation projects, taking advantage of the Kyoto Protocol's joint implementation mechanism. The initiative sought to encourage project development by providing a share of national Kyoto emission units, which are tradable on international markets. The projects offering the greatest reduction in emissions in exchange for the smallest number of emission units were to be prioritised, with a cut-off point when all emission units allocated to the programme were exhausted. In a pilot phase (2003/04), projects were selected through two tender rounds. For the 41 projects approved, the expected net benefit was a reduction of 11 $MtCO_2e$ over the first commitment period. This component of the package, too, is under review, and may be discontinued.

Improvements in *energy efficiency* will be important if New Zealand is to meet its GHG reduction targets, as recognised by the Energy Efficiency and Conservation Act, which sets energy efficiency targets and policies. However, to ensure that the most cost-effective domestic emission control measures are implemented, *sectoral*

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Table 7.2 **Energy prices,** selected OECD countries, 2005

	Electricity		Oil		Natural gas	
	Industry (USD[c]/kWh)	Households (USD[d]/kWh)	Industry[a] (USD[c]/tonne)	Households[b] (USD[d]/1 000 l)	Industry (USD[c]/10[g] kcal)	Households (USD[d]/10[g] kcal)
New Zealand	0.060	0.130	396.7	. .	401.0	655.4
Canada	0.049[e]	0.069[e]	299.7	625.6	223.6[g]	376.3[g]
Korea	0.059	0.119	434.7	1 139.5	341.8[g]	663.3[g]
Australia	0.061[f, g]	0.098[g, h]	. .	. .	. .	. .
Netherlands	. .	0.211	. .	902.7	222.4[e]	716.4
Switzerland	0.083	0.103	. .	416.4	402.0	496.1
OECD Europe	0.059[h]	0.148[e]	. .	661.7	. .	. .
OECD	. .	. .	205.8[h]	637.0	249.2[g]	464.7[g]
NZL price/OECD Europe (%)	*56*[h]	*76*[e]	. .	. .	. .	. .
NZL price/OECD (%)	. .	. .	*101*[h]	. .	*137*[g]	*130*[g]

a) High-sulphur oil.
b) Light fuel oil.
c) At current exchange rates.
d) At current purchasing power parities.
e) 2003 data.
f) Price excluding tax.
g) 2004 data.
h) 2002 data.
Source: IEA, 2006b.

targets should be clearly set (e.g. for the transport sector). Increased development of cost-effective, smaller-scale projects based on renewable energy sources, such as wind and solar, could also help moderate recent increases in the carbon intensity of the electricity supply. Although agriculture is an important sector, heavily exposed to international competition, no-regrets means of reducing GHG emissions (e.g. improving energy efficiency, applying best manure management practices) should be identified and deployed through voluntary initiatives with farmers.

2. Ozone-Depleting Substances

2.1 Commitments and overall approach

New Zealand has long been *active in international efforts* to phase out ozone-depleting substances (ODS). It is affected by ozone layer depletion, having one of the

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Box 7.2 **Carbon sequestration in plantation forests**

Plantation forests play a *pivotal role* in New Zealand's GHG accounting for the first Kyoto commitment period, during which protected indigenous forests are considered a neutral carbon reservoir that does not contribute to CO_2 removal. Removals of CO_2 are calculated from the growth of planted forests, and emissions from the harvesting of planted and privately owned indigenous forests.

About *6 600 km² of plantation forest has been established* since 1990 (MAF, 2006). These plantations are known as "Kyoto forests" and count as carbon sinks. Carbon sequestration in plantation forests is the main domestic measure New Zealand uses to reduce net GHG emissions. Since 1990, new forest planting has added 423 km² per year, on average, but the annual net planting rate declined from a peak in 1994 (980 km²) to a net loss of 10 km² in 2004 (StatsNZ, 2005; NZCCO, 2005; MAF, 2006).

MAF estimates *carbon sequestration in the plantation forest estate* annually, both for the entire estate and for the Kyoto forests. The ministry also models the variability of aggregate projected carbon sequestration, assuming various new planting rates. In all the scenarios modelled, carbon sequestration in Kyoto forests increases until 2019, when harvesting of the stands planted in the early 1990s (radiata pine, which makes up 90% of the country's exotic forest, is harvested after around 27 years, on average) begins to outweigh the effects of new planting.

Annual *CO_2 uptake by pinus radiata* is estimated at 26 tonnes per hectare (Trotter *et al.*, 2004). To offset CO_2 emissions of 35 Mt per year would thus require a total of about 15 000 km² of new forest, and the effect would last only for the 27 years or so until harvest. Recognition of forests as useful carbon sinks has led to a range of policies favouring plantation forests (Rhodes and Novis, 2002). As the Kyoto forests near commercial maturity, however, it is increasingly realised in New Zealand that their sequestration of carbon is *not a permanent solution*. Indeed, recent studies indicate that planting rates must soon rise to about 400 km² per year if the post-1990 carbon pool is not to become a net source, rather than a net sink, by 2018-22 (Kerr *et al.*, 2004).

highest rates of skin cancer among OECD countries. It is a party to the Vienna Convention and Montreal Protocol, has ratified the Protocol's amendments and has been on time or early in meeting deadlines for stopping the consumption and trade of CFCs and other ODS. New Zealand implements the Montreal Protocol and its amendments under the 1996 Ozone Layer Protection Act. The Act allows for a phase-out of HCFCs and methyl bromide (except critical uses permitted under the Protocol), and bans most uses of other ODS.

Although *not a producer of ODS*, New Zealand, like most countries, has considerable amounts in circulation in refrigeration, insulation and firefighting equipment.

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It has regulated the entry of *new ODS*, banning their use in various industry sectors and prohibiting their bulk import as well as the manufacture or sale of products containing them. The country has promoted best practices and vocational training to ensure that *existing ODS* are not released to the atmosphere during servicing and installation of refrigeration and air-conditioning equipment. Halons contained in firefighting equipment are being collected and destroyed through a voluntary programme, and a code of conduct encourages lower use of methyl bromide for strawberry production. New Zealand has used a system of *tradable import permits* issued to individuals, based on use during a base year (1991 for methyl bromide; 1991, 1992 or 1993 for HCFCs), with entitlements decreasing over time towards the scheduled phase-out dates.

2.2 Progress in phasing out specific ODS

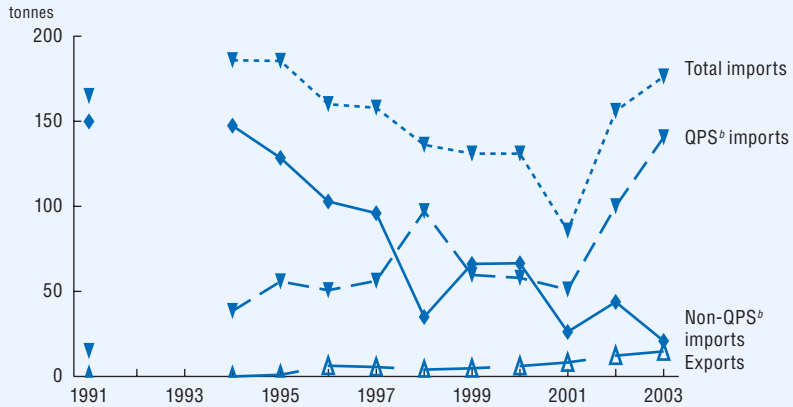
The sale of *bulk CFCs* was banned in 1991, three years before the Montreal Protocol deadline. Approximately 75% of metered dose inhalers used in New Zealand are CFC-free. *Bulk halons* have not been imported since 1990 or sold since 1991, except small amounts for essential uses related to health and safety. From 2000 to 2003, the government and the fire protection industry collected and destroyed halon-based systems. In 2000, New Zealand was estimated to have stocks of 15 000 kg of halon 1301 and 80 000 kg of halon 1211, mostly in hand-held fire extinguishers. By 2004, more than 30 000 kg of halons had been destroyed. New Zealand is also *phasing out HCFCs* in advance of the Montreal Protocol deadline (2030), aiming for total phase-out by 2015. Use of HCFCs had been consistently below the allowable limits set in the Protocol, so the limits specified in permits were lowered. However, in 2000, when manufacturers of insulation foam and air-conditioning units claimed they were unable to secure sufficient supplies of HCFCs at a satisfactory price, permits authorising the use of an additional 3.5 tonnes of HCFCs[1] were issued.

New Zealand is the world's *11th largest user of methyl bromide*.[2] It respected the Montreal Protocol phase-out target of 2005 but remains dependent on *methyl bromide use* in quarantine and pre-shipment (both exempt under the Protocol), particularly for fumigation of exported logs and timber. Some 23% of New Zealand's log exports, 1.4 million m^3, require fumigation to meet hygiene standards of importing countries.[3] Of the 204.8 tonnes of methyl bromide used for quarantine and pre-shipment in 2004, the Ministry of Agriculture and Forestry (MAF) estimates that 70% was used for fumigation of export logs and timber, principally for China, Australia and India. Like many OECD countries, New Zealand also has continued to let strawberry growers use methyl bromide under Montreal Protocol "critical use" exemptions totalling 40.5 tonnes in 2005 and 30.5 tonnes in 2006 (Figure 7.2). However, it has stated that its critical use exemption request for 2007 is its last such request (MED, 2006).

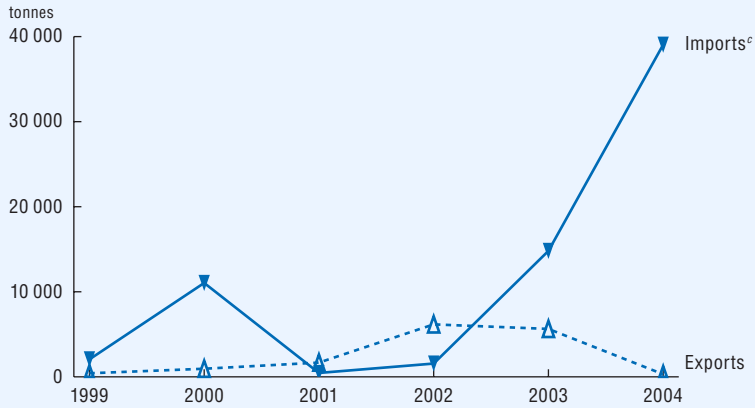
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Figure 7.2 **Trade and environment trends**

Methyl bromide consumption,[a] 1991-2003



Import and export of hazardous waste, 1999-2004



a) Imports minus exports.
b) Quarantine and pre-shipment.
c) 2004: an additional 160 000 litres of copper ammonium chloride was imported.
Source: Ministry of Economic Development.

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New Zealand prohibits nearly all *import of ODS*, both in bulk and in products. Remaining imports, mainly for essential uses, require an import permit or exemption letter (MED, 2005). Imports and exports of recycled ODS do not require such permits but the Ministry of Commerce must be notified and supporting documentation presented to customs. In practice, the *New Zealand Customs Service* has intercepted just two shipments of goods containing ODS that were not permitted or exempted, including a shipment of 75 kg of carbon tetrachloride in 2002. Out of concern at the potential administrative burden and doubts about the effectiveness of such an approach, New Zealand is one of several Montreal Protocol parties opposing the proposed establishment of an international *tracking system for ODS* as a means of trying to prevent illegal trade.

3. International Trade and the Environment

3.1 Context

New Zealand's economy is *dependent on overseas trade* (Chapter 4). In the past, a large proportion of its exports (mainly agricultural products) went to the UK, but its trading partners have become more diverse. Australia is New Zealand's most important export market, accounting for nearly 20% of the value of total exports in 2004. It is followed by the US (14.3%), Japan (11.4%), China (6.3%) and the UK (5.1%). On international markets, New Zealand's "*clean and green*" image brings a premium price for goods deemed safe or environmentally sensitive, such as dairy and meat products from animals that graze year-round on open pastures.

Dairy and meat products are the top two merchandise export categories (worth NZD 6 billion and NZD 4.5 billion, respectively, in 2004), followed by wood and wood products, fish and machinery. More than 90% of New Zealand's dairy production is exported. Meat exports, which made up almost 30% of national exports in the mid-1960s, had dropped to 10% by the early 2000s but have since begun rising again. Organic food exports are relatively minor but growing. New Zealand's extensive plantation forests are for the most part certified as sustainably managed under an internationally recognised eco-label (Chapter 5). Tourism is the biggest source of export dollars, and nature-based activities are cited as main attractions by two-thirds of international visitors (Chapter 3).

New Zealand has increasingly sought to facilitate trade, both multilaterally (through the World Trade Organization) and through *free trade agreements*, particularly with partners in the Asia-Pacific region. It has had a trade agreement with Australia since 1983. New Zealand recently concluded or is pursuing bilateral or regional trade agreements with Thailand, Chile, Singapore and Brunei. Trade agreement negotiations

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are under way with China, Malaysia and ASEAN countries. In 2001, the government adopted a framework for systematically including environmental standards in trade agreements. As a consequence, a mutual commitment to meet *environmental standards* is included in the recent agreement with Thailand and in the Trans-Pacific Strategic Economic Partnership (New Zealand, Brunei, Chile and Singapore).

3.2 Endangered species

New Zealand implements its *commitments under CITES* (the Convention on International Trade in Endangered Species of Wild Flora and Fauna) through the 1989 Trade in Endangered Species Act. Schedules to the Act, periodically updated to reflect changes in the CITES appendices, specify the CITES-protected flora and fauna which are barred from trade. The Department of Conservation issues import and export permits and captive breeding permits. MAF is responsible for quarantine, and the Customs Service for border control. Representatives of these three agencies make up the Wildlife Enforcement Group, set up in 1993 to co-ordinate information and counter illegal trade.

New Zealand's location and wealth of unique species makes it a *staging area for the world wildlife trade*. In 1997, the Royal Forest and Bird Protection Society reported that illegal export of indigenous plants and animals from New Zealand, as well as smuggling of CITES-listed species from other countries through New Zealand, had reached worrying levels (Williams, 1997). Also in 1997, TRAFFIC, an international non-government network monitoring global trade in endangered species, reported that bird smuggling in New Zealand was being carried out by organised crime syndicates. The accidental death in 2003 of the principal wildlife smuggler in New Zealand and the bird flu epidemic in 2005 have led to a sharp decrease in the smuggling of listed bird species in recent years. In 2003, a New Zealand customs official observed that endemic beetles were being openly traded via the Internet around the world.[4] Concern about the increasing illegal trade in and declining wild populations of geckos (Watson and Steere, 2006) led to their classification under CITES Appendix 3 in 2003.

The number of *seizures of CITES-protected species or materials* at the border ranged between 4 000 and 5 000 per year in the early 2000s. Of these, 90% occurred at Auckland International Airport. Since the late 1990s, the main items seized have been coral and traditional Chinese medicines, though wildlife smuggling remains a concern. In its *action against illegal trade*, New Zealand has in recent years successfully prosecuted a number of CITES violators, including members of a bird smuggling syndicate[5] and two persons posing as botanists, who were transporting 300 specimens of native orchids and other rare plants taken from conservation areas

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(Interpol, 2006). Concerns about possible involvement by Asian triad gangs, an upsurge in smuggling of native orchids and insects, and emerging bio-security risks have been growing. Given these trends, an assessment of enforcement issues would be timely, in particular whether fines and jail sentences serve as real disincentives for wildlife smuggling at their present levels, in light of the potential gains, and whether consideration should be given to reinforcing controls at points of retail sale of wildlife products and traditional Asian medicines, in addition to border controls.

New Zealand has actively supported *CITES education, training and awareness raising* nationally and throughout the region. At Auckland International Airport, a series of CITES fact sheets, describing species of particular interest to travellers, have been distributed since 2003. Border control officers undergo periodic training courses to sharpen their recognition of CITES-protected species and derived products. Special information campaigns have been elaborated to raise awareness of CITES issues among Chinese and Pacific Islander communities in New Zealand; although quantitative indicators of the *impact of these native-language programmes* are not available, they are believed to have helped reduce imports of CITES-protected goods by individuals (CITES Secretariat, 2001; Delahunt, 2003). Part of the programmes' success stemmed from the involvement of community leaders. Thus, consideration should be given to building CITES education partnerships with other community-based groups, such as bird protection societies and environmental groups.

3.3 Timber

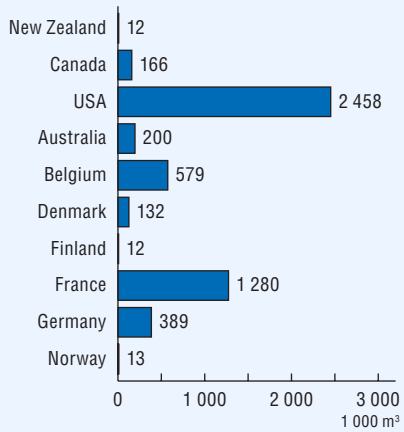
Tropical timber

Between 2000 and 2005, New Zealand's *imports of tropical timber* rose slightly, reaching 12 000 m^3 according to data from the International Tropical Timber Organization (ITTO, 2006) (Figure 7.3). New Zealand is a consumer member of the ITTO, and like most countries has struggled to meet the ITTO's Objective 2000 (ensuring that all traded timber is from forests certified as sustainably managed). To move towards Objective 2000, New Zealand has encouraged the use of certification regimes and eco-labels. Through its Interim Timber Procurement Policy it has also worked to ensure that government-purchased wood and wood products come from sustainably managed forests.

Members of New Zealand's *Imported Tropical Timber Group (ITTG)*, which includes major importers and retailers as well as environmental NGOs (with MAF as an observer), have pledged not to import tropical timber from certain countries that are known for unsustainable forest practices, and not to advertise or otherwise promote tropical timber decking that comes from unsustainably managed forests.

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Figure 7.3 **Imports of tropical wood,**[a] selected countries, 2005



a) Logs, sawn wood, veneer and plywood.
Source: ITTO 2006.

In 2004, the New Zealand Timber Importers Association, a member of the ITTG, for the first time expelled one of its members (a foreign-owned timber importing company) for violating this code of conduct.

Illegal logging

New Zealand has participated in a range of *international efforts against illegal timber trade*, such as the Forest Law Enforcement and Governance initiative, the Asia-Pacific Forestry Commission of the Food and Agriculture Organization (FAO) and the United Nations Forum on Forests. The country is also developing a national policy to guide its efforts against illegal logging and related trade.

3.4 Hazardous waste

New Zealand has ratified the *Basel Convention* (in 1994) and *Waigani Convention* (in 2000), which aim to limit the export of hazardous waste from developed countries to developing countries but allow the import of hazardous waste by OECD countries for what is presumed to be proper management and disposal. The 1996 Hazardous Substances and New Organisms Act and the 2004 Imports and Exports (Restrictions)

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Prohibition Order (No. 2) implement these international commitments. New Zealand is one of several OECD countries (including Australia, Canada and the US) that have not ratified the "Basel Ban" amendment to the Basel Convention. The amendment would prohibit the export of hazardous waste for any reason, including recycling, from a list of developed (mostly OECD) countries to less developed ones.

Data on hazardous waste generation and transport are weak, as no national tracking system exists (Chapter 2). In 2004, New Zealand exported some 325 tonnes of hazardous waste, including persistent organic pollutants (e.g. PCBs, DDT), to France and Germany for treatment and disposal. It accepts hazardous waste for disposal from other Pacific Island countries, in keeping with the Waigani Convention. While New Zealand's exports of hazardous waste varied little over the review period, imports increased sharply (Figure 7.2).

4. The Marine Environment

New Zealand ratified the 1982 *UN Convention on the Law of the Sea* in 1995 and the 1995 UN Fish Stocks Agreement in 2001, and accepted the 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas in 2006. The requirements of all three instruments have been integrated into the *1996 Fisheries Act* through amendments (Chapter 4). In 2001, New Zealand began developing a draft national ocean policy, to serve as a framework for overall marine resource management (Box 7.3).

New Zealand has jurisdiction over a *vast ocean area*, 14 times greater than its land area. Its exclusive economic zone (EEZ) is the sixth largest in the world at over 4 million km^2. In 2006, the country filed a claim under the Law of the Sea Convention to further extend its marine territory to include an area of 1.7 million km^2 adjoining its EEZ. If the claim is approved, New Zealand will gain exclusive rights to the *undersea resources* in the new area, from petroleum and other minerals to benthic organisms such as sponges and molluscs.

4.1 International fishery management

Marine fisheries play an important part in New Zealand's economy, as a major export earner (Chapter 4). About 90% of the catch is exported, and government support for fisheries is among the lowest in the OECD. The Ministry of Fisheries works to enhance the industry's economic performance and international competitiveness while assuring sustainability of fish stocks and marine ecosystems. New Zealand fishers are increasingly operating on the high seas and in the fishery jurisdictions of other

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Box 7.3 **Development of a draft national ocean policy**

Increasing pressures on the marine environment

The *fisheries, minerals and oil and gas reserves* in New Zealand's EEZ have considerable economic value. Fishing is the sixth largest export earner. Oil and gas are exploited in several parts of the EEZ, and the government has created incentives for further exploration. More offshore oil and gas fields are expected to be developed in the next few years (MfE, 2005b). The government has granted a mineral prospecting licence for the sea floor at the Kermadec Ridge, and is considering additional licence applications.

Regulations to protect the marine environment are few, variable and inconsistently applied. Less than 1% of the marine environment has been surveyed, and sensitive areas are poorly mapped (DOC, 2005). Under the RMA, environmental impact assessment is not required beyond the 12 nautical mile territorial sea limit. Some polluting activities in the EEZ are subject to environmental controls, but compliance is difficult to monitor. For other activities beyond the 12 nautical mile limit, such as the laying of pipelines and cables, New Zealand has few requirements that environmental effects be considered (MfE, 2005b; Benson-Pope, 2005). However, in 2006, MNZ, working with MfE and industry representatives, jointly produced a set of Environmental Best Practice Guidelines for the Offshore Petroleum Industry (MfE, 2006b).

The draft national ocean policy

In 2001, the government launched the development of an *ocean policy* to provide an overarching framework for dealing with existing and emerging pressures on the marine environment (Benson-Pope, 2005). In the first phase of the work, from 2001 to 2003, the government agreed on the following vision statement: "Healthy Oceans: wisely managed for the greatest benefit of all New Zealanders, now and in the future." Work was halted in 2003 to allow the government to respond to a Court of Appeals decision relating to the foreshore and seabed. This culminated in the enactment of the Foreshore and Seabed Act in 2004. Work on oceans policy resumed in late 2005 and is expected to be completed in 2007.

The policy is to be supported by a research programme, called *Ocean Survey 20/20*, launched in 2005 and scheduled to be completed by 2020. The goal of this survey of New Zealand's ocean territory is to provide information about the subsurface, sea floor, water column and atmosphere, as well as to contribute to assessments of the EEZ's ecological, commercial and scientific values and vulnerabilities (e.g. hazards, bio-security risks).

countries. They are involved in three types of international fisheries: deep water and middle depth trawling, deep water long lining, and tuna purse seining and long lining. Most of New Zealand's offshore fishing is concentrated in the *Ross Sea (Antarctica)*

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and the western and central Pacific Ocean. In the Ross Sea, toothfish are harvested under a management regime run by the Commission for the Conservation of Antarctic Marine Living Resources. The world's largest tuna fishery is exploited in the western and central Pacific. In the early 2000s, a few New Zealand high seas fishers caught stocks such as orange roughy in the Indian and Atlantic oceans.

Building *international co-operation to limit destructive fishing practices* was a priority of New Zealand during the review period, backed up by national measures. In 2005, the New Zealand fishing industry initiated negotiations with the central government regarding the potential closure of nearly one-third of the EEZ to bottom trawling and other destructive fishing practices. This move would build on a 2000 ban on trawling at 19 seamounts with total area of 100 000 km^2. New Zealand has also gone farther than most countries in seeking to control its fishers' activities on the high seas. Since 2001, all New Zealand-flagged fishing vessels have had to obtain a *high seas fishing permit*, to report catch and position information, and to comply with monitoring, control and enforcement conditions while fishing on the high seas.[6] Although its surveillance and enforcement efforts previously stopped at the EEZ boundaries, New Zealand now prohibits its nationals from taking fish on the high seas unless authorisation is given by a country that is a party to a relevant international agreement. Since 2001, New Zealand-flagged vessels have reported catching 10 000 to 25 000 tonnes of fish per year on the high seas (Table 7.3).

New Zealand actively combats *illegal, unregulated and unreported* (IUU) fishing. In 2004, it introduced a national action plan to combat IUU fishing. The Minister of Fisheries is a member of the high Seas Task Force founded in 2005 to help define

Table 7.3 **New Zealand's high seas fisheries catch,** 2001-04
(tonnes)

Area	2001	2002	2003	2004
Antarctic Pacific	612	1 374	1 486	1 423
Central Pacific	4 601	20 390	15 139	13 363
South-west Pacific	3 112	3 979	3 738	3 044
South Indian Ocean	1 172	. .	. .	. .
North-east Atlantic	137	. .	. .	. .
Total	9 634	25 743	20 362	17 830

Source: MFish, 2006.

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international approaches to combating IUU fishing. More recently it launched a programme, budgeted at NZD 11.6 million over 2006-10, to crack down on poachers and black-market fishing, with a special team for covert operations. New Zealand advocates strengthening and expanding *regional fishery management organisations* to promote better management of high seas fish stocks and to prevent IUU fishing. It is a member of several regional fishery organisations.[7] With Australia and Chile, New Zealand launched an effort in 2006 to create a South Pacific Regional Fisheries Management Organisation.

In 2004, New Zealand published a *national action plan*[8] *to reduce incidental kill of seabirds* in New Zealand waters and by New Zealand-flagged vessels on the high seas (MFish, 2003). The plan starts with voluntary measures, and, in case these prove insufficient, sketches out the introduction of mandatory measures. Information about the level of seabird by-catch is limited, as observers are present on only a small percentage of boats using the fishing methods known to be implicated. An estimated 5 200 seabirds are killed in New Zealand waters as by-catch every year, mainly by long lines and set nets.

4.2 International commitments regarding marine pollution

Traffic in New Zealand ports and waters increased during the review period. Changes in activity between 1997 and 2003 included a 9% increase in refinery intake volume and a 35% increase in fuel import volume. At the same time, oil tankers registered a 15% reduction in the number of port visits, indicating a trend towards larger vessels. The number of commercial cruise vessels calling in New Zealand ports has also risen (URS, 2004). An increasing portion of foreign tankers calling in national ports are double-hulled (about 80% in 2005).

In 1998, New Zealand acceded to the 1978 *MARPOL Convention* on the prevention of pollution from ships by oil and other harmful substances discharged during normal operations or released accidentally, as well as to the 1996 Protocol to the London Convention on the prevention of marine pollution by dumping of waste and other matter. It has integrated its commitments under these two conventions into regulations stemming from the 1994 Maritime Transport Act and the 1991 Resource Management Act. Maritime New Zealand (MNZ) monitors compliance and enforces against violations through a comprehensive programme of flag and port state control.

Port state control

New Zealand is a signatory of the *Tokyo Memorandum of Understanding* on port state control regarding safety inspections of foreign ships. MNZ uses a risk-based targeting system (taking account of ship age, type, flag, deficiencies, detentions, classification society and time since last inspection) to pick the ships it inspects. In general, low-risk ships are inspected annually, medium-risk ships every six months and high-risk ships every three months. Overall, MNZ *inspects 48% of foreign ships*

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calling at New Zealand ports (Tokyo MOU Secretariat, 2005). Key documents inspected include the International Oil Pollution Prevention Certificate and the Oil Record Book. Inspectors also check the functioning of *pollution prevention equipment* such as incinerators, oily water separators and sewage plants. As a participant in Interpol's Project Clean Seas, New Zealand shares information on MARPOL violations and illegal activities detected, and shares best-practice information regarding port state inspections and enforcement.

About *5% of New Zealand's port state inspections lead to detentions*, about average for OECD countries in the Asia-Pacific region (Table 7.4). However, a review in 2004 suggested that New Zealand's ship inspection activities were disproportionately focused on large oceangoing ships (over 400 tonnes gross tonnage), whereas most compliance problems are with smaller commercial, recreational and fishing vessels (EMS, 2004). Large ships calling at New Zealand ports are generally well maintained because of the remote location (shipowners do not want to risk costly breakdowns) and because MNZ is known to be strict in detaining substandard ships.

Table 7.4 **Port state inspection in the Asia-Pacific region,** selected OECD countries, 2005

	Total inspections	Deficiencies detected[a]	Ships detained	Inspection rate (%)	Detention rate (%)
New Zealand	509	328	24	*47.5*	*4.7*
Australia	3 076	1 700	154	*71.5*	*5.0*
Japan	4 680	3 279	248	*47.0*	*5.3*
Korea	3 490	1 990	123	*39.6*	*3.5*
Total[b]	21 058	14 421	1 097	*70.0*	*5.2*

a) Number of inspections that resulted in finding of one or more deficiencies.
b) For all parties to Tokyo MOU.
Source: Tokyo MOU Secretariat, 2005.

Pollution discharges from ships

The number of *reported oil discharges, or* "*operational spills*", from ships declined during the review period, from an average of 35 per quarter in 1998 to 20 per quarter in 2004. The amounts discharged were generally small; in 2004, 48% were estimated to be less than a litre, 35% between 1 and 100 litres, and 8% over 100 litres. This decline can in part be attributed to regional infringement fines being used more

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widely, as well as to the use of better refuelling practices. The majority of spills were of unknown origin, but where the source was known, fishing vessel refuelling was the most prominent cause, followed by bilge pumping (EMS, 2004). However, *monitoring of oil discharges* relies on self-reporting from vessels and offshore installations, which have little incentive to reveal such incidents. There is no organised surveillance of New Zealand waters for potential discharges, and self-reporting may be spotty. For example, only 0.3-0.5% of ships participating in the Safe Ship Management programme reported oil spills in the early 2000s (MNZ, 2004). Surveillance carried out for other purposes occasionally results in detection of illegal discharges from ships; such incidents are routinely followed up with enforcement.

Waste reception facilities in some of New Zealand's *major ports* cannot handle the full range of ship waste, from ballast water to tank washing sludge, used chemicals and oil, bilge water and sewage. For example, despite a newly constructed deep-water berth, the port at Marsden Point (the main reception point for imported oil, as the major refinery is located nearby) is not fully equipped to accept waste from larger vessels. Disposal services are mainly provided by private, commercially operated road tankers, and the ultimate fate of the waste collected is often not monitored.

Oil spills and accidents

New Zealand ratified the 1990 *OPRC Convention on oil pollution preparedness* in 1999. Since then, oil spill planning, preparedness and response have been carried out using the convention's three-tier approach (industry is tier 1, regional councils are tier 2 and Maritime New Zealand is tier 3), under which each level can call on the one above for assistance when needed. The principles, approaches, roles and responsibilities for response are detailed in the Marine Oil Spill Response Strategy, adopted in 2000. In 2006, New Zealand tested its readiness to respond to a major maritime incident in a major drill ("Exercise Hard Rock"). Involving more than 140 officials, it tested notification chains and communication systems, the deployment of resources and equipment and co-operation among personnel. Regional oil spill preparedness plans, prepared by regional councils, are also periodically evaluated through such drills.

From 1998 to 2004, MNZ recorded *778 marine oil spills* (URS, 2004). Most were small; 20 spills exceeded 1 tonne, four exceeded 20 tonnes and one was around 300 tonnes. During the same period there were three major *shipping accidents* in New Zealand waters, involving oil spills of 50 tonnes or more, and about six others where a potentially major spill was averted (URS, 2004). New Zealand maintains the domestic capacity to respond to a nominal spill of 3 500 tonnes, which is estimated to be a "once in a hundred years" event (MNZ, 2006). Each region is equipped with sufficient resources to deal with the smaller spills it would normally experience, and can escalate the response by

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calling on nationally held stocks and expertise for major incidents. A memorandum of understanding with Australia makes Australian response capacity available as reinforcement if the scale of the response should exceed national capacity.

New Zealand assesses the overall *risk of marine oil spills* every five years, evaluating risks from vessels and other activities (cargo transfer, bunkering, offshore oil and gas operations), and updates its Marine Oil Spill Response Strategy accordingly. The most recent assessment, in 2004, concluded that the overall risk level had changed little since 1998, as greater risk from increased traffic had been offset by risk reductions associated with safer ships, improved navigation technology and increased response capacity (URS, 2004). However, it was noted that information on vessel movements in coastal areas and on average loads should be improved to enable fuller evaluation of risks associated with the growing average size of container and cruise ships. Information derived from ships' automatic identification systems is expected to fill this gap as from 2007.

Dumping at sea

Conditions for *marine dumping* set by the 1972 London Convention and its 1996 Protocol have been transposed into New Zealand legislation, which requires a permit from MNZ to dump waste outside the 12 nautical mile limit and from regional councils to dump within the limit. Permit applicants must demonstrate that other options have been investigated and that sea disposal is the last and best option. In addition, the waste must be tested and compared to guidelines derived from the US Environmental Protection Agency. In certain cases, a risk assessment must be carried out to evaluate the waste's bio-availability, toxicity and potential effects on the marine environment. Regulations on dredge spoil disposal generally limit the amount that can be dumped annually at a particular marine site to 50 000 m^3.

Monitoring compliance with the dumping rules is a big challenge because of the size and remoteness of the EEZ. Compliance with permit conditions relies primarily on self-monitoring by dumpers and on reports of unauthorised dumping from third-party ships and aeroplanes. MNZ retains a database of permits, but information about permit conditions and compliance is sparse.

5. Regional Environmental Co-operation

During the review period, New Zealand focused its *regional environmental co-operation* on strengthening environmental management in the South Pacific and protecting Antarctica (Box 7.4).

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Box 7.4 **Protection of the Antarctic environment**

Antarctica is the *world's largest and most pristine wilderness*, covering nearly 14 million km^2. The Antarctic Treaty (1959) applies to the area below latitude 60° south, including all islands and ice shelves. New Zealand is one of the 12 original signatories of the Antarctic Treaty. Although involved in discussions in the 1980s regarding controlled mineral exploitation in the Antarctic, the country has actively supported full environmental protection, since it ratified the *Protocol on Environmental Protection* to the Antarctic Treaty (agreed in Madrid in 1991, in force since 1998). The Protocol designated Antarctica as a "natural reserve devoted to peace and science" and introduced a ban on mining in the area.

Five annexes to the Madrid Protocol set out *requirements* regarding environmental impact assessment, conservation of flora and fauna, waste disposal, prevention of marine pollution and protected areas. Annex V simplified the existing protected area system under two designations: Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs). When Annex V came into force in 2002, the 20 previously designated protected areas in the Ross Sea region were incorporated as ASPAs. Entry into an ASPA is regulated by permit, in accordance with established management plans. Entry into an ASMA does not require a permit, but activities are guided by a code of conduct.

New Zealand was instrumental in designating the *McMurdo Dry Valleys* as the first ASMA in 2004 (jointly with the US). It is hoped that this designation will strengthen co-ordination of activities in the area and help minimise cumulative environmental impacts. The valleys, covering some 4 800 km^2 on the western coast of McMurdo Sound, form the largest relatively ice-free area on the Antarctic continent. The perennially ice-covered lakes, ephemeral streams and extensive areas of exposed soil within the McMurdo Dry Valleys are subject to low temperatures, limited precipitation and salt accumulation that make them globally unique ecosystems. In 2001, New Zealand produced the first state of the environment report for the Ross Sea Region.

A range of international commitments regarding conservation of the Antarctic environment is reflected in national legislation. The *Antarctica (Environmental Protection) Act (1994)* requires environmental impact assessments for any proposed activity in the Antarctic. On the basis of the assessments, which Antarctica New Zealand and the MfE review and audit, the Ministry of Foreign Affairs decides whether to permit the activity. The *Antarctic Marine Living Resources Act (1981)* implements the commitments made under the 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), requiring permits for the taking of marine organisms in the Antarctic. However, New Zealand has not ratified the 1972 London Convention on the conservation of Antarctic seals.

New Zealand has implemented measures to conserve *Antarctic fisheries*. Since 2003 it has extended best environmental practice across its toothfish fisheries and stepped up efforts to detect and deter illegal fishing in the Southern Ocean and Ross Sea through regular patrols and surveillance. Parties to the CCAMLR adopted a proposal by New Zealand, Australia and the US to implement a centralised *vessel monitoring system* in 2004 in an effort to combat illegal, unregulated and unreported fishing in the Antarctic.

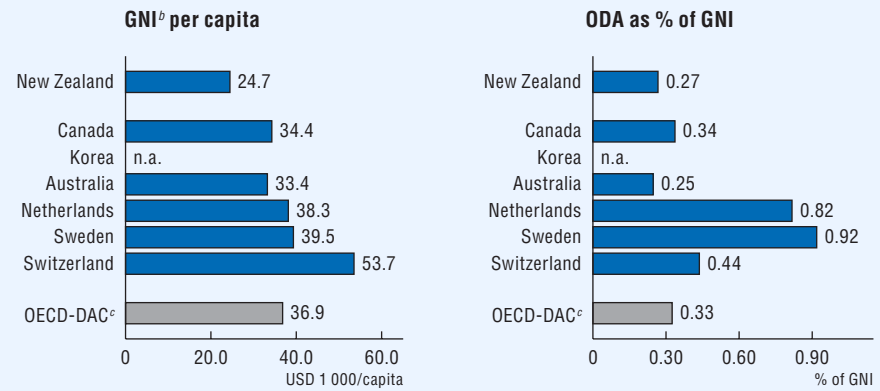
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5.1 Official development assistance

The *New Zealand Agency for International Development* (NZAID) was established as a semi-autonomous body within the Ministry of Foreign Affairs and Trade in 2002. It was charged with managing the government's allocation of official development assistance (ODA), with a central focus on eliminating poverty and a core (but not exclusive) focus on the Pacific. Environmental concerns are mainstreamed into ODA with two particular objectives: promoting environmentally sustainable resource use and development that is consistent with the receiving country's priorities, and enhancing assets of the poor through conservation of natural resources.

In 2005, New Zealand's *ODA expenditure as a percentage of GNI* was 0.27%[9] (Figure 7.4). In 2007, the share of ODA in GNI is projected to rise to 0.28%, compared with the OECD-DAC average of 0.33% and the UN target of 0.7%, which the New Zealand Government endorsed in Rio. Total ODA amounted to NZD 389 million in 2005. In May 2006, the government announced that ODA would be increased by NZD 138 million over the next four years, with priority on bilateral aid to Vanuatu, Papua New Guinea, theSolomon Islands, Fiji and Vietnam. ODA directed at *environmental activities in the Pacific rose* from NZD 1 million in 1997 to about NZD 4 million in 2005.

Figure 7.4 **Official development assistance,** 2005[a]



a) Preliminary data.
b) Gross national income in USD at current exchange rates.
c) Member countries of the OECD Development Assistance Committee.
Source: OECD-DAC.

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5.2 Environmental co-operation for regional development

Strong bilateral ties with Australia have been maintained through New Zealand's regular representation on Australia's Environment Protection and Heritage Council[10] and Natural Resource Management Ministerial Council. Among other efforts, such co-operation has led to the recent harmonisation of the two countries' environmental standards for a range of consumer products (e.g. appliances).

New Zealand strives to integrate environmental concerns into its assistance and regional co-operation with *South Pacific island countries*. In 2005, 4.5% of its ODA in the Pacific region was specifically oriented towards strengthening environmental management (Cornforth, 2005). New Zealand has offered technical assistance and training to South Pacific countries to enhance their CITES enforcement capacity.[11] It also hosted the 2003 Interpol meeting on *wildlife crime*, which allowed Pacific island countries to attend for the first time, and inspired a subsequent Pacific Islands Forum resolution to take measures to better incorporate biodiversity protection concerns into trade. In addition, New Zealand provides bilateral assistance for sustainable forestry and management of ODS to Pacific island countries.

New Zealand remains active in the *Pacific Regional Environment Programme*,[12] providing technical expertise and programme support, particularly for training in environmental management and protection. It has ratified the programme's protocols on the prevention of pollution by dumping and co-operation in combating pollution emergencies (Noumea Convention), and helped make the amendments consistent with the London Convention and its protocols. New Zealand chaired the Pacific Island Roundtable for Nature Conservation, which recently created the first inventory of conservation activities in the Pacific region. As chair of the *Pacific Islands Forum* in 2004, New Zealand focused on development of a *Pacific Plan* to strengthen regional co-operation and integrate environmental concerns into economic policies. A first draft was endorsed at the forum meeting in October 2005.

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Notes

1. In ozone depleting potential, as measured in CFC-11 equivalence.
2. The top ten users are the US, Italy, Spain, Israel, France, Japan, Australia, the UK, Canada and Poland.
3. Fumigation concentrations range from 48 mg/m^3 for Australia to 64 mg/m^3 for India and 120 mg/m^3 for China.
4. Customs officials had stopped a traveller who tried to leave New Zealand with 12 endemic beetles, but were unable to prosecute because the beetles were not listed under domestic law.
5. They smuggled endangered birds' eggs from Australia into New Zealand, then exported the hatched birds as specimens bred in captivity.
6. New Zealand's surveillance and enforcement efforts previously stopped at the EEZ boundary.
7. These include the Commission for the Conservation of Southern Bluefin Tuna, the Commission for the Conservation of Antarctic Marine Living Resources, the Arrangement [with Australia] for the Conservation and Management of Orange Roughy on the South Tasman Rise and the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.
8. In response to the 1997 FAO International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries.
9. By comparison, it was 0.52% of GNP in 1975, 0.33% in 1980 and 0.25% in 1995.
10. Successor to the Australia and New Zealand Environment and Conservation Council (ANZECC).
11. Eleven of the 21 island countries in the Pacific Regional Environment Programme are not party to CITES.
12. Formerly the South Pacific Regional Environment Programme.

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I.A Selected environmental data

I.B Selected economic data

I.C Selected social data

II.A Selected multilateral agreements (worldwide)

II.B Selected multilateral agreements (regional)

III. Abbreviations

IV. Physical context

V. Selected environmental websites

I.A: SELECTED ENVIRONMENTAL DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	**NZL**	AUT	BEL	CZE	DNK	FIN
LAND													
Total area (1000 km^2)		9971	1958	9629	378	100	7713	**270**	84	31	79	43	338
Major protected areas (% of total area)	*2*	8.7	9.2	25.1	17.0	9.6	18.5	**32.4**	28.0	3.4	15.8	11.1	9.1
Nitrogenous fertiliser use (t/km^2 of agricultural land)		2.7	1.1	2.6	8.8	18.9	0.2	**2.1**	3.5	10.8	6.8	7.6	6.0
Pesticide use (t/km^2 of agricultural land)		0.06	0.04	0.08	1.24	1.20	-	**0.02**	0.09	0.69	0.10	0.11	0.06
Livestock densities (head of sheep eq./km^2 of agr. land)		192	256	191	1011	1560	62	**685**	492	1790	287	912	290
FOREST													
Forest area (% of land area)		45.3	33.9	32.6	68.9	63.8	21.4	**34.7**	41.6	22.4	34.1	12.7	75.5
Use of forest resources (harvest/growth)		0.4	0.2	0.6	0.4	0.1	0.6	**..**	0.7	0.9	0.7	0.7	0.7
Tropical wood imports (USD/cap.)	*3*	1.6	0.2	2.2	10.7	6.1	4.0	**3.4**	0.4	24.2	0.3	3.8	1.4
THREATENED SPECIES													
Mammals (% of species known)		31.6	34.0	18.8	24.0	17.9	24.7	**18.0**	22.0	30.5	18.9	22.0	11.9
Birds (% of species known)		12.9	17.0	11.6	12.9	13.3	12.5	**21.0**	27.3	28.1	49.5	13.2	13.3
Fish (% of species known)		7.3	34.4	14.4	25.3	9.2	0.8	**10.0**	41.7	23.8	40.0	15.8	11.8
WATER													
Water withdrawal (% of gross annual availability)		1.5	15.5	19.2	20.3	35.6	6.4	**1.7**	4.2	32.5	11.9	4.4	2.1
Public waste water treatment (% of population served)		72	25	71	64	78	..	**80**	86	46	70	89	81
Fish catches (% of world catches)		1.2	1.6	5.4	5.0	1.9	0.2	**0.6**	-	-	-	1.4	0.2
AIR													
Emissions of sulphur oxides (kg/cap.)		76.3	12.2	49.4	6.7	10.4	126.9	**18.6**	4.4	14.6	22.2	4.5	16.4
(kg/1000 USD GDP)	*4*	2.6	1.4	1.4	0.3	0.6	4.6	**0.8**	0.2	0.5	1.4	0.2	0.6
change (1990-early 2000s)		-27	..	-31	-14	-46	59	**39**	-55	-58	-88	-86	-64
Emissions of nitrogen oxides (kg/cap.)		78.4	12.0	63.9	15.8	24.4	84.2	**39.0**	24.7	26.3	32.3	35.5	40.5
(kg/1000 USD GDP)	*4*	2.7	1.4	1.8	0.6	1.3	3.0	**1.7**	0.9	1.0	2.0	1.2	1.5
change (1990-early 2000s)		-6	18	-19	-2	47	29	**16**	-3	-24	-40	-31	-32
Emissions of carbon dioxide (t./cap.)	*5*	17.2	3.6	19.7	9.5	9.6	17.6	**8.1**	9.2	11.2	11.6	9.4	13.2
(t./1000 USD GDP)	*4*	0.57	0.39	0.53	0.35	0.50	0.63	**0.36**	0.31	0.41	0.71	0.32	0.47
% change (1990-2004)		29	27	20	15	105	36	**49**	31	7	-23	-	25
WASTE GENERATED													
Industrial waste (kg/1000 USD GDP)	*4, 6*	..	..	..	40	40	..	**10**	..	50	50	20	130
Municipal waste (kg/cap.)	*7*	380	320	740	410	390	450	**400**	550	470	280	670	450
Nuclear waste (t./Mtoe of TPES)	*8*	4.0	0.1	1.1	1.6	3.0	-	**-**	-	1.9	1.4	-	1.9

.. not available. - nil or negligible.

1) Data refer to the latest available year. They include provisional figures and Secretariat estimates.
Partial totals are underlined. Varying definitions can limit comparability across countries.

2) IUCN management categories I-VI and protected areas without IUCN category assignment; national classifications may differ.

3) Total imports of cork and wood from non-OECD tropical countries.

4) GDP at 2000 prices and purchasing power parities.

Source: OECD Environmental Data Compendium.

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OECD EPR / SECOND CYCLE

FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD*	OECD*
549	357	132	93	103	70	301	3	42	324	313	92	49	506	450	41	779	245	35042
13.3	31.5	5.2	8.9	9.5	1.2	19.0	17.1	18.9	6.4	29.0	8.5	25.2	9.5	9.5	28.7	4.3	30.1	16.4
7.5	10.5	3.0	6.2	0.5	8.1	6.0	-	14.6	9.6	4.5	2.6	3.6	3.6	6.0	3.5	3.1	6.8	2.2
0.27	0.17	0.14	0.14	-	0.05	0.58	0.33	0.41	0.08	0.06	0.40	0.16	0.14	0.05	0.10	0.06	*0.21*	*0.07*
514	689	245	207	65	1139	488	4351	2142	845	315	498	226	339	409	794	290	*674*	208
31.6	30.2	22.8	19.5	1.3	9.4	23.3	34.5	9.5	39.2	30.0	36.9	41.6	33.3	73.5	30.8	27.0	11.6	34.4
0.6	0.5	0.6	0.5	-	0.7	0.5	0.5	0.6	0.5	0.6	0.8	0.5	0.5	0.7	0.8	0.5	0.6	0.6
6.8	1.8	2.7	0.1	2.8	11.2	7.1	-	15.6	3.6	0.3	17.6	0.1	6.2	2.2	0.6	0.5	2.7	4.0
19.0	41.8	37.8	71.1	-	1.8	40.7	51.6	18.6	3.4	14.1	17.7	22.2	26.3	22.4	32.9	22.2	*6.3*	..
19.2	27.3	1.9	18.8	44.0	5.4	18.4	50.0	21.5	7.7	8.6	13.7	14.4	25.5	19.1	36.4	30.8	*15.4*	..
31.9	68.2	26.2	32.1	-	23.1	29.0	27.9	48.9	-	7.0	22.9	24.1	52.9	16.4	38.9	9.9	*11.1*	..
17.5	20.2	12.1	4.7	0.1	2.3	24.0	3.7	9.9	0.7	18.6	15.1	1.4	34.7	1.5	4.7	17.0	*20.8*	*11.4*
79	92	56	32	50	73	69	95	98	73	55	41	53	55	86	97	17	*95*	*64*
0.7	0.3	0.1	-	2.2	0.3	0.3	-	0.5	2.9	0.2	0.2	-	1.0	0.3	-	0.6	0.7	27.9
9.0	7.4	46.3	35.3	35.0	24.5	11.5	6.7	5.3	4.9	38.1	28.4	19.0	37.3	6.5	2.3	31.3	16.9	27.8
0.3	0.3	2.6	2.7	1.3	0.8	0.5	0.1	0.2	0.1	3.6	1.6	1.6	1.8	0.2	0.1	4.6	0.6	1.1
-60	-89	4	-64	22	-48	-63	-80	-58	-58	-55	-9	-81	-29	-45	-60	33	-73	-40
22.7	17.2	28.9	17.7	90.5	31.0	21.8	38.1	26.6	46.9	20.8	27.8	19.0	34.7	27.1	11.4	14.1	26.8	34.3
0.8	0.7	1.7	1.4	3.3	1.0	0.9	0.8	1.0	1.3	2.0	1.6	1.6	1.7	1.0	0.4	2.1	1.0	1.4
-29	-48	11	-24	-2	5	-34	-27	-28	-5	-38	13	-53	14	-25	-46	48	-43	-17
6.4	10.3	8.5	5.6	7.7	10.2	7.9	24.9	11.4	7.9	7.8	5.7	7.0	7.7	5.8	6.0	2.9	9.0	11.1
0.23	0.40	0.45	0.40	0.26	0.31	0.31	0.47	0.42	0.21	0.66	0.33	0.54	0.36	0.20	0.20	0.40	0.33	0.44
9	-12	33	-19	19	37	16	7	18	26	-15	52	-34	59	-	8	63	-4	17
70	20	..	20	-	60	20	..	40	20	140	50	40	20	90	10	30	30	60
540	640	430	460	730	750	520	660	600	700	260	450	300	640	470	660	360	620	550
4.1	1.4	-	1.8	-	-	-	-	0.1	-	-	-	3.1	1.5	3.8	2.1	-	4.0	1.5

UKD: pesticides and threatened species: Great Britain; water withdrawal and public waste water treatment plants: England and Wales.

5) CO_2 from energy use only; sectoral approach; international marine and aviation bunkers are excluded.

6) Waste from manufacturing industries.

7) CAN, NZL: household waste only.

8) Waste from spent fuel arising in nuclear power plants, in tonnes of heavy metal, per million tonnes of oil equivalent of total primary energy supply.

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I.B: SELECTED ECONOMIC DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	**NZL**	AUT	BEL	CZE	DNK
GROSS DOMESTIC PRODUCT												
GDP, 2004 (billion USD at 2000 prices and PPPs)		964	957	10842	3447	921	561	**91**	241	285	168	160
% change (1990-2004)		47.2	49.7	52.4	19.7	116.2	59.5	**53.7**	35.5	31.0	15.1	32.1
per capita, 2004 (1000 USD/cap.)		30.2	9.2	36.9	27.0	19.2	27.9	**22.4**	29.5	27.4	16.5	29.6
Exports, 2004 (% of GDP)		38.2	30.1	10.0	13.1	44.1	18.2	**29.2**	50.6	83.5	71.3	43.5
INDUSTRY	*2*											
Value added in industry (% of GDP)		32	27	23	31	43	26	**25**	32	27	40	27
Industrial production: % change (1990-2003)		42.3	42.2	43.4	-3.2	164.7	29.8	**26.9**	53.2	17.6	3.0	36.1
AGRICULTURE												
Value added in agriculture (% of GDP)	*3*	3	4	2	1	4	4	**7**	2	1	4	3
Agricultural production: % change (1990-2005)		25.6	41.5	27.6	-12.3	19.3	25.4	**47.9**	9.9	13.0	..	0.7
Livestock population, 2005 (million head of sheep eq.)		118	275	787	53	30	283	**99**	17	25	12	24
ENERGY												
Total supply, 2004 (Mtoe)		269	165	2326	533	213	116	**18**	33	58	46	20
% change (1990-2004)		28.5	33.1	20.7	19.6	129.9	32.2	**28.2**	32.6	17.5	-7.1	12.2
Energy intensity, 2004 (toe/1000 USD GDP)		0.28	0.17	0.21	0.15	0.23	0.21	**0.19**	0.14	0.20	0.27	0.13
% change (1990-2004)		-12.7	-11.1	-20.8	-0.1	6.3	-17.1	**-16.6**	-2.1	-10.3	-19.3	-15.1
Structure of energy supply, 2004 (%)	*4*											
Solid fuels		10.6	4.3	23.5	21.8	23.5	42.7	**10.7**	12.0	10.2	44.7	21.5
Oil		36.4	58.1	40.8	47.8	47.6	32.0	**39.9**	43.3	40.4	20.5	41.3
Gas		28.9	26.4	22.1	13.2	11.9	19.6	**19.6**	23.1	25.5	16.6	22.8
Nuclear		8.7	1.4	9.1	13.8	16.0	-	**-**	-	21.6	14.6	-
Hydro, etc.		15.3	9.8	4.5	3.4	1.0	5.6	**29.9**	21.5	2.3	3.5	14.4
ROAD TRANSPORT	*5*											
Road traffic volumes per capita, 2002 (1000 veh.-km/cap.)		10.1	0.7	15.9	6.2	2.3	9.8	**11.2**	8.3	8.8	4.4	8.9
Road vehicle stock, 2003 (10 000 vehicles)		1850	2051	23139	7254	1454	1279	**255**	490	544	409	232
% change (1990-2003)		11.7	107.5	22.6	28.4	328.4	30.8	**38.1**	32.7	27.7	57.8	22.7
per capita (veh./100 inh.)		58	20	80	57	30	64	**64**	60	52	40	43

.. not available. - nil or negligible.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Value added: includes mining and quarrying, manufacturing, gas, electricity and water and construction; production: excludes construction.

Source: OECD Environmental Data Compendium.

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FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD
145	1650	2109	210	141	9	132	1495	24	446	175	446	181	70	910	258	225	529	1649	29441
31.6	28.1	23.0	48.7	24.4	43.6	144.4	21.3	91.1	36.6	54.6	60.2	34.0	30.7	44.2	31.6	14.0	63.6	39.4	40.9
27.8	27.4	25.6	19.0	14.0	29.9	32.7	25.7	53.3	27.4	38.1	11.7	17.2	12.9	21.3	28.7	30.4	7.4	27.6	25.3
37.1	25.9	38.2	20.2	64.9	36.8	80.2	26.7	146.2	65.4	43.7	39.1	30.9	76.8	27.0	46.2	45.9	28.9	24.7	23.3
32	25	30	23	31	27	42	29	20	26	38	30	29	32	30	28	27	31	26	29
71.3	13.4	9.7	11.7	67.4	..	302.4	11.8	39.3	16.5	33.6	81.5	17.7	10.9	24.1	45.0	19.4	65.9	9.0	26.2
4	3	1	7	4	9	3	3	1	3	2	3	4	5	3	2	1	12	1	3
-3.9	0.9	-4.7	10.1	-10.5	5.4	2.6	10.7	13	-9.2	-9.4	-15.8	1.1	..	7.4	-10.2	-4.3	18.2	-8.0	..
8	156	117	21	12	1	50	64	6	42	9	58	19	6	100	13	12	111	113	2639
38	275	348	30	26	3	15	184	5	82	28	92	27	18	142	54	27	82	234	5508
30.6	21.1	-2.3	37.4	-7.7	61.0	46.1	24.6	33.0	23.1	28.7	-8.1	49.6	-14.0	56.1	13.4	8.6	54.6	10.1	21.7
0.26	0.17	0.17	0.15	0.19	0.40	0.12	0.12	0.20	0.18	0.16	0.21	0.15	0.26	0.16	0.21	0.12	0.15	0.14	0.19
-0.7	-5.5	-20.6	-7.6	-25.8	12.1	-40.2	2.8	-30.4	-9.9	-16.8	-42.6	11.6	-34.2	8.3	-13.9	-4.7	-5.5	-21.0	-13.6
20.0	5.0	24.6	30.1	13.6	2.9	15.1	9.2	2.1	10.8	3.5	58.6	13.0	24.5	14.8	5.5	0.5	27.3	16.1	20.5
29.8	32.8	36.0	57.2	24.9	25.0	58.5	46.2	69.4	39.6	39.7	23.4	59.3	17.4	49.7	28.8	46.1	36.7	35.9	40.7
10.5	14.3	22.6	7.4	45.5	-	24.2	36.6	26.9	45.5	16.7	12.8	12.7	29.7	17.7	1.6	10.0	22.8	37.5	21.7
15.7	41.6	12.5	-	12.1	-	-	-	-	1.2	-	-	-	24.3	11.6	37.5	25.9	-	8.9	11.0
24.0	6.2	4.3	5.3	3.8	72.0	2.2	8.0	1.6	2.9	40.2	5.2	15.0	4.2	6.3	26.5	17.5	13.2	1.6	6.1
9.4	8.7	7.2	7.5	2.3	8.2	8.8	8.3	7.9	7.7	7.3	3.6	6.3	2.4	4.4	8.5	7.8	0.8	8.1	8.2
263	3563	4736	500	320	19	179	3848	33	787	240	1364	542	154	2311	451	406	645	3296	62611
17.6	25.2	27.0	98.1	..	41.5	88.2	28.6	64.7	37.3	23.8	113.2	146.5	56.9	60.0	15.0	25.0	173.2	30.7	33.3
50	59	57	45	32	66	45	66	73	48	53	36	52	29	55	50	55	9	55	54

3) Agriculture, forestry, hunting, fishery, etc.

4) Breakdown excludes electricity trade.

5) Refers to motor vehicles with four or more wheels, except for Italy, which include three-wheeled goods vehicles.

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I.C: SELECTED SOCIAL DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	**NZL**	AUT	BEL	CZE	DNK
POPULATION												
Total population, 2004 (100 000 inh.)		319	1040	2939	1277	481	201	**41**	82	104	102	54
% change (1990-2004)		15.3	28.0	17.6	3.4	12.2	17.8	**20.8**	5.9	4.3	-1.5	5.1
Population density, 2004 (inh./km^2)		3.2	53.1	30.5	338.0	482.8	2.6	**15.0**	97.5	340.6	129.5	125.3
Ageing index, 2004 (over 64/under 15)		72.3	18.6	59.7	140.3	44.4	65.4	**54.9**	97.1	97.2	91.6	79.5
HEALTH												
Women life expectancy at birth, 2004 (years)		82.4	77.6	80.1	85.6	80.8	83.0	**81.3**	82.1	81.7	79.0	79.9
Infant mortality, 2004 (deaths /1 000 live births)		5.3	19.7	6.9	2.8	5.3	4.7	**6.2**	4.5	4.3	3.7	4.4
Expenditure, 2004 (% of GDP)		9.9	6.5	15.3	8.0	5.6	9.6	**8.4**	9.6	10.1	7.3	8.9
INCOME AND POVERTY												
GDP per capita, 2004 (1000 USD/cap.)		30.2	9.2	36.9	27.0	19.2	27.9	**22.4**	29.5	27.4	16.5	29.6
Poverty (% pop. < 50% median income)		10.3	20.3	17.0	15.3	..	11.2	**10.4**	9.3	7.8	4.4	4.3
Inequality (Gini levels)	*2*	30.1	48.0	35.7	31.4	..	30.5	**33.7**	26.0	26.0	25.0	24.0
Minimum to median wages, 2000	*3*	42.5	21.1	36.4	32.7	25.2	57.7	**46.3**	x	49.2	32.3	x
EMPLOYMENT												
Unemployment rate, 2004 (% of civilian labour force)	*4*	7.2	3.0	5.5	4.7	3.7	5.5	**3.9**	4.9	8.4	8.3	5.5
Labour force participation rate, 2004 (% 15-64 years)		79.6	59.9	74.9	77.5	67.8	76.1	**78.0**	79.7	66.2	70.6	80.3
Employment in agriculture, 2004 (%)	*5*	2.6	15.9	1.6	4.5	8.1	3.7	**7.5**	5.0	2.0	4.3	3.1
EDUCATION												
Education, 2004 (% 25-64 years)	*6*	84.3	22.6	87.9	84.0	74.4	64.1	**77.6**	80.2	63.6	89.1	81.4
Expenditure, 2003 (% of GDP)	*7*	6.1	6.8	7.5	4.8	7.5	5.8	**6.8**	5.5	6.1	4.7	7.0
OFFICIAL DEVELOPMENT ASSISTANCE	*8*											
ODA, 2005 (% of GNI)		0.34	..	0.22	0.28	..	0.25	**0.27**	0.52	0.53	..	0.81
ODA, 2005 (USD/cap.)		116	..	93	103	..	82	**67**	189	189	..	389

.. not available. - nil or negligible. x not applicable.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (including all incomes, taxes and benefits) for the entire population.

3) Minimum wage as a percentage of median earnings including overtime pay and bonuses.

Source: OECD.

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OECD EPR / SECOND CYCLE

FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD
52	603	825	111	101	3	40	582	5	163	46	382	105	54	427	90	74	718	598	11617
4.9	6.3	4.0	9.6	-2.6	14.8	15.4	2.6	17.6	8.9	8.3	0.2	6.4	1.6	9.9	5.1	10.1	27.8	4.4	11.6
15.5	109.8	231.1	83.8	108.6	2.8	57.5	193.1	174.8	391.9	14.2	122.1	114.2	109.8	84.4	20.0	179.0	92.1	244.1	33.2
89.6	88.5	134.5	121.5	98.7	52.2	53.5	133.1	75.3	74.2	74.3	76.9	107.8	66.8	116.0	97.3	100.8	19.4	87.1	70.2
82.3	83.8	81.4	81.4	76.9	82.7	80.7	82.5	81.0	81.4	82.3	79.4	80.5	77.8	83.8	82.7	83.7	73.8	80.7	..
3.3	3.9	4.1	4.1	6.6	2.8	4.9	4.1	3.9	4.1	3.2	6.8	4.0	6.8	3.5	3.1	4.2	23.6	5.1	..
7.5	10.5	10.6	10.0	8.0	10.2	7.1	8.8	8.0	9.2	9.2	6.5	10.1	5.9	8.1	9.1	11.6	7.7	8.4	..
27.8	27.4	25.6	19.0	14.0	29.9	32.7	25.7	53.3	27.4	38.1	11.7	17.2	12.9	21.3	28.7	30.4	7.4	27.6	25.3
6.4	7.0	9.8	13.5	8.2	..	15.4	12.9	5.5	6.0	6.3	9.8	13.7	..	11.5	5.3	6.7	15.9	11.4	10.2
25.0	28.0	28.0	33.0	27.0	35.0	32.0	33.0	26.0	27.0	25.0	31.0	38.0	33.0	31.0	23.0	26.7	45.0	34.0	30.7
x	60.8	x	51.3	37.2	x	55.8	x	48.9	47.1	x	35.5	38.2	..	31.8	x	x	..	41.7	..
8.9	9.6	9.5	10.5	6.1	3.1	4.5	8.0	4.8	4.6	4.4	19.0	6.7	18.2	10.6	6.4	4.4	10.2	4.7	6.9
74.1	69.6	77.0	64.8	59.2	83.6	71.0	62.2	66.6	78.6	79.4	63.8	76.9	69.4	69.2	77.8	87.3	51.7	75.9	70.9
4.9	3.5	2.4	12.6	5.3	6.3	6.4	4.5	1.3	3.0	3.5	18.0	12.1	5.1	5.5	2.1	3.7	34.0	1.3	6.1
77.6	65.3	83.9	56.2	75.4	60.0	62.9	48.2	62.3	70.7	88.3	50.1	25.2	84.7	45.0	82.9	84.5	26.1	65.1	67.5
6.1	6.3	5.3	4.2	6.1	8.0	4.4	5.1	3.6	5.0	6.6	6.4	5.9	4.7	4.7	6.7	6.5	3.7	6.1	5.8
0.47	0.47	0.35	0.24	..	..	0.41	0.29	0.87	0.82	0.93	..	0.21	..	0.29	0.92	0.44	..	0.48	0.33
171	165	120	48	..	..	168	86	580	314	600	..	35	..	72	363	238	..	179	121

4) Standardised unemployment rates; MEX, ISL, TUR: commonly used definitions.

5) Civil employment in agriculture, forestry and fishing.

6) Upper secondary or higher education; OECD: average of rates.

7) Public and private expenditure on educational institutions; OECD: average of rates.

8) Official Development Assistance by Member countries of the OECD Development Assistance Committee.

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II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE)

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA
1946 Washington	Conv. - Regulation of whaling	Y D	R	R
1956 Washington	Protocol	Y D	R	R
1949 Geneva	Conv. - Road traffic	Y R		R
1957 Brussels	Conv. - Limitation of the liability of owners of sea-going ships	Y S		
1979 Brussels	Protocol	Y		
1958 Geneva	Conv. - Fishing and conservation of the living resources of the high seas	Y S	R	R
1959 Washington	Treaty - Antarctic	Y R		R
1991 Madrid	Protocol to the Antarctic treaty (environmental protection)	Y R		R
1960 Geneva	Conv. - Protection of workers against ionising radiations (ILO 115)	Y	R	
1962 Brussels	Conv. - Liability of operators of nuclear ships			
1963 Vienna	Conv. - Civil liability for nuclear damage	Y	R	
1988 Vienna	Joint protocol relating to the application of the Vienna Convention and the Paris Convention	Y		
1997 Vienna	Protocol to amend the Vienna convention	Y		
1963 Moscow	Treaty - Banning nuclear weapon tests in the atmosphere, in outer space and under water	Y R	R	R
1964 Copenhagen	Conv. - International council for the exploration of the sea	Y R		R
1970 Copenhagen	Protocol	Y R		R
1969 Brussels	Conv. - Intervention on the high seas in cases of oil pollution casualties (INTERVENTION)	Y	R	R
1973 London	Protocol (pollution by substances other than oil)	Y	R	R
1969 Brussels	Conv. - Civil liability for oil pollution damage (CLC)	Y D	D	S
1976 London	Protocol	Y R	R	
1992 London	Protocol	Y R	R	
1970 Bern	Conv. - Transport of goods by rail (CIM)	Y		
1971 Brussels	Conv. - International fund for compensation for oil pollution damage (FUND)	Y D	D	S
1976 London	Protocol	Y R	R	
1992 London	Protocol (replaces the 1971 Convention)	Y R	R	
2000 London	Amendment to protocol (limits of compensation)	Y R	R	
2003 London	Protocol (supplementary fund)			
1971 Brussels	Conv. - Civil liability in maritime carriage of nuclear material	Y		
1971 London, Moscow, Washington	Conv. - Prohib. emplacement of nuclear and mass destruct. weapons on sea-bed, ocean floor and subsoil	Y R	R	R
1971 Ramsar	Conv. - Wetlands of international importance especially as waterfowl habitat	Y R	R	R
1982 Paris	Protocol	Y R	R	R
1987 Regina	Regina amendment	Y R	R	
1971 Geneva	Conv. - Protection against hazards of poisoning arising from benzene (ILO 136)	Y		
1972 London, Mexico, Moscow, Washington	Conv. - Prevention of marine pollution by dumping of wastes and other matter (LC)	Y R	R	R
1996 London	Protocol to the Conv. - Prevention of marine poll. by dumping of wastes and other matter	R		S
1972 Geneva	Conv. - Protection of new varieties of plants (revised)	Y R	R	R

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OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	**NZL**	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
R	R	R	**R**	R	R	R	R	R	R	R		R	R	R	R		R	R		R	R	R	R	R		R	
R	R	R	**R**	R	R	R	R	R	R	R		R	R	R	R		R	R		R	R	R	R	R		R	
R	R	R	**R**	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	
D		D			D		D	D	D	D			R		S		D	D	R	R		R	D	R		D	
		R			R			S		S						R			R	R		R		R		D	
		R	**S**		R		R	R	R				S	S			R			R		R		R		R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R			R		R	R	R		R	R	R	R	R	R	
R	R	R	**R**	S	R	R	S	R	R	R	R	S			R		R	R	R		S	R	R	S		R	
R					R	R	R	R	R	R	R	R			R		R	R	R	R	R	R	R	R	R	R	
	S				S					S				S			R			R							
						R						R							R		R	S				S	
					S	R	R	R	S	R	R	R			R		R	R	R	S	R	S	R	S	S	S	
						S						S			S				S								
R	R	R	**R**	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	
					R		R	R	R	R			R	R			R	R	R	R		R	R			R	
					R		R	R	R	R			R	R			R	R	R	R		R	R			R	
R	S	R	**R**		R		R	R	R	R	S		R	R	R		R	R	R	R		R	R	R		R	
		R	**S**		R		R	R	R	R				R	R		R	R	R	R		R	R	R		R	
D	D	D	**D**		D		D	D	D	D	D		D	D	D	R	D	D	D	D		D	D	D			
R	R	R			R		R	R	R	R	R		R	D	R	R	R	R	R	R		R	R	R			
R	R	R	**R**		R		R	R	R	R	R		R	R	R	R	R	R	R	R		R	R	R	R	R	
				R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	
D	D	D	**D**		R		D	D	D	D	D		D	D	D		D	D	D	R		D	D	D		D	
R		R	**R**		R		R	R	R	R	R		R	D	R		R	R	R	R		R	R			D	
R	R	R	**R**		R		R	R	R	R	R		R	R	R	R	R	R	R	R		R	R	R	R	R	
R	R	R	**R**		R		R	R	R	R	R		R	R	R		R	R	R	R		R	R		R	R	
R			**R**		R		R	R	R	R				R	R		R	R		R		R	R				
					R		R	R	R	R					R		R	R		S		R	R			S	
R	R	R	**R**	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	**R**	R	R		R	R	R	R	R	R	R	R		R	R	R	R				R	R	R	R	
						R		R	R	R	R	R			R						R	R		R			
R	R	R	**R**		R		R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	R	R		R	
		R	**R**		R		R	S	R	R			R	R			S	R				R	R	R		R	
R	R	R	**R**	R	R	R	R	R	R	R		R		R	R		R	R	R	R	R	R	R	R		R	

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II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA
1978 Geneva	Amendments	Y R	R	R
1991 Geneva	Amendments	Y		R
1972 Geneva	Conv. - Safe container (CSC)	Y R	R	R
1972 London, Moscow, Washington	Conv. - International liability for damage caused by space objects	Y R	R	R
1972 Paris	Conv. - Protection of the world cultural and natural heritage	Y R	R	R
1973 Washington	Conv. - International trade in endangered species of wild fauna and flora (CITES)	Y R	R	R
1974 Geneva	Conv. - Prev. and control of occup. hazards caused by carcinog. subst. and agents (ILO 139)	Y		
1976 London	Conv. - Limitation of liability for maritime claims (LLMC)	Y	R	
1996 London	Amendment to convention	Y S		
1977 Geneva	Conv. - Protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration (ILO 148)	Y		
1978 London	Protocol - Prevention of pollution from ships (MARPOL PROT)	Y R	R	R
1978 London	Annex III	Y R		R
1978 London	Annex IV	Y		
1978 London	Annex V	Y	R	R
1997 London	Annex VI	Y		S
1979 Bonn	Conv. - Conservation of migratory species of wild animals	Y		
1991 London	Agreem. - Conservation of bats in Europe	Y		
1992 New York	Agreem. - Conservation of small cetaceans of the Baltic and the North Seas (ASCOBANS)	Y		
1996 Monaco	Agreem. - Conservation of cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area	Y		
1996 The Hague	Agreem. - Conservation of African-Eurasian migratory waterbirds	Y		
2001 Canberra	Agreem. - Conservation of albatrosses and petrels (ACAP)	Y		
1982 Montego Bay	Conv. - Law of the sea	Y R	R	
1994 New York	Agreem. - relating to the implementation of part XI of the convention	Y R	R	S
1995 New York	Agreem. - Implementation of the provisions of the convention relating to the conservation and management of straddling fish stocks and highly migratory fish stocks	Y R		R
1983 Geneva	Agreem. - Tropical timber	Y R		R
1994 New York	Revised agreem. - Tropical timber	Y R	R	R
1985 Vienna	Conv. - Protection of the ozone layer	Y R	R	R
1987 Montreal	Protocol (substances that deplete the ozone layer)	Y R	R	R
1990 London	Amendment to protocol	Y R	R	R
1992 Copenhagen	Amendment to protocol	Y R	R	R
1997 Montreal	Amendment to protocol	Y R		R
1999 Beijing	Amendment to protocol	Y R		R
1986 Vienna	Conv. - Early notification of a nuclear accident	Y R	R	R
1986 Vienna	Conv. - Assistance in the case of a nuclear accident or radiological emergency	Y R	R	R
1989 Basel	Conv. - Control of transboundary movements of hazardous wastes and their disposal	Y R	R	S

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OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	**NZL**	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
R	R	R	**R**	R		R	R	R	R	R		R		R	R		R	R	R	R	R		R	R		R	
R	R	R		R		R	R	R		R		R					R		R		R	R	R			R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	S	R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R		R	R	R	R		R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R					R	R	R	R	R	R		R	R	R	R			R		R	R		R	R			
R		R	**R**		R		D	D	R	D	R			R		R	R	R	R			R	R	R	R	R	
		R					R	R	S	R						R	S	R				R	R	R		R	
					R	R	R	R	R	R		R			R			R		R	R	R	R			R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	
R	R	R		R	R	R	R	R	R	R	R	R			R	R	R	R	R	R	R	R	R	R		R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R					R		R	R	R	R	R					R		R	R			R	R			R	
		R	**R**	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R		R	R
				R	R	R	R	R	R	R		R		R		R	R	R	R	R	R		R			R	
					R		R	R	R	R							R		R				R			R	S
									R		R				R					R		R					
					R		R	R	R	R	S	R		R	R	R	R				R	R	R	R		R	R
		R	**R**						S													R			R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S		R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S		R	R
S	S	R	**R**	R	R		R	R	R	R	R		R	R	R	R	R	R	R	R		R	R			R	R
R	R	R	**R**	R	R		R	R	R	R	R			R	R	R	R	R		R		R	R	R		R	R
R	R	R	**R**	R	R		R	R	R	R	R			R	R	R	R	R		R		R	R	R		R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	S	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

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II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)

Y = in force S = signed R = ratified D = denounced

		CAN		MEX	USA
1995 Geneva	Amendment				
1999 Basel	Prot. - Liability and compensation for damage				
1989 London	Conv. - Salvage	Y	R	R	R
1990 Geneva	Conv. - Safety in the use of chemicals at work (ILO 170)	Y		R	
1990 London	Conv. - Oil pollution preparedness, response and co-operation (OPRC)	Y	R	R	R
2000 London	Protocol - Pollution incidents by hazardous and noxious substances (OPRC-HNS)				
1992 Rio de Janeiro	Conv. - Biological diversity	Y	R	R	S
2000 Montreal	Prot. - Biosafety (Cartagena)	Y	S	R	
1992 New York	Conv. - Framework convention on climate change	Y	R	R	R
1997 Kyoto	Protocol	Y	R	R	S
1993 Paris	Conv. - Prohibition of the development, production, stockpiling and use of chemical weapons and their destruction	Y	R	R	R
1993 Geneva	Conv. - Prevention of major industrial accidents (ILO 174)	Y			
1993	Agreem. - Promote compliance with international conservation and management measures by fishing vessels on the high seas	Y	R	R	R
1994 Vienna	Conv. - Nuclear safety	Y	R	R	R
1994 Paris	Conv. - Combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa	Y	R	R	R
1996 London	Conv. - Liability and compensation for damage in connection with the carriage of hazardous and noxious substances by sea (HNS)		S		
2000 London	Protocol - Pollution incidents by hazardous and noxious substances (OPRC-HNS)				
1997 Vienna	Conv. - Supplementary compensation for nuclear damage				S
1997 Vienna	Conv. - Joint convention on the safety of spent fuel management and on the safety of radioactive waste management	Y	R		R
1997 New York	Conv. - Law of the non-navigational uses of international watercourses				
1998 Rotterdam	Conv. - Prior informed consent procedure for hazardous chemicals and pesticides (PIC)	Y	R	R	S
2001 London	Conv. - Civil liability for bunker oil pollution damage				
2001 London	Conv. - Control of harmful anti-fouling systems on ships				S
2001 Stockholm	Conv. - Persistent organic pollutants	Y	R	R	S

Source: IUCN; OECD.

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OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	**NZL**	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
			R	R	R	R	R	R	R	R		R				R	R	R	R	R	R	R	R	R	R	R	R
							S	S	S			S				S							S	S		S	
		R	**R**		R		R	S	R	R	R		R	R	R		R	R	S			R	R	R		R	
	R														R			R	R				R				
R	R	R	**R**				R	R	R	R	R		R	R	R		R	R	R	R		R	R	R	R	R	
							S	S	S	S	R						R		R				R				
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R		**R**	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	S	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
					R												R						R				
R	R	R																R					R				R
R	R	R		R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
							S	S		S							S	S					S			S	
							S	S	S	S	R						R		R				R				
		S				S									S												
R	R	R		R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R		R	
								R		S		R				S	R	R		R			R				
R	R	R	**R**	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R		R	R	R	S	R	R
											R				S	R						R	S				
R		S					R	S			R					R		R	R			R	R				
R	S	R	**R**	R	R	R	R	R	R	R	R	S	R	S	S	R	R	R	S	R	R	R	R	R	S	R	R

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II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL)

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA
1948 Baguio	Agreem. - Establishment of the Asia-Pacific fishery commission	Y		R
1956 Rome	Agreem. - Plant protection for the Asia and Pacific region	Y		
1958 Geneva	Agreem. - Adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipments and parts	Y		
1964 Brussels	Agreem. - Measures for the conservation of Antarctic Fauna and Flora	Y		R
1972 London	Conv. - Conservation of Antarctic seals	Y	R	R
1976 Apia	Conv. - Conservation of nature in the South Pacific	Y		
1979 Honiara	Conv. - South Pacific Forum Fisheries Agency	Y		
1980 Canberra	Conv. - Conservation of Antarctic marine living resources	Y	R	R
1981 Lima	Conv. - Protection of the marine environment and coastal areas of the South-East Pacific	Y		
1981 Lima	Agreem. - Regional co-operation in combating pollution by hydrocarbons or other harmful substances in cases of emergency	Y		
1983 Quito	Supplementary protocol to the agreement	Y		
1983 Quito	Prot. - Protection of the South-East Pacific against pollution from land-based sources	Y		
1989 Paipa	Prot. - Conservation and management of protected marine and coastal areas of the South-East Pacific	Y		
1989 Paipa	Protocol - Protection of the South-East Pacific against radioactive contamination	Y		
1985 Rarotonga	Conv. - South Pacific nuclear free zone treaty	Y		
1986 Noumea	Conv. - Protection of the natural resources and environment of the South Pacific region	Y		R
1986 Noumea	Protocol (prevention of pollution by dumping)	Y		R
1986 Noumea	Protocol (co-operation in combating pollution emergencies)	Y		R
1993 Apia	Agreem. - South Pacific Regional Environment Programme (SPREP)	Y		S
1987 Port Moresby	Treaty - South Pacific fisheries	Y		R
1988	Agreem. - Conservation of wetlands and their migratory birds		R	R	R
1989 Wellington	Conv. - Prohibition of fishing with long driftnets in the South Pacific	Y		R
1990 Noumea	Protocol	Y		R
1990 Noumea	Protocol	Y	S	
1992 Honiara	Treaty - Cooperation in fisheries surveillance and law enforcement in the South Pacific region	Y		
1993 Tokyo	Memorandum of understanding on port state control in the Asia-Pacific region	Y	R	
1993 Canberra	Conv. - Conservation of Southern Pacific bluefin tuna	Y		
1995 Port Moresby	Conv. - Regional convention on hazardous and radioactive wastes (Waigani Convention)	Y		

Source: IUCN; OECD.

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OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	**NZL**	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
R	R	R	**R**						R																	R	
	R	R	**R**						R								R			R						R	
R		R	**R**	R	R	R	R	R	R	R	R	R			R	R	R	R	R	R	R	R	R	R	R	R	R
R		R	**R**		R				R						R			R	R							R	
R		R	**S**		R				R	R					R			R	R							R	
		R	**R**						R																		
		R	**R**																								
R	R	R	**R**		R			R	R	R	R				R		R	R	R			R	R			R	R
		R	**R**																								
		R	**R**						R																	S	
		R	**R**						R																	R	
		R	**R**						R																	S	
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		R	**S**																								
R	R	R	**R**																								
R	R	R	**R**																								
		R	**R**																								

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Reference III
ABBREVIATIONS

CFC	Chlorofluorocarbon
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
DAC	Development Assistance Committee of the OECD
DOC	Department of Conservation
EECA	Energy Efficiency Conservation Authority
EEZ	Exclusive economic zone
ERMA	Environmental Risk Management Authority
FAO	Food and Agricultural Organization of the United Nations
GDP	Gross domestic product
GHG	Greenhouse gas
GNI	Gross national income
HCFC	Hydrochlorofluorocarbon
HSNO	Hazardous Substances and New Organisms
ITTO	International Tropical Timber Organization
IUCN	International Union for the Conservation of Nature and Natural Resources
LGA	Local Government Act
LGNZ	Local Government New Zealand
MAF	Ministry of Agriculture and Forestry
MARPOL	Convention on Prevention of Pollution from Ships
MED	Ministry for Economic Development
MfE	Ministry for the Environment
MFish	Ministry of Fisheries
MNZ	Maritime New Zealand
MoH	Ministry of Health
MSD	Ministry of Social Development
Mtoe	Million tonnes of oil equivalent
NGO	Non-governmental organisation
NIWA	National Institute of Water and Atmospheric Research
NZCA	New Zealand Conservation Authority
ODA	Official development assistance
ODS	Ozone-depleting substance(s)

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PCB	Polychlorinated biphenyl
PCE	Parliamentary Commissioner for the Environment
PM	Particulate matter
POP	Persistent organic pollutant
RMA	Resource Management Act
StatsNZ	Statistics New Zealand
WHO	World Health Organization
WTO	World Trade Organization

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Reference IV
PHYSICAL CONTEXT

New Zealand comprises *two main islands and numerous smaller ones* in the south-west Pacific Ocean. With total land area of 270 500 km^2, the country is slightly larger than the United Kingdom. The two major islands make up the bulk of the land area, the South Island accounting for 56% and the North Island for 43%. The sea area in New Zealand's *exclusive economic zone* is six times larger than its land territory. Running 1 600 km from north to south, the country has a coastline of 15 135 km.

The country is *physically isolated*, located nearly 2 000 km from Australia, the nearest continent (Map). This isolation resulted in a high percentage of species endemism; it is estimated that 80% of vascular plants are endemic, 90% of insects, 57% of land and freshwater birds, and 100% of amphibians and reptiles. Besides two species of endemic bat, there are no native land mammals. Instead, ground-dwelling birds such as the kiwi evolved to occupy the niches filled elsewhere by small mammals.

New Zealand's terrain is *predominantly mountainous*, with some large coastal plains. Nearly half the country's land surface has a slope of over 28 degrees, and fully three-quarters has a slope over 10 degrees. The South Island's Southern Alps, which run its length from north to south, include 223 peaks that surpass 2 300 metres, and harbour 360 glaciers.

Before human settlement, forests covered nearly 80% of the land area. By 1600, one-third of indigenous forests had been felled and replaced by grasslands. From 1850, European settlement led to the conversion of another third of the country's forests to farmland, as well as extensive modification of wetlands, coasts and riverbanks. Due to land conversion, the share of indigenous forest and woodland has shrunk to 35% (mostly located in mountainous areas). Pasture is the dominant *land cover*, at 52% overall.

New Zealand's *freshwater ecosystems* include more than 70 major river systems, 770 lakes and at least 73 significant wetlands. They provide habitat to a wide variety of native plants and animals, including 38 water plant species, 35 species of endemic freshwater fish, 34 species of waterbirds and hundreds of aquatic and semi-aquatic invertebrates. More than half of New Zealand's endemic fish (21 species) are members of the galaxiid family, elongate fish lacking scales. Conservation of the four species of mudfish and two species of freshwater eel that occur in New Zealand waters is especially problematic, given their unique lifecycles and their greatly diminished habitat.

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Located in the Pacific rim at the junction of the Pacific and Australian tectonic plates, New Zealand is at relatively high risk of *volcanic activity and earthquakes*. The North Island has four active volcanoes and several dormant ones. Earthquakes are common, with quakes registering 6 on the Richter scale occurring on average once per year, and those of 7 once every decade.

Natural resources include iron ore, coal, gold, timber, natural gas, hydropower, sand and limestone, as well as fisheries. The country's many rivers are swift and well-suited to hydropower generation.

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Reference V
SELECTED ENVIRONMENTAL WEBSITES

Website	Host institution
Central Government	
www.maf.govt.nz/mafnet	Agriculture and Forestry (Ministry of)
www.nzaid.govt.nz	Aid and Development (New Zealand Agency of)
www.doc.govt.nz/index.html	Conservation (Department of)
www.med.govt.nz/Economic	Development (Ministry of)
www.eeca.govt.nz	Energy Efficiency and Conservation (Authority)
www.mfe.govt.nz	Environment (Ministry for the)
www.pce.govt.nz	Environment (Parliamentary Commissioner for the)
www.ermanz.govt.nz	Environmental Risk Management Authority
www.fish.govt.nz	Fisheries (Ministry of)
www.nzfsa.govt.nz	Food Safety Authority (NZ)
www.mft.govt.nz	Foreign Affairs and Trade (Ministry of)
www.govt.nz	Government agencies (general portal for)
www.moh.govt.nz/moh.nsf	Health (Ministry of)
www.beehive.govt.nz	New Zealand Government (Official Website of the)
www.dpmc.govt.nz	Prime Minister and Cabinet (Office of the)
www.msd.govt.nz	Social Development (Ministry of)
www.stats.govt.nz/default.htm	Statistics (New Zealand Office of)
www.treasury.govt.nz	Treasury (New Zealand Office of)
www.tourism.govt.nz	Tourism (Ministry of)

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Local Government

www.lgnz.co.nz	Local Government (NZ National Council of)
www.ecan.govt.nz/home	Canterbury (Regional Council of)
www.hbrc.govt.nz/DesktopDefault.aspx	Hawke's Bay (Regional Council of)
www.gw.govt.nz/section11.cfm	Wellington (Regional Council of)
www.ew.govt.nz	Environment Waikato (Regional Council of)

Non-governmental

www.deerstalkers.org.nz	Deerstalkers' Association
www.ecologic.org.nz	Ecologic
www.eco.org.nz	Environment and Conservation Organisations
www.nzaee.org.nz	Environmental Education (NZ Association for)
www.fedfarm.org.nz	Federated Farmers of New Zealand
www.fishandgame.org.nz	Fish and Game New Zealand
www.fonterra.com/default.jsp	Fonterra Cooperative Group
www.forestandbird.org.nz	Forest and Bird (Royal Society for Protection of)
www.landcare.org.nz	Landcare Trust
www.nzfarmsure.co.nz	New Zealand Farmsure
www.nzwine.com/swnz	New Zealand Sustainable Wine Growing
www.ngaitahu.iwi.nz/Main/Home	Ngai Tahu Development Corporation
www.panpac.co.nz	Pan Pac Forest Products Limited
www.soil-health.org.nz	Soil and Health Association of New Zealand
www.nzbcsd.org.nz	Sustainable Development (Business Council for)
www.sustainabilitynz.org/default.asp	Sustainability Council of New Zealand
www.zerowaste.co.nz	Zero Waste New Zealand

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