

Assessment and recommendations

The Assessment and recommendations present the main findings of the Environmental Performance Review of New Zealand and identify 50 recommendations to help New Zealand make further progress towards its environmental policy objectives and international commitments. The OECD Working Party on Environmental Performance reviewed and approved the Assessment and recommendations at its meeting on 9 November 2016. Actions taken to implement selected recommendations from the 2007 OECD Environmental Performance Review are summarised in the Annex.

1. Environmental performance: Trends and recent developments¹

New Zealand's population enjoys generally high living standards and environmental quality of life. The natural environment is deeply rooted in the cultural identity of the large indigenous Maori population and of the entire country. The use of natural resources underpins New Zealand's small open economy. The products of the primary sector (including agriculture, forestry, fishery and aquaculture products, as well as oil and coal) account for over half of the country's exports. New Zealand is the world's largest exporter of dairy products and sheep meat, and among the largest exporters of forestry products. Agriculture accounts for 7% of value added, more than three times the OECD average. The country's pristine wilderness and spectacular landscapes attract millions of tourists every year.

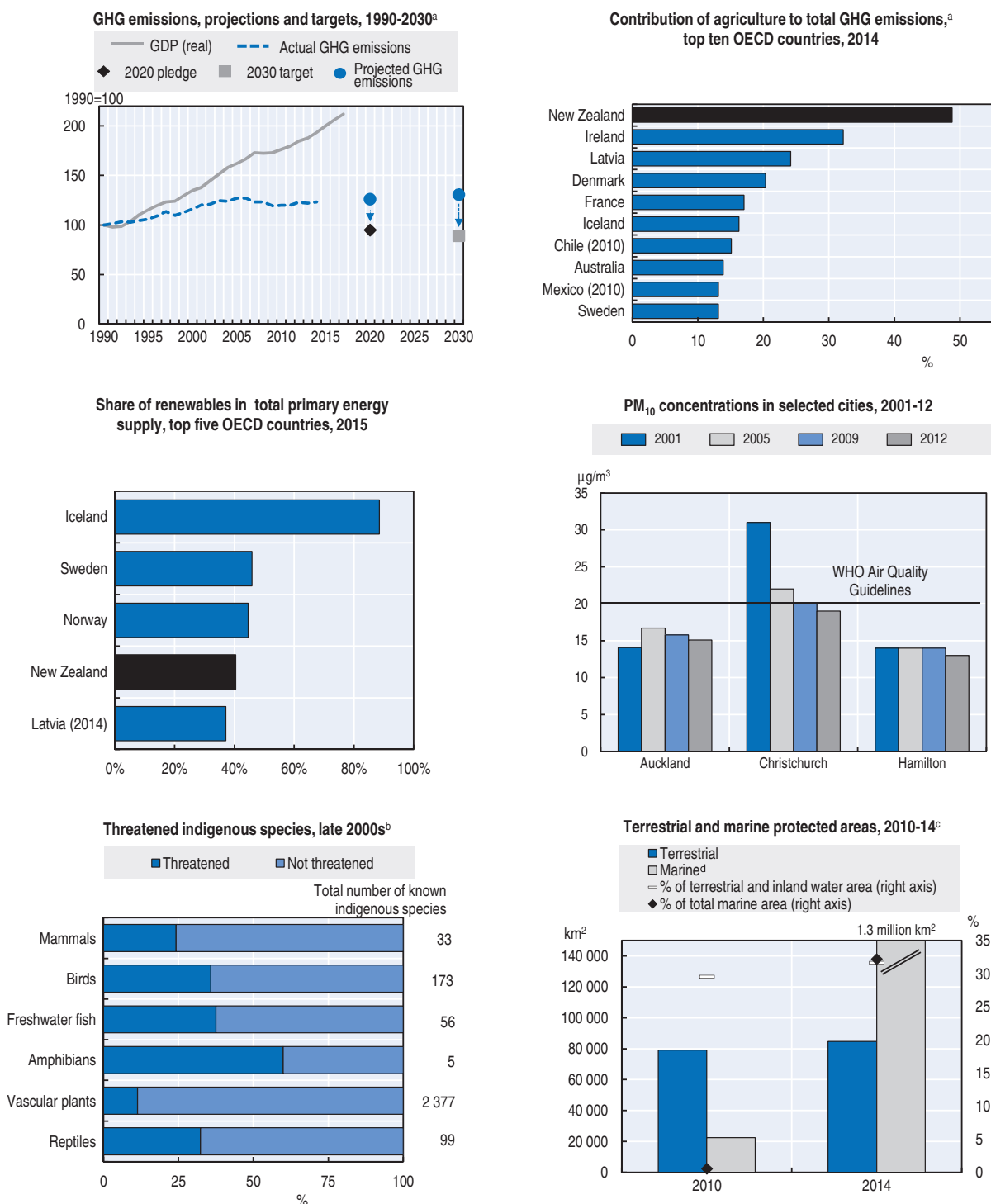
The economy has grown faster than the OECD's as a whole since 2000. Sustained exports and construction activity have been the key drivers of growth. However, fast population growth, partly linked to large immigration flows, has increased housing shortages and costs in major cities (Section 5). Income inequality and poverty rates have risen, and disparities persist in health and education outcomes (OECD, 2015). New Zealand's growth model has been showing its environmental limits, with increased greenhouse gas (GHG) emissions, rising pressures on freshwater (Section 4) and biodiversity, and persistent bottlenecks in transport, water and waste treatment infrastructure.

Climate change mitigation and adaptation

GHG emissions continue to rise: by 2014, they had increased by 6% from 2000 levels, and by 23% from 1990 levels (Figure 1). Road transport, industry and agriculture (mainly livestock production and fertiliser use) have been the main drivers of this increase. The land use, land-use change and forestry (LULUCF) sector removed more than a third of New Zealand's GHG emissions in 2000-14. However, removals have declined in recent years as more planted forests have reached harvest maturity (MfE, 2015). While emissions have grown at a lower rate than the economy and the population, New Zealand's gross GHG emissions per capita and per unit of gross domestic product (GDP) remain among the five highest in the OECD.

New Zealand has an unusual emissions profile: nearly half of its GHG emissions come from agriculture, mainly emissions of methane from ruminant animals (enteric fermentation) and nitrous oxides from animal waste and fertilisers. This is the highest share in the OECD (Figure 1) and reflects the importance of the sector to the economy. Transport, mainly on roads, is the second largest emitting sector; it accounts for 17% of emissions (MfE, 2016a). Motor vehicles are the primary transport mode for both goods and passengers, reflecting New Zealand's dispersed population, a history of low-density urban development and the associated challenges in expanding alternative transport modes, notably public transport. As a result, motor vehicle and car ownership rates are the highest in the OECD. The number of vehicles has increased by 65% since 2000, with a rising share of diesel vehicles. The fleet is relatively old (the average age of cars is 14 years) and emission-intensive (184.8 gCO₂/km compared to 143 gCO₂/km for cars sold in Japan, where most of the New Zealand's fleet comes from).

Figure 1. Selected environmental performance indicators



a) Excluding emissions/removals from land use, land-use change and forestry (LULUCF).

b) Threatened species according to the New Zealand Threat Classification System (NZTCS). The number of known species excludes vagrant and migrant species.

c) Data refer to information available as of 6 August 2014.

d) Include marine protected areas and marine reserves, benthic protected areas and seamount closures; exclude Sugar Loaf Island marine protected area and a range of other areas protected in consideration of domestic protected area planning. Total marine area includes the territorial sea and the Exclusive Economic Zone (EEZ).

Source: Country submission; IEA (2016), *IEA World Energy Statistics and Balances* (database); OECD (2016), *OECD Environment Statistics* (database); The Treasury (2016), *Budget Policy Statement 2016*.

GHG emissions from power generation account for a smaller share of total emissions than in most other OECD member countries, as a result of New Zealand's clean energy mix. Renewable sources represent 80% of electricity generation and 40% of primary energy supply, among the highest shares in the OECD (Figure 1). Energy generation from renewables has increased by 60% since 2000. Most additional supply has come from geothermal sources, which now accounts for 60% of renewable energy supply (both electricity and heat); solar and wind power generation has more than tripled in the same period. Achieving the national target of generating 90% of electricity from renewables by 2025 will contribute to reducing GHG emissions (Section 3). Energy consumption increased at a slower rate than GDP, but New Zealand remains among the ten most energy-intensive OECD economies.

Despite the increase in GHG emissions, New Zealand met its Kyoto Protocol target (reducing annual GHG emissions to 1990 levels over 2008-12) by using its forest sinks and international carbon credits (Section 3). In preparation for the 2015 Paris climate conference, New Zealand announced its intended nationally determined contribution (INDC) to reduce GHG emissions by 30% below 2005 levels by 2030 (equivalent to 11% below 1990 levels). The government ratified the 2015 Paris Agreement in October 2016. Depending on the intended use of forestry sinks and carbon credits, achieving the 2030 target may effectively mean an increase in gross domestic GHG emissions. In addition, the 2030 target is not on the path towards New Zealand's long-term goal of reducing emissions by 50% below 1990 levels by 2050 (Climate Action Tracker, 2016).

Given its largely decarbonised power generation sector and the weight of agriculture-related biological emissions (from livestock and animal waste), New Zealand faces particular challenges in mitigating its domestic GHG emissions. New Zealand's climate mitigation policy largely relies on forest sinks and carbon pricing via the Emissions Trading Scheme (NZ ETS). The system has had limited effectiveness, however, and needs to be strengthened (Section 3). Expanding forest plantations remains a viable option to offset emissions in the short to medium term, while agriculture and other sectors develop and adopt new low-carbon technology. However, the expected mitigation contribution of each emitting sector and the relative role of international carbon credits and domestic actions are not clear. Information on the costs and abatement potential of mitigation options also needs to be improved (Royal Society of New Zealand, 2016).

All emitting sectors, including agriculture, need to take actions in the short term to curb their emissions using the available mitigation options, starting from phasing out fossil fuels from the energy mix and increasing the efficiency of energy use (Section 3). Better urban planning can help reduce energy use and GHG emissions in cities (Section 5). At the same time, New Zealand should continue to promote and support research in new mitigation technologies, especially for biological emissions from farming (Section 3). In September 2016, the government announced the establishment of three expert groups on agricultural biological emissions, forestry and adaptation to build the evidence base on these issues.

New Zealand is vulnerable to the effects of climate change. In some areas of the country, sea level rise and heavier rainfalls will raise the risk of coastal and river flooding; more frequent and intense droughts are expected in other areas. Overall, this will affect tourism, energy supply from hydro, irrigation, agriculture productivity, fish stocks, ecosystems and human health. National legislation requires local authorities to consider the effects of climate change in their planning decisions. However, many struggle to gather and evaluate data and to plan effectively for climate change impacts such as sea level rise (PCE, 2015a).

New Zealand has improved the evidence base of potential impacts. For example, it has developed vulnerability assessments for the tourism and transport sectors. However, these have yet to be translated into sectoral adaptation strategies; similar assessments for other key economic sectors (e.g. agriculture) are lacking.

Air quality management

With increasing road transport, industrial production and power generation, emissions of some major air pollutants (nitrogen and sulphur oxides, and non-methane volatile organic compounds) rose over 2000-14, although at a lower rate than GDP and population growth. Nonetheless, air quality has generally improved, owing mainly to a shift from wood to electricity- and gas-based home heating; national wood burner emission and efficiency standards, and the replacement of older wood burners; improved building insulation; and the introduction of standards for vehicle fuels. Air quality is generally good by international standards (Figure 1), even though short-term air quality standards are breached near busy inner-city roads and in areas with high concentrations of wood burners.

New Zealand has improved the monitoring of particulate matter (PM₁₀) pollution, but fine particulate matter (PM_{2.5}), which has greater health impacts, is still monitored at only a few sites in major cities. Most of the air quality standards, which are part of the 2004 National Environmental Standards (NESs) for Air Quality, follow the guidance of the World Health Organization. However, New Zealand has no national standards on PM_{2.5} concentrations. A review of the NESs' particulate matter provisions is due to be completed in 2017.

Waste management

New Zealand lacks comprehensive, timely and internationally comparable data on waste generation, treatment and disposal. Available data indicate that the generation of municipal solid waste rose by 13% between 2012 and 2014, as a result of increased population and income. The majority of waste is disposed of in landfills. The 2008 Waste Minimisation Act introduced a waste disposal levy (NZD 10 per tonne on waste sent to landfill). Revenue from the levy is used to support waste minimisation activities at national and local level, partly through the Waste Minimisation Fund. However, the levy effectively covers only 30% of total landfilled waste. This hampers its effectiveness in encouraging waste minimisation and alternative forms of waste treatment. There is no national regulation of the disposal of agricultural waste, despite the large size of the sector, nor of hazardous waste landfills, storage or transportation facilities (Section 2). The size and low population density of the country make recycling an economically difficult business. To encourage recycling, the government has accredited 14 voluntary product stewardship schemes.

Waste management practices differ across local authorities. Several local councils have launched programmes and regulations aimed at promoting recycling. For example, recycling requirements have helped the Wellington region reduce the amount of waste going to landfills by 15% in five years. Some cities apply quantity- or volume-based waste charges, which provide incentives to households to reduce waste. Evidence from the Auckland region indicates that districts applying volume-based charges send nearly half of the waste volume to landfills than districts financing waste management through flat charges included in property taxes. This is consistent with experience from other countries (e.g. Germany and Korea). Quantity- or volume-based waste charges could be more extensively applied to encourage waste minimisation and recycling, and finance advanced waste management services.

Biodiversity conservation and sustainable use

Most of New Zealand's native flora and fauna species are endemic, owing to the geographic location and natural history of the country (which evolved in the absence of mammalian predators). Invasive species, predators and habitat fragmentation and degradation continue to push native species into extinction. The species extinction rates are among the highest in the world: more than half of amphibians and roughly a third of mammals, birds, fish and reptiles are under threat (Figure 1). New Zealand is a global leader in pest control methods (e.g. of mammalian predators and invasive weeds). These methods, coupled with specific recovery programmes (e.g. offshore island management), have helped improve the population status for certain species. The Predator Free New Zealand 2050 initiative, launched in mid-2016, foresees the establishment of a public-private partnership company to support large-scale predator eradication programmes.

The area under environmental protection expanded to reach 32% of New Zealand's territory and 30% of the Exclusive Economic Zone (EEZ), shares significantly higher than in most OECD member countries and well above international targets (Figure 1). Almost half of the terrestrial protected areas fall within the most stringent protection categories according to the international classification, and prioritisation of ecosystems for conservation has improved. However, not all ecosystem types are well represented in the protected area network, and some land with significant conservation value has low legal protection status (PCE, 2013a). The government's proposal of a new Marine Protected Areas Act improves the process for establishing and managing marine reserves (the current legislation dates back to 1971), but it would apply only to territorial waters (as opposed to the entire EEZ).

There are concerns that indigenous biodiversity on private land is declining (Brown, 2015). This partly reflects limited use of incentives for landowners to maintain biodiversity and ecosystem services on their land. After an unsuccessful attempt to adopt the National Policy Statement for Indigenous Biodiversity in 2011, the government plans to launch a stakeholder dialogue to develop a new national policy statement by late 2018. Inter-institutional collaboration over biodiversity policy has improved and New Zealand has successfully mobilised local communities to engage in biodiversity protection programmes. However, the separate management of species and ecosystems has led to inefficiencies in preventing biodiversity loss. A more strategic and long-term approach to biodiversity protection and sustainable use is needed. The first step is the delivery of the 2016-20 National Biodiversity Strategy and Action Plan.

New Zealand has made progress in mainstreaming biodiversity considerations into sectoral policies, but pressures from some sectors remain of concern. Agricultural production (mainly dairy farming) has intensified; fertiliser consumption increased faster than agricultural production and value added over the 2000s. This has added to large volumes of nitrogen released to soils from dairy farming, with harmful effects on biodiversity and water quality (Section 4). Organic farming is barely developed, representing less than 1% of agricultural land in 2014, compared with the OECD average of more than 2%. Commercial and customary fisheries have long been primarily managed through a transferable quota system, which has helped reduce overfishing and maintain the fish stock at sustainable levels. A suite of management tools recognises Maori customary non-commercial fishing rights and practices. Several management plans and measures address the effect of fishing methods on seabirds and other marine species, although pressures remain high. The ecological integrity of forest ecosystems is good, although pressures from

invasive species and disease outbreaks are increasing. Forest plantations have expanded as a result of the NZ ETS (Section 3) and of several programmes that support afforestation and forest regeneration to provide carbon sequestration.

Recommendations on climate change, air, waste and biodiversity

Climate change

- Develop a strategic plan for the achievement of the 2030 climate mitigation target; identify the expected contribution of each sector to domestic emission mitigation and the anticipated reliance on international carbon markets; improve the knowledge base on the available mitigation options, their costs and trade-offs.
- Develop vulnerability assessments for all major economic sectors to inform sectoral climate change adaptation strategies; develop mechanisms to mainstream climate resilience into sectoral planning and investment processes; support local communities to mainstream climate resilience into land-use planning.

Air management

- Continue to strengthen the monitoring and reporting of air quality data, in particular of PM_{2.5} concentrations in areas that are likely to exceed international guidelines; broaden the scope of the National Environment Standards on Air Quality to include maximum concentrations for PM_{2.5}.

Waste management

- Extend the waste disposal levy to cover all relevant landfill types; encourage local authorities to introduce quantity- or volume-based waste charges to help minimise waste, foster recycling and improve recovery of waste service costs.
- Improve the collection of data on the generation, disposal and treatment of waste, with a view to producing timely, comprehensive and internationally comparable information.

Biodiversity conservation and sustainable use

- Continue to improve the information base on the state of biodiversity, particularly in private lands; identify conservation priorities and formulate long-term strategies and plans for biodiversity protection and sustainable use; speed up the process for the adoption of a national policy statement on biodiversity; build on international experience in using innovative policy instruments and approaches, including payments for ecosystem services and biodiversity offsetting.

2. Environmental governance and management

Since 2007, New Zealand has made considerable progress in strengthening stakeholder collaboration and engagement with Maori communities at national and sub-national level and implementing recommendations of the previous OECD *Environmental Performance Review* in the areas of environmental information and education. However, some of the 2007 *Review* recommendations in the regulatory domain remain unaddressed, in particular with respect to hazardous waste management, integration of biodiversity considerations into land-use planning, compliance assurance and liability for environmental damage. New Zealand would benefit from introducing approaches and instruments such as integrated pollution prevention and control and strategic environmental assessment, which are widely regarded as best international practices.

Institutional framework

In New Zealand's decentralised system of environmental governance, most policies are implemented at the regional and local levels. The central and local governments are developing ways of working with Maori communities (iwi/hapu) in accordance with the Treaty of Waitangi. At the national level, the National Resources Sector (NRS) – created in 2008 – is a grouping of the eight government agencies with natural resource management responsibilities. Led by the Ministry for the Environment (MfE), the NRS co-ordinates policy making effectively in a number of areas to align economic development and sustainability goals through multiple institutional mechanisms. However, in some areas such as urban development and management of marine ecosystems, co-ordination among institutions is insufficient. This is partly due to the patchy regulatory regime in these domains and lack of clarity in the role of different government agencies (EDS, 2016).

The combination of land-use planning and environmental regulatory powers in the hands of regional and territorial authorities allows adequate consideration of local circumstances. However, with the exception of a few policy areas where National Environmental Standards (NESs) have been established, this system leads to regulatory requirements for economic activities that are inconsistent across the country and overly dependent on local development priorities. The national independent environmental regulator – the Environmental Protection Authority, which was created in 2011 – has a disparate mix of responsibilities under different statutes (e.g. to regulate hazardous substances and economic activities on the continental shelf), but only marginal powers in regulating pollution.

With declining environment-related personnel numbers, the resource capacity of smaller district and city councils is a persistent challenge. This is particularly true in compliance monitoring and enforcement, where local authorities have few dedicated staff. The central government co-ordinates general natural resource management priorities with local authorities. The National Monitoring System ensures the national government's oversight of local-level environmental policy implementation, but includes few outcome indicators.

Regulatory framework

The 1991 Resource Management Act (RMA) is a remarkably comprehensive piece of environmental legislation, governing almost every aspect of environmental management. However, over its lifetime, the RMA has been subject to 21 substantive amendments, doubling in size and inevitably losing some of its coherence. The RMA provides a framework for national environmental policy development via National Policy Statements (NPSs) and NESs; sub-national governments are responsible for implementing national directions. The RMA system presumes the use of land is permitted unless restricted by a regional or district plan.

The development of NPSs and NESs is fragmented and slow (only four NPSs and five sets of NESs adopted over 25 years). The full potential of the RMA for establishing nationwide environmental rules, therefore, has not been reached. The adoption of NESs for water bodies used as sources of drinking water supply and for assessing and managing contaminants in soil over the last decade has strengthened the regulatory framework, but significant gaps remain. New Zealand has not progressed in developing a nationwide regime and standards for managing hazardous waste or biodiversity protection. The

government is aware that national consistency of environmental regulatory requirements is lacking; it plans to issue several new NPSs and NESs in the near future. There is also a lack of guidance from the central government on implementing existing national policies and standards. This leads to uncertainty in achieving desired environmental outcomes and creates an uneven playing field for economic entities. No comprehensive evaluation has analysed the performance of the RMA in order for it to deal with implementation problems and deliver its objectives (Palmer and Blakeley, 2015). More generally, *ex post* evaluation, especially at the local level, could be strengthened.

New Zealand has a complex hierarchy of land-use planning documents at the national, regional and local levels. This often leads to duplication in developing, for example, district and regional plans (Section 5). All regulations and plans are subject to an assessment of costs and benefits (including environmental and social ones) as part of the regulatory impact analysis. The *ex ante* assessment of regional and territorial plans under the RMA includes evaluation of reasonable development alternatives, but not systematic appraisal of significant and cumulative environmental effects. The integration of environmental, particularly biodiversity protection, considerations into land-use planning and management remains a significant challenge.

In a system unusual among OECD member countries, a discharge permit is required whenever an intended development or activity is not in accordance with the rules of the relevant authority's planning document. An assessment of environmental effects (AEE) is required as part of every resource consent application, irrespective of the size of the potential environmental impact. Conditions in discharge permits for air, water and waste are not set according to any nationally standardised methodology, although they must be consistent with NESs. Unlike in many other OECD member countries, there is no system for cross-media integration of discharge permits on the basis of best available techniques that addresses environmental impacts in a holistic way, although conditions may require the permit holder to adopt the best practicable option. Activities that do not require a permit because of their relatively minor impact or historic use rights contribute to cumulative environmental impacts, which are poorly accounted for (Brown, 2016).

Reform of the RMA to reduce the administrative burden on businesses is ongoing. This process includes streamlining development and amendment of policy statements or plans and consideration of resource consent and permit applications. Simplifying regulations for activities with low environmental impact is consistent with good international practices. However, the use of streamlined environmental planning with restricted public participation and no judicial control should be limited to only a few, clearly defined cases to prevent administrative abuse.

Compliance assurance

Most local authorities monitor compliance with resource consents proactively. A growing number have adopted a risk-based approach, prioritising inspections based on factors such as compliance history and the number and complexity of consent conditions. However, over a third of local authorities identified monitoring and enforcement as a "significant capability gap" (NZPC, 2016).

Non-compliance with environmental requirements remains relatively high, with 20% of inspected resource consent holders found to be non-compliant, although fines for criminal offences have been substantially increased. Local authorities lack adequate enforcement

capacity, particularly at the territorial level: under half of local authorities used infringement notices entailing administrative fines in 2014/15, while district and city councils account for only 23% of all environmental enforcement actions in the country (MfE, 2016b).

New Zealand has established soil contamination standards and procedures for the identification and remediation of contaminated land. It uses innovative financial security instruments such as bonds and mitigation trusts to ensure environmental remediation and restoration of ecosystems. However, it lacks a mechanism to enforce liability with respect to past contamination of land or water bodies, or damage to ecosystems and biodiversity. The budgetary Contaminated Sites Remediation Fund administered by the MfE is the main means of addressing land contamination where no liability for the contamination can be assigned.

The central government and local authorities have concluded a number of voluntary agreements with individual companies and industry groups to promote sustainable production practices, including the major “Sustainable Dairying: Water Accord” to reduce agricultural pollution of freshwater bodies. The agreement sets clear environmental performance targets, many of which have already been achieved, and requires regular reporting and third-party auditing (Section 4). The central government also uses sustainable public procurement and corporate environmental responsibility awards to promote green business practices. However, local authorities underuse compliance promotion.

Environmental democracy

There are several opportunities for public participation in the drafting of primary and secondary legislation. In addition, the public can take part in district and regional planning, which provides the regulatory basis for local environmental management. Specific legal provisions implement the consultation rights of the Maori people. One example of collaborative consultation is the Land and Water Forum; it has been effective in bringing together multiple stakeholders to tackle the challenge of water management, including diffuse water pollution from agriculture (Section 4). The plan development process (including standard-setting) is the primary opportunity for public participation under the RMA whereas public involvement in the consent determination process is much more limited (only 4% of consents are notified to the public).

Over the last decade, the country has demonstrated progress in promoting broad access to environmental information. Specifically, it has adopted the 2015 Environmental Reporting Act and implemented the Environmental Monitoring and Reporting initiative to improve collection, management and publication of environmental data. However, unlike most other OECD member countries, New Zealand does not have a Pollutant Release and Transfer Register (PRTR), which would provide the public with industrial release and waste management data.

The Environment Court provides broad and transparent access to justice on environmental matters. The government actively facilitates access of Maori groups, community organisations and other non-governmental organisations (NGOs) to environmental judicial remedies by covering their legal costs through the Environmental Legal Assistance Fund.

New Zealand has made progress in promoting environmental education and incorporating sustainability in the national school curriculum. The national Enviroschools programme and its equivalent for Maori-speaking communities actively promotes voluntary engagement of schools in a “whole school” approach to environmental education.

Recommendations on environmental governance and management

Regulatory framework

- Conduct a comprehensive evaluation of the effectiveness of RMA implementation at the local authority level in achieving its objective of development within the limits of the environment's carrying capacity; consider a regulatory review of the RMA to evaluate whether its framework as a whole remains fit for purpose.
- Prepare new and review existing NPSs and NESs to reinforce the national-level regulatory and methodological framework for managing air and water pollution; establish national standards for hazardous waste management.
- Establish nationally standardised requirements for air and water discharge permits and waste generation and management; encourage better cross-media integration of discharge permits on the basis of best available techniques; extend consent and permit requirements to existing use rights obtained under older regulatory regimes.
- Build capacity of local authorities to carry out their permitting, compliance monitoring and enforcement responsibilities through better nationwide guidance, support and training, including interactive online support; introduce outcome indicators in the National Monitoring System to strengthen the national government's oversight and *ex post* evaluation of policy implementation and enforcement at the local level.
- Evaluate the implementation of requirements for the assessment of environmental effects (AEE) and consider defining environmental impact-based thresholds for activities above which the scope of assessment would remain comprehensive and notification to the public would be mandatory, while smaller activities could undergo simplified AEE without notification.
- Ensure coherence of regional and territorial land-use plans; require explicit assessment of cumulative environmental impacts as part of the planning process; continue efforts to integrate biodiversity protection into land-use planning, particularly on private land.

Compliance assurance

- Promote risk-based targeting and other resource-efficient inspection practices among local authorities; strengthen compliance assurance through more active use of administrative enforcement tools and better national oversight of their consistent application; enhance compliance promotion through best practice guidance.
- Establish mechanisms to enforce strict (independent of fault) liability regime for damage to water bodies and ecosystems; expand the use of bonds and mitigation trusts under the RMA to secure the remediation of potential future environmental damage.

Environmental democracy

- Continue to ensure public participation in land-use planning, limiting exemptions to a few clearly defined cases; build capacity of Maori communities to ensure their adequate participation in resource management planning.
- Establish a Pollutant Release and Transfer Register (PRTR) to collect, and facilitate the public's access to, information on environmental impacts of private companies.

3. Towards green growth

New Zealand has built an international reputation as a “green” country, both as tourism destination and as producer of natural and safe food. In 2011, the government established the Green Growth Advisory Group to advise on green growth opportunities, in line with the 2009

OECD Declaration on Green Growth, and to inform the preparation of the Business Growth Agenda (the government's economic development programme). The Agenda, launched in 2012 and revamped in 2015, considered the recommendations of the Group, but only to a limited extent. It pursues the broad goal of building a more competitive and productive economy; it sets the target of making exports account for 40% of GDP by 2025, up from about 30% in 2015. Among other things, the Agenda focuses on improving the productivity of, and the value generated by, the natural resource-based sectors (including the large export-oriented livestock production sector), while reducing their environmental impact.

Nonetheless, the Agenda is far from providing a long-term vision for the transition of New Zealand to a low-carbon, greener economy. Such transition is likely to entail increasing trade-offs with the current production and export targets. In particular, reducing GHG emissions (Section 1) and improving water quality (Section 4) would be difficult to achieve by relying only on productivity gains and without reducing agricultural output (Royal Society of New Zealand, 2016). New Zealand should accelerate its current work on exploring the economic opportunities that arise from exporting higher value products, tapping into emerging markets and investing in environmental quality improvements to reduce its reliance on natural resource use. This will help the country defend its "green" reputation, which will be increasingly essential for its competitiveness and attractiveness in the global market as consumer and investor preferences shift towards sustainability and strong environmental performance.

Getting prices right

In line with the recommendations of the 2007 OECD *Environmental Performance Review*, New Zealand has extended the use of economic instruments to put a price on environmental externalities and encourage efficient use of natural resources. These include the globally unique nitrogen cap-and-trade system in the Lake Taupo catchment (Section 4), the New Zealand GHG Emissions Trading Scheme (NZ ETS) and the waste disposal levy (Section 1).

The NZ ETS, introduced in 2008, is the cornerstone of the country's climate change mitigation policy. It was designed to operate within the international Kyoto Protocol emission credits market and to cover all GHGs and emitting sectors, including agriculture and forestry – the only ETS in the world to do so. However, the system has been amended several times, which has created regulatory uncertainty for participants. The changes indefinitely postponed the inclusion of biological emissions from agriculture (nearly half of New Zealand's GHG emissions). They also added transitional measures to moderate the impact of the carbon price on participants (such as the so-called one-for-two arrangement² and the delay in phasing out the free allocations to emission-intensive, trade-exposed activities). These provisions, alongside the unlimited availability of cheap international credits, have contributed to weakening the carbon price signal. With the exception of a modest positive impact on afforestation, the effectiveness of the NZ ETS has been limited and is likely to remain so (Leining and Kerr, 2016).

Changes to the NZ ETS are needed if it is to provide a sufficiently high and stable price signal to influence investment decisions and unlock emission mitigation options. In 2015, the MfE launched the third review of the NZ ETS to assess its effectiveness in contributing to achieving New Zealand's INDC. The first phase of the review led to the gradual phase-out of the one-for-two arrangement. The review did not consider the possibility of bringing biological emissions from agriculture back within the NZ ETS, however. New Zealand needs to reassess the decision of indefinitely postponing the entry of these emissions in the

NZ ETS. If such a decision is confirmed, alternative pricing or regulatory measures should make agriculture contribute to achieving climate mitigation objectives. Given the significance of agricultural biological emissions, continuing to shield them from mitigation obligations would make meeting these objectives harder, place a disproportionate burden on other sectors and slow the pace of adjustment in the agriculture sector (Bibbee, 2011). To address this issue, in September 2016 the government announced the establishment of the Biological Emissions Reference Group.

Expanding the use of environmentally related taxes and charges could encourage more efficient use of energy and resources and support the government's ongoing fiscal consolidation efforts. Revenue from environmentally related taxes accounts for 1.3% of GDP and 4.2% of total tax revenue, among the lowest shares in the OECD; it has declined as a share of GDP by nearly 20% since 2000. Unlike many OECD member countries, New Zealand taxes only transport energy, and does so at comparatively low rates. At the same time, the NZ ETS put a price on CO₂ emissions from most fuel use. Overall, 68% of CO₂ energy-related emissions face a carbon price signal (in the form of energy tax or NZ ETS price), which is less than in most OECD member countries (OECD, 2016a). Despite rising emission allowance prices since mid-2015, the carbon price component of energy prices remains negligible, well below a conservative estimate of the social cost of carbon (EUR 30 tCO₂) and too low to influence behaviour (OECD, 2016a; Royal Society of New Zealand, 2016). Even if carbon prices increase further, there is scope to raise taxes on fuels used for transport, heating and industrial processes so long as the NZ ETS does not cap GHG emissions. Fuel taxes can also help take account of local air pollution and other social costs directly or indirectly linked to transport energy use (e.g. noise, congestion and accident costs) in the absence of a sophisticated (country-wide, time- and location-specific) road pricing system, which would be theoretically more efficient.

New Zealand is the only OECD member country to apply an excise duty to petrol but not to diesel; diesel vehicles are subject to a distance-based road user charge instead. As such, the road user charge does not encourage behaviours that would reduce fuel use (e.g. avoiding high-speed driving that uses up more fuel). The tax and charge rates are set based on investment needs, with no consideration for environmental externalities. The differential charging system tends to favour diesel vehicles due to their higher fuel efficiency, but does not consider the higher emissions of local air pollutants from such vehicles. As the road charges are not differentiated by the car's weight or engine size, they provide no incentive to the uptake of smaller or more fuel-efficient vehicles. In addition, New Zealand applies a favourable tax treatment to company cars and parking lots, which is a cost for the public budget and tends to encourage private car use, long-distance commuting and urban sprawl (Harding, 2014). The number of motor vehicles has increased considerably, with higher growth rates for diesel than for petrol vehicles. Lax vehicle standards have favoured the import of used vehicles; as a result, the vehicle fleet is old and relatively inefficient (Section 1). The government should consider introducing fuel efficiency and emission standards for imported (new and used) vehicles. Overall, there is a need for a coherent system of fuel and vehicle standards and charges. Introducing road pricing (tolls or congestion charges) would help improve transport demand management in large urban areas, especially in Auckland (Section 5).

Support to fossil fuel consumption is low in New Zealand in comparison to most other countries. New Zealand is a founding member of the Friends of Fossil Fuel Subsidy Reform, an informal group of non-G20 countries that advocates policy reforms of these subsidies globally.

Leading by example, in 2015, New Zealand voluntarily underwent a peer review of fossil-fuel subsidies in the context of the Asia-Pacific Economic Co-operation. The review concluded that none of the eight measures analysed encourage wasteful consumption, in part because they do not lower domestic fuel prices (APEC, 2015). OECD (2016b) estimates, however, that some of these measures cost the New Zealand government about NZD 60 million in tax breaks and budgetary transfers in 2014. In addition, the free allocations of NZ ETS emission allowances to energy-intensive, trade-exposed activities represent forgone revenue that the government could raise if it auctioned the allowances (PCE, 2016a). The government provides some tax and royalty incentives to oil and gas exploration. As OECD (2013a) indicated, these incentives can distort investment decisions in favour of fossil fuel production and potentially counteract New Zealand's efforts to address global climate change.

Investing in sustainable energy and low-carbon transport modes

Investment in renewables has increased in recent years, without the need for any direct subsidies or public support; geothermal, hydro and wind are cost-competitive. IEA (forthcoming) considers this performance a world-class success story. New Zealand already has the OECD's fourth highest shares of renewables in its energy mix (Figure 1). Renewable sources (mainly hydro) supply over 80% of its electricity (Section 1), and the government aims to bring this share to 90% by 2025. However, some factors constrain the further development of renewable sources: the vulnerability of hydro resources to droughts; their uncertain long-term availability due to climate change and water quality concerns; and the impact of growing shares of variable renewable resources (i.e. wind and solar power) on the stability of the power system.

There is scope to improve energy efficiency as the energy intensity of the economy has remained broadly stable since 2000 at levels well above the OECD average (Section 1). New Zealand's approach to energy efficiency has changed from direct financial support to a greater focus on information and partnerships. The NZ ETS has provided little incentive to invest in renewables and energy efficiency. It is not clear how much further improvement market forces will deliver. A comprehensive package of policy measures is needed to complement the NZ ETS carbon pricing. Such measures should primarily address non-pricing barriers to investing in low-carbon energy sources and adopting energy-efficient technology in industry, transport and buildings (Section 5). This will have multiple environmental, energy security and health benefits.

Investment in land transport infrastructure is significant, but heavily tilted towards roads. In 2012-15, the National Land Transport Fund (NLTF), which receives all revenue from the petrol tax and the road user charge, mostly financed investment in highways and local roads (78% of the NLTF). Public transport, cycling and walking infrastructure received only 10% of the Fund (NZTA, 2015). Additional investments in road infrastructure will be needed to meet increasing demand. However, further developing urban public transport systems and improving service quality and supply of bus services could provide other options for commuters, reduce road congestion and improve environmental outcomes.

With its large share of renewable electricity, New Zealand can use electric vehicles (EVs) effectively to mitigate transport-related GHG emissions. The transport sector is the largest final energy user and the second largest source of GHG emissions (Section 1). So far the uptake of EVs in New Zealand has been limited and growing slowly. In mid-2016, the government launched the Electric Vehicle Programme aiming to double the EV fleet every year till 2021. It foresees exempting EVs from the road user charge until they make up 2% of the light vehicle fleet. This will provide some incentive to users, but the electricity

distribution system will need to be adapted and the charging infrastructure developed to accelerate the mass roll out of EVs. The central and local governments should lead by example and commit to purchase EVs for a proportion of their own fleets, which would provide a strong signal to the transport industry and the public. More advanced options such as a full electric car-sharing service could be piloted.

Promoting eco-innovation

New Zealand has a well-developed innovation system and a sound skills base. In line with an increased emphasis on innovation as a driver of economic growth, public investment in science and innovation has increased by 60% since 2007-08. However, gross domestic expenditure on research and development (R&D) has remained low at about 1.2% of GDP, about half the OECD average. Public institutions, mostly universities and Crown research institutes, conduct most of the R&D. Despite close co-operation between industry and public research, the number of patents is relatively small, and commercialisation of public research results could be improved (OECD, 2014).

The government is the main source of funding for environmental research. Environment-related R&D accounts for nearly 10% of government R&D outlays. This is the highest share in the OECD, but has declined from about 18% in 2007. The share of total energy R&D budget dedicated to renewables and energy efficiency has progressively increased; it exceeded 70% in 2014, although public funding for energy R&D is limited and should be raised (IEA, forthcoming). This has contributed to a steady increase of the number of patent applications related to climate change mitigation technology, a trend observed in many other countries and driven by global climate mitigation commitments. Overall, environment- and climate-related technologies made up nearly 12% of all patent applications in 2010-12, in line with the OECD average and more than three times the level in 2000. New Zealand has developed a specialisation and competitive advantage in some technology fields:³ water, wastewater and waste treatment; water adaptation; and renewable energy generation.

New Zealand's innovation policy has increasingly focused on environment-related research and innovation as a way to improve the natural resource base of the economy. The Conservation and Environment Science Roadmap, under development in 2016, aims to set the future research priorities in these domains. Five out of the 11 "science challenges" included in the National Science Challenges initiative relate to the environment and natural resources. The initiative, launched in 2013, pledges to invest more than NZD 350 million over ten years to support public research on emerging and complex issues for New Zealand's future development by drawing scientists and stakeholders together across different institutions and science fields. The environment is also among the key research sectors identified by the National Statement of Science Investment (NSSI), which identifies priorities for the government's investment in research and innovation in 2015-25. The NSSI has partially shifted research funding from budget allocations for research institutions to contestable funding open to all institutions and science fields, with a view to improving the efficiency of R&D spending and support impact-driven science. However, the bidding process is time consuming and tends to increase the upfront costs of research projects. There are concerns this may negatively affect the retention of research skills and penalise environmental research, which has generally fewer market applications and has, therefore, less tangible impact. Progress has been made in reducing fragmentation of research funding across institutions and support programmes, but administration and transaction costs remain high. The economic efficiency of the environment-related innovation policy and its

contribution to ultimately improving environmental performance, resource productivity and energy efficiency are not systematically evaluated.

New Zealand is a world leader in the research related to reducing the environmental impact from agriculture, primarily on GHG emissions and water quality, and has consolidated its technology specialisation and competitive advantage in this area. New Zealand led the establishment of the Global Research Alliance on Agricultural Greenhouse Gases, which groups 46 countries and fosters international co-operation and investment in research into mitigating GHG emissions from food production. The government, in co-operation with the business sector, has launched several initiatives to support agriculture-related R&D and commercialisation of research results.

Contributing to the global sustainable development agenda

New Zealand has gained a reputation as a “good global citizen”, partly owing to its development-friendly approach in trade negotiations and its support to Small Island Developing States. On the basis of the OECD pilot assessment methodology (OECD, 2016c), New Zealand performs better than the OECD as a whole with regards to meeting most Sustainable Development Goals (SDGs). Spending on official development assistance (ODA) grew considerably in 2010-15; however, at 0.27% of gross national income (GNI), it remains well below the internationally agreed target of 0.7% of GNI. More than 40% of ODA targets environmental objectives (including climate change, biodiversity, desertification, renewable energy, water supply and sanitation), one of the highest shares in the OECD. An export-oriented economy, New Zealand has negotiated numerous free trade agreements, most of which include environmental provisions; it advocates the removal of trade barriers on environmental goods and services. This may support the country’s efforts in developing a greener export base.

Recommendations on green growth

- Establish a whole-of-government, multi-stakeholder process to develop a long-term vision for the transition of New Zealand towards a low-carbon, greener economy, taking into account the opportunities to diversify the economy and reduce its reliance on agriculture and the use of natural resources; develop a framework for monitoring and reporting progress towards green growth objectives, based on sound indicators linking economic activity with environmental performance, as a way to build consensus around the low-carbon, green transition.

Getting prices right

- Reform the NZ ETS at the earliest opportunity to ensure a price of carbon that is consistent with New Zealand’s transition to a low-carbon economy, by i) aligning the supply of NZ ETS units to the country’s mitigation targets and the trajectory towards net-zero emissions; ii) auctioning domestic allocations once the stock of banked NZ ETS units is depleted, and considering the introduction of a floor price, increasing over time, on auctioned allowances; iii) avoiding the use beyond 2020 of international carbon credits that were acquired before 2015; iv) setting a limit to the quantity of international carbon credits that can be used to offset domestic emissions (if international credits become newly eligible); v) establishing a clear timeframe and schedule for phasing out the free allocations of emission allowances to energy-intensive and trade-exposed activities; vi) removing the price ceiling or, at the very least, increasing it over time.

Recommendations on green growth (cont.)

- Set a clear date for the inclusion of biological emissions from agriculture in the NZ ETS or introduce alternative pricing and regulatory measures to enforce emission reduction obligations; place the point of obligation at the farm level; further invest in developing tools for measuring, monitoring and reporting GHG emissions at farm level.
- Expand the use of environmentally related taxes, charges and prices, possibly within the framework of an overall reform of the tax structure, with a view to encouraging more efficient use of energy and resources and supporting the ongoing fiscal consolidation efforts: i) consider introducing an excise duty on diesel and ensure that petrol and diesel tax/charge rates take account of environmental externalities; ii) introduce water pollution charges and taxes on industrial air emissions.
- Systematically assess fossil fuel subsidies and tax exemptions, with a view to identifying those that are inefficient and encourage wasteful consumption and fossil fuel production and should, therefore, be removed.

Investing in sustainable energy and low-carbon transport modes

- Design and implement a comprehensive package of GHG emission mitigation measures to complement the NZ ETS carbon pricing and address non-pricing barriers to the adoption of low-carbon technology and solutions, including for energy generation and use in industry, transport and buildings; carefully assess the interactions between the NZ ETS and other potential GHG mitigation policy instruments.
- Ensure the consistency of investment priorities for land transport infrastructure, and the related financing model, with long-term climate and environmental objectives; reform the tax treatment of company cars and parking spaces; introduce fuel efficiency and air emission standards for new and imported used vehicles; ensure adequate public and private investment for the adaptation of the electricity distribution system and the development of charging infrastructure for electric vehicles (EVs); introduce mandatory EV quotas in the fleets of public institutions.

Promoting eco-innovation

- Develop a science and innovation roadmap to provide a long-term view of innovation policy, while maintaining the current emphasis on environmental research; continue to increase, and provide stability to, public R&D funding to attract and retain innovation capacity; further streamline the innovation and R&D funding system, with a view to reducing transaction and administrative costs; continue to invest in agriculture-related research and to lead internationally the development of technologies and practices to mitigate GHG emissions and reduce water contamination.

Contributing to the global sustainable development agenda

- Maintain the strong commitment to environment and climate change in development co-operation, while increasing the volume of official development assistance in line with international goals.

4. Water resources management

New Zealand's freshwater resources are vital to the primary sector and tourism, as well as to the country's culture. Agriculture is the dominant land use; dairy farming has intensified in recent decades in response to high global milk prices. The link between pastoral intensification and pressures on freshwater quality and quantity is increasingly

being acknowledged (PCE, 2013b; MfE, 2016c). Water contamination from the cumulative effects of diffuse agricultural and urban stormwater run-off (Section 5) is a growing environmental and public health concern. For Maori, freshwater is a taonga (culturally valued resource), essential to life and identity, and they are asserting their right to co-govern water resources and be more actively involved in decision-making processes.

In recognition of the need to safeguard water quality and prevent and reduce over-allocation, New Zealand has embarked on a process of reforming national freshwater policy. Further government support is required to assist regional councils and local communities with setting ambitious goals, and to accelerate implementation of the reform to reduce investment uncertainty and the risk of further pressure on freshwater resources and ecosystems.

State and trends

New Zealand has abundant water resources, with less than 5% of renewable freshwater resources allocated for use. However, rainfall and freshwater availability vary substantially across regions and seasons. A large proportion of annual rainfall occurs in winter when demand for irrigation is relatively low. Some regions are relatively dry and suffer from periodic droughts. Three-quarters of consumptive freshwater is used for irrigation, mostly in the regions of Canterbury and Otago, where summers with low rainfall and high temperatures would otherwise limit farming (MfE and Statistics NZ, 2015). In these regions, as well as in Marlborough and Hawke's Bay, water demand is exceeding what is available and sustainable; freshwater allocated for irrigation of pastoral and arable land increased by 82% between 1999 and 2010. However, the latest data indicate that approximately 35% of the volume of water allocated is not being used, which highlights opportunities for a more efficient reallocation of water (Aqualinc, 2010). Reconciling these competing needs and providing adequate environmental flows for freshwater ecosystems is an emerging challenge, which will be further exacerbated by climate change.

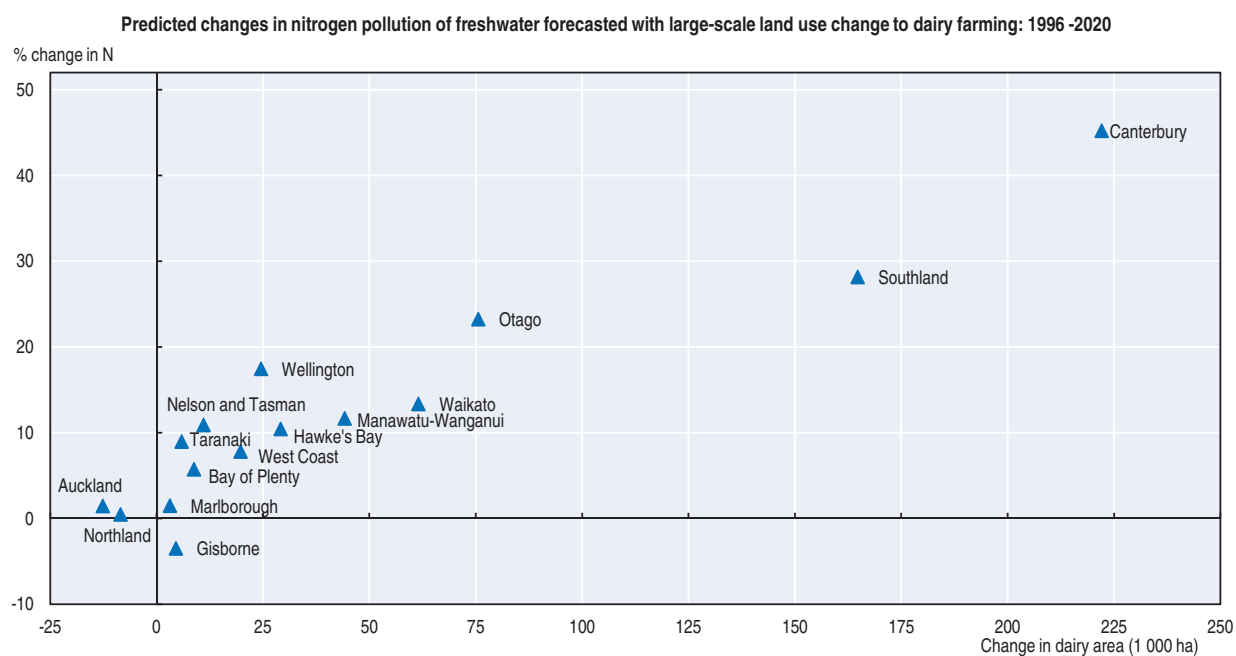
Achieving water quality improvements in many New Zealand catchments will likely require significant manipulation of existing land management, given the intensive nature of the country's agricultural sector and good regulation of point source pollution in most places. Water quality in some regions (Canterbury, Otago, Southland, Waikato, Taranaki, Manawatu-Wanganui and Hawke's Bay) has suffered from diffuse pollution associated with the steady expansion of intensive farming (most notably dairy farming) and urbanisation (PCE, 2015b; see also Section 5). The pollutants of most concern are nutrients, pathogens and sediments. In particular, nitrogen levels from diffuse agricultural sources have continued to increase; between 1998 and 2009, the nitrogen balance worsened more than in any other OECD member country (OECD, 2013b). Over 1990-2012, nitrogen leaching into soil from agriculture increased by 29% and total nitrogen levels in rivers by 12% (MfE and Statistics NZ, 2015). Contamination of groundwater with nitrates and microbial pathogens is recognised as a human health risk. For example, New Zealand has relatively high rates of largely preventable enteric or gastro-intestinal disease in comparison to England, Australia and Canada (Ministry of Health, 2016).


Deteriorating water quality remains one of the biggest threats to native freshwater species, alongside habitat loss and predation from introduced species. New Zealand has some of the highest levels of threatened freshwater species in the world, with almost three-quarters of native fish threatened with extinction. Macroinvertebrate Community

Index scores are poorest in rivers located downstream of catchments where agricultural intensity and urban land cover are high (Larned et al., 2016).

The full impacts of past and present agricultural land-use practices on water quality have yet to materialise; the time lag between improved land-use practices and improved water quality can be long (up to decades), particularly for groundwater resources. There are concerns that even with best mitigation practices, recent elevated inputs from continued large-scale conversion of land to dairy farming, coupled with time lag effects, will result in more freshwater degradation (Figure 2).

Figure 2. Large-scale land-use change to dairy farming is predicted to increase nitrogen loads



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Institutional and regulatory framework

Under the 1991 Resource Management Act (RMA), regional authorities are responsible for the management of water risks – droughts, floods, water quality and freshwater ecosystem degradation – and activities that affect these risks, including water abstraction and wastewater discharges. Regional councils regulate these activities through resource consents and permits (Section 2); these include conditions to ensure that water resource use is compatible with objectives set in regional policy statements and plans. Regional councils must consult with their communities when they prepare and review water management plans. The values of iwi (indigenous communities) are important to freshwater management, and iwi play a key role in decision-making processes; co-management arrangements between iwi, regional authorities and central government are an important element of Treaty of Waitangi settlements. Central government develops national policy guidance to direct and support regional councils.

The RMA has regulated point-source pollution effectively through discharge permits, which set limits for discharging industrial and urban wastewater into water bodies. Adoption of the National Environmental Standard for Sources of Human Drinking Water

2007, along with the Health (Drinking Water) Amendment Act 2007, has strengthened drinking water legislation. However, the control of diffuse pollution and efficient water allocation remain challenging. Water is not always used, or available, for its highest value use (economic, social and environmental) primarily due to over-allocation in some regions and a “first-in, first-served” approach to issuing resource consents for water abstractions.

Until recently, the mix of regulatory and non-regulatory measures has been insufficient to address key pressures on freshwater quantity and quality, partly because of the prolonged absence of national policy guidance (Office of the Auditor-General, 2011). Decision-making processes around resource consents and freshwater management can be litigious and resource consuming, as well as create uncertainty (MfE, 2016d) (Section 2). The adoption of the 2011 National Policy Statement for Freshwater Management (NPS-FM) and the proposed amendments to the RMA are important milestones towards addressing these policy matters.

National freshwater policy reform

The 2011 NPS-FM, updated in 2014, is a welcome step towards addressing water quality and quantity challenges and fills a long-standing gap in national policy guidance under the RMA. It is partially based on the recommendations of the multi-stakeholder Land and Water Forum. The NPS-FM requires regional councils to set quantity and quality objectives, as well as limits and rules to achieve them, based on considerations of human and ecosystem health, by 2025 (or 2030, if 2025 is not practicable). This process is progressing slowly, with regional councils using different methodologies for setting objectives, limits and rules. The NPS-FM deadlines are creating concern for some stakeholders about delaying potential private investment in environmental protection and reducing the opportunity to manage environmental impacts to acceptable levels.

The national freshwater policy reform encourages collaborative governance, whereby regional councils, iwi/Maori, local communities and stakeholders collectively set objectives and limits for freshwater quantity and quality. While voluntary, the collaborative, consensus-driven process enables a shift from effect-based management of resource consents for individual landowners to integrated management of catchments. It also raises awareness of issues among stakeholders, creates buy-in and offers flexibility in achieving water quality and quantity objectives. Consensus through collaborative governance may be one of the greatest strengths of the New Zealand freshwater policy reform, but there are options to improve its effectiveness. Despite the potential benefits of collaborative governance, it is too early to evaluate the outcomes of collective action in New Zealand.

A national framework for collaborative governance, financial and technical support for collaborative groups, and incentives to improve water quality beyond the status quo may provide viable solutions for creating ambitious water quality improvement targets in a shorter period. One such incentive could be to require collaborative group discussions to start at the highest water quality level (e.g. suitable for swimming), and call for disproportionate costs (such as shutting down or reducing production, and the associated economic and social costs) to be proven to reduce water quality objectives towards, but not below, the minimum national standards (see below). This approach would consider social, economic and environmental trade-offs, while ensuring water objectives are set at the most effective level. An independent auditor, such as the Environmental Protection Authority, the Parliamentary Commissioner for the Environment or certified independent experts, could determine what is disproportionate.

The NPS-FM requires that overall freshwater quality within a region be maintained or improved, existing over-allocation phased out, and further over-allocation of water avoided. To guide regional councils and communities through the water quality objective and limit-setting process, a National Objectives Framework (NOF) provides mandatory minimum national standards for water quality (known in New Zealand as national bottom lines), with which the large majority of rivers already comply. Optional water quality guidelines beyond the minimum national standards are provided in the NOF so that objectives and limits can be customised to regional and local needs. Growing concerns about increasing nitrogen pollution and public health risks have led some parties to suggest these minimum standards need to be more ambitious to meet public expectations and to maintain the life-supporting capacity of freshwater ecosystems. For example, there is strong public support for water quality limits to be set at levels suitable for swimming (MfE, 2016c). Important work is ongoing at the national level on setting sediment, dissolved oxygen and nitrate limits to manage algal growth. Water quality parameters are also being set for estuaries, wetlands, intermittently closing and opening lakes and lagoons, and potentially groundwater. The revision or development of new water quality parameters should be expedited to minimise the need for repeated community engagement and consultation and updates of regional plans to meet new regulations.

The success of the NPS-FM will ultimately lie with regional councils and their ability to engage with the communities. There are substantial challenges to manage water within quality and quantity limits and to carry out effective collaborative governance. Guidance for regional councils, including further development of robust science and data to support limit setting and catchment management, will be critical. Improvements in analysis and reporting of environmental data are required, in particular for *Environment Aotearoa*, the national state of the environment report (PCE, 2016b). Continued progress through unambiguous national guidance and a more comprehensive NOF, coupled with holding regional councils accountable for achieving the NPS-FM and their regional plans, will be necessary to ensure success.

Getting the NPS-FM implementation right is critical for recognising the relationship between iwi/Maori and water bodies, maintaining New Zealand's environmental reputation, and reconciling agricultural production and urban development with sustainable management of natural resources. The NPS-FM ultimately aims to ensure the efficient and productive use of freshwater, and to maintain or improve freshwater quality. At the same time, in 2015 the Ministry for Primary Industries set the goal of doubling the real value of primary industry exports by 2025. To achieve both objectives would require a significant improvement in water-use efficiency (both in terms of the quantity of water used and the effects on water quality), and a shift in focus from increasing agricultural production to increasing added value/profitability. Innovations such as precision agriculture can help reduce water consumption and pollution. Ongoing agricultural advisory services and collaboration between universities, research institutes and the agriculture sector can facilitate diffusion of advanced technologies and mobility of skills.

Economic and voluntary instruments to manage water quantity and quality

New Zealand has introduced some economic instruments for water management, but there is still scope for expanding their use to manage water quantity and quality effectively, as recommended by the 2007 OECD *Environmental Performance Review*. Charges for water abstraction and discharges are minimal and cover only the administrative costs of resource

consents. New arrangements are required for allocating water abstraction consents at the catchment scale, and for allocating allowances to discharge diffuse contaminants. In both instances, water use and discharge allowances should be allocated at a level that is consistent with good land management practice. Certainty around the nature of rights attached to water use and pollutant discharge allocations would promote investment certainty for water users and investors. Clarification and recognition of Maori (iwi/hapu) rights and interests in water are required before progress can be made with the introduction of economic instruments. A number of options set a precedent, including co-governance agreements, granting legal personhood to a water body, a permanent allocation of water and/or monetary settlement.

Regional councils require a set of economic instruments to maximise the efficiency of water allocation, within limits, to cater for local circumstances. The current system of “first-in, first-served” water allocation may exclude new entrants regardless of the increased value (social, cultural, economic or environmental) they may bring. Abstraction charges (or resource rentals) can encourage water users to improve water-use efficiency and provide a return to a collective resource to account for negative environmental impacts and opportunity costs. Water consent cap-and-transfer schemes can allow freshwater to move to its highest value use over time. Capping water extractions at a sustainable rate, while accounting for environmental flows and climate change impacts before catchments approach full allocation, is critical; resolving over-allocation *ex post* is more complex.

New Zealand is in a unique, advantageous position to cap and manage diffuse pollution outputs using the national model OVERSEER[®] (a farm-scale nutrient budgeting and loss estimation model), rather than regulating pollution through proxies such as fertiliser use and livestock numbers, which can be less effective at reducing pollution. Calculated nitrogen surplus at the farm level, and nitrogen concentrations in wastewater discharges from municipal and industrial users, could set the basis for a nitrogen pollution charge regime to internalise the full cost of pollution, in line with the polluter pays principle.

Water quality cap and transfer can allow a more efficient polluter to expand output, while ensuring that the burden of pollution remains capped. In 2011, New Zealand implemented a globally unique water quality cap-and-trade market involving diffuse sources of nitrogen pollution in the Lake Taupo catchment. It is too early to assess the impact on water quality, but the market has provided the flexibility for land to move to its highest value use, while meeting the overall nitrogen load reduction targets (Duhon et al., 2015); however, this has come at a significant cost to the public to buy back land to retire from intensive agriculture.

This bold policy experiment provides lessons for establishing similar systems in other catchments at a lower cost. Determining the current level of water quality, the assimilative capacity of water bodies and the level of water quality required to maintain ecosystem functioning while accounting for time lags will be necessary as part of setting water quality caps at the catchment level. The measurement of both environmental costs and opportunity costs is a difficult exercise, one that a natural capital accounting approach may support. Further investment in calibration and validation of the OVERSEER[®] is required to improve its accuracy.

Agreements between industry and government such as the “Sustainable Dairying: Water Accord” have had success in improving water quality. Thanks to this accord, environmental best practices (e.g. fencing dairy cattle off from waterways) have been put in place more rapidly than would have occurred through new regulations, which require public consultation and are open to potentially lengthy court cases.

Financing water resource management

The droughts of 2007-09 and 2012-13 demonstrated the vulnerability of New Zealand's weather-dependent and predominantly pasture-based agriculture industry and economy to variable rainfall patterns. The government is providing grants and concessional financing to help fulfil irrigation's potential to increase export earnings and accelerate New Zealand's economic development; NZD 400 million has been allocated for irrigation schemes in 2016-19. Creating greater efficiency in water use and augmenting surface and groundwater flows have the potential to reduce pressure on water resources and address over-allocation. There are economic benefits from supporting the development of irrigation; it contributed an estimated NZD 2.17 billion to the national economy in 2011/12 and this value continues to grow. However, these estimates do not include environmental and social impacts of irrigation, or the marginal benefits of individual projects, and the benefits largely accrue to the agriculture and processing industries.

Government promotion of, and financial support for, increasing irrigation and more intensive agriculture – without operational rules and regulation to protect river flows and water quality under the NPS-FM and reflected in regional plans – are likely to further increase pressures on freshwater resources. Environmental gains may be limited if more efficient irrigation techniques do not result in lower net water use, but simply allow an increase in irrigated volume or area. The government also provides funding across multiple schemes to enable greater protection of water bodies and to address historic pollution. An increase in water pollution associated with land-use intensification is recognised as a risk that needs to be managed, as it runs counter to the objectives of this water quality funding. Natural capital accounting could be explored to evaluate the costs and benefits of irrigation and clean-up projects compared to realistic alternative approaches, and assist with resource management decisions.

Greater financial support is required for regional councils, which are already struggling to manage freshwater effectively. Considerable finances will be needed to continue to fund regional collaborative groups and technical advisory groups, address historic pollution, and invest in science and innovative technologies to achieve freshwater objectives. Greater support and funding will also be required for regional councils to increase their capacity for more effective implementation, monitoring, enforcement and reporting. The government proposes to increase the ability of councils to recover costs from water users for monitoring, enforcement, research and management. The use of economic instruments could also be used as a source of revenue to recover costs for water management.

Recommendations on water resources management

- Foster coherence between water, climate and primary industry policies; develop a whole-of-government long-term strategy to increase the added value of export products within climate and freshwater quality and quantity objectives; explore options to diversify the agricultural sector, improve trade relations, tap into emerging markets.

National freshwater policy reform

- Continue partnerships with Maori/iwi in policy development and decision making at both central and local government levels; under the principles of the Treaty of Waitangi, address iwi proprietary and non-proprietary rights and interests in freshwater (quantity and quality).

Recommendations on water resources management (cont.)

- Increase financial support and capacity for regional councils to deliver on, and expedite implementation of, the National Policy Statement for Freshwater Management (NPS-FM); assist with the development of robust science at regional and catchment scales; encourage regional councils to make progress even without absolute science and enable flexibility in policy to periodically review water quantity and quality limits; increase investment in research and innovation to develop new water pollution abatement technologies (including OVERSEER®).
- Review implementation of the NPS-FM to ensure that water quantity and quality limits set locally are ambitious and comprehensive enough to achieve national ecosystem and human health objectives and public expectations; establish performance indicators to track and evaluate implementation of the NPS-FM by regional councils, and strengthen compliance monitoring and enforcement of resource consent conditions; ensure the revision or development of new water quality parameters is expedited to minimise the need for repeated community consultation and updates of regional plans.
- Require regional councils and collaborative groups to start discussions around water quality limits at the highest level (e.g. at water quality suitable for swimming); if necessary, the case can be made to argue away from such limits, within the bottom lines, if disproportionate costs can be proven.
- Develop a national framework for collaborative governance to ensure the appointment of collaborative groups reflect a balanced range of the community's interests, values and investments, including the unique position of Maori, as well as to clarify the process, including the ultimate line of decision making, the objectives of collaborative governance and expected use of outputs; develop indicators to test that collaborative group recommendations comply with, or give effect to, the RMA and the NPS-FM and to evaluate the cost effectiveness of collective action.

Financing water resource management

- Review government support for irrigation to ensure that funding is only provided for projects that would not proceed otherwise, and that have net community-wide benefits; conduct, and release publicly, cost-benefit analyses of irrigation projects that are eligible for financial support; any funding should seek to achieve the greatest return on investment in terms of long-term, measurable environmental, economic and social outcomes.

Economic instruments to manage water quantity and quality

- Rationalise and expand the use of water demand management measures, including volumetric pricing to recover costs of water management and reflect environmental impacts and opportunity costs associated with scarcity; strengthen and expand water markets where appropriate to encourage innovation and the efficient use of water, particularly in stressed and over-allocated catchments.
- Introduce pollution charges or enable water quality trading to internalise the environmental and opportunity costs of diffuse pollution from rural and urban sources, and promote innovation in pollution control; develop a strategic financing model for the remediation of historically contaminated water sites.
- Experiment with natural capital accounting to provide a basis for valuing water resources and freshwater ecosystems, and quantifying the costs and benefits of freshwater policy and management decisions.

5. Sustainable urban development

New Zealand is among the most urbanised countries in the world. In 2014, 86% of the population lived in cities and towns of 1 000 inhabitants or more (UN, 2014). This makes the environmental footprint of cities particularly important to national environmental performance and citizens' quality of life. Auckland, the only large city by international standards, accounts for roughly one-third (1.45 million) of the country's population and GDP. It hosts the country's major commercial and manufacturing centres, and serves as the most important logistical trade node. Other important cities are the capital Wellington and Christchurch (with nearly 400 000 residents each); another dozen towns are home to more than 50 000 inhabitants.

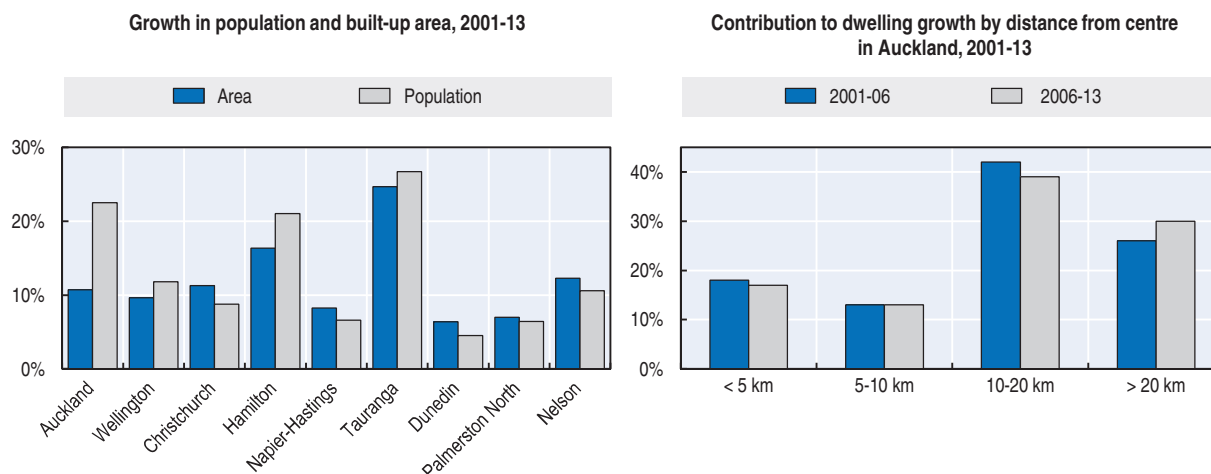
Most urban areas are experiencing pressures from population growth. Growth was particularly strong in Auckland and its two neighbouring cities Hamilton and Tauranga (with growth rates above 30% over 2000-15). Auckland's population is expected to increase by another 50% over the next 30 years. Urban population growth has provoked severe pressures on land use, environment, housing and water, and transport infrastructure, particularly in Auckland. The challenge for Auckland and other fast-growing cities is to accommodate a larger population in a way that makes more efficient use of space and infrastructure, and that enhances environmental sustainability, well-being and the economic viability of development. Coherent national policies promoting sustainable development and green growth are critical to support cities in achieving these objectives and to ensure coherence and consistency between national and local policies.

Key urban and environmental trends

As in many "new world" countries, cities in New Zealand have largely developed in tandem with the expansion of motorisation. As such, their urban form reflects the prevalence of private motor vehicles as the dominant transport mode, as well as a cultural preference for stand-alone houses (Howden-Chapman et al., 2015). Cities generally feature small high-density areas and large low-density peri-urban suburbs. Most have been expanding to accommodate their growing populations, with the lion's share of the new built-up area located at the city fringes and greenfields. Auckland's built-up area increased by about 10% since 2001 (Figure 3). However, with the city's population growing even faster, the city's population density has increased.

Despite expansion, housing supply has not met the demand of a rapidly growing population. House prices have risen sharply (by some 50% over 2013-16 in Auckland), eroding affordability and raising financial stability risks (OECD, 2015). The environmental performance of the housing stock in New Zealand cities is relatively poor. About 30% of New Zealand homes are poorly insulated and a quarter of homeowners and half of renters report problems with dampness or mould. This incurs significant economic costs, and is detrimental both to environmental performance (e.g. increasing energy consumption) and public health. New Zealand cities face spatial inequalities as wealthier and more educated people tend to live in suburbs nearer the city centre or with natural amenities (NZPC, 2016).

The level of public transport use has increased in most major cities, but remains low by OECD standards. In most cities, dwellers travel more than 90% of distances in private motor vehicles, facilitated by large areas devoted to roads and parking. Significant investment has expanded both Auckland's public transport and motorway capacity, which has helped accommodate population growth and keep congestion levels relatively stable over the past

Figure 3. **Population and built-up area are growing in many cities**

Source: Based on New Zealand Productivity Commission (2016), Better Urban Planning (draft); Nunns (2014), *Population-weighted densities in New Zealand and Australian cities: A new comparative dataset* (database).

StatLink  <http://dx.doi.org/10.1787/888933459632>

15 years. However, the city's congestion levels remain the second highest in Oceania (TomTom, 2016). Heavy reliance on private motor vehicles results in air quality falling below required standards in areas close to highways and arterial roads (which are also heavily used by diesel-powered heavy vehicles). Transport-related energy use and greenhouse gas (GHG) emissions are high and increasing. Yet GHG emissions at city level have increased less than GDP and population growth. Auckland and Wellington have lower carbon dioxide emissions per capita than many cities in Australia, Canada or the United States.

Environmental quality of life in New Zealand cities is relatively high. Cities are relatively green, with large gardens and easy access to natural areas. Within Auckland's urban area, green spaces occupy a quarter of the land. Urban air quality has improved and is generally good compared to many cities in other OECD member countries; average concentrations of fine particulate matter and nitrogen oxides generally meet national standards or international guidelines for air quality. Further, 96% of the urban population is connected to wastewater treatment services (NZPC, 2016). However, sewerage infrastructure expansion and stormwater management have not kept pace with population growth. This has resulted in frequent overflows of sewerage systems in rainy periods, which can have severe impacts on water quality. More than half of Auckland's freshwater streams and a third of marine waters are in a degraded or poor state. In addition, urban expansion into greenfield areas has contributed to soil degradation and habitat fragmentation. A number of cities started implementing policies to reduce waste generation and encourage recycling, but data limitations hamper the tracking of progress. Many of these pressures are likely to intensify as the population and built-up area grow.

The institutional and policy frameworks for sustainable urban development

In contrast to many OECD member countries, New Zealand has no national policy, or vision, for urban development. Yet many cities, including the three largest ones, have adopted urban development strategies pursuing the goal of compact urban form. These strategies aim to reap the economic and social benefits from agglomeration, increase accessibility and public transport use and, ultimately, reduce potential environmental

impacts of sprawling cities (NZPC, 2016). These cities have, therefore, adopted policies that constrain urban outward expansion and promote densification. However, several factors have prevented significant progress: institutional fragmentation; a complex planning system; insufficient national guidance; poor integration of land use, transport and infrastructure decisions; and lack of community support.

As in many countries, administrative boundaries do not match the extent of built-up areas in several New Zealand cities, which undermines coherent and integrated urban planning. To facilitate integrated decision making, a national law agglomerated all local authorities in the Auckland region (seven local councils and a regional council) into one single metropolitan governance body (named Auckland Council) in 2010 and required it to develop a spatial plan. The reform enabled the council to tackle issues beyond the capacity of previously individual councils (such as advancing network investments in the area of sewerage and wastewater management) and improved vertical co-ordination. Several smaller cities have, at their own initiative, established looser forms of inter-municipal collaboration, such as mayoral forums and joint working groups, but institutional co-ordination remains weak. The multiplicity of interlocutors for city governments at the national level, and insufficient co-ordination among them, limit an integrated approach to urban planning. In the absence of formal structures to co-ordinate large urban infrastructure projects, ad hoc collaborative processes try to resolve long-standing tensions between the central government and Auckland government in transport and housing (NZPC, 2016).

Three core pieces of legislation (Resource Management Act or RMA, Local Government Act and Land Transport Management Act) govern urban planning through a hierarchy of plans from the national to the local level. The different procedures, criteria and timeframes for planning and decision making required by these acts have led to a proliferation of local planning documents, duplication of efforts and considerable investment of time and resources by all parties involved.

National guidance is lacking on how to implement the RMA (the primary land-use legislation) in urban settings and on how to reconcile different planning instruments. This has led to inconsistencies across plans, misalignment of policy and application of unnecessarily restrictive and complex land-use regulations, which have ultimately frustrated both the objectives of urban growth and environmental protection. In a welcome step, the government announced that the National Policy Statement (NPS) on Urban Development Capacity would come into effect in December 2016. However, the NPS focuses heavily on land supply and capacity for housing and business development. While it requires the integration of infrastructure, business and residential planning, it misses the opportunity to provide city councils with guidance on how to manage urban growth in a way that would enhance urban environmental performance.

Spatial plans (i.e. plans integrating land use, housing, transport, infrastructure and other urban planning issues) are not mandatory in New Zealand cities, with the exception of Auckland. In 2012, the Auckland Council adopted the Auckland Plan, a comprehensive spatial plan that established a clear vision and strategic direction for the region's development over 30 years, accompanied by objectives and measurable targets. Land use, housing, transport and infrastructure planning documents are to be explicitly aligned to the Auckland Plan for prioritising resource allocation. Some cities (or groups of neighbouring authorities) have also moved towards strategic spatial planning on a voluntary basis. However, these strategies have limited legal weight and no formal links with statutory

planning and budgeting processes under the three core acts mentioned above, which hampers their implementation.

Despite recent reforms to streamline decision-making processes (Section 2), processes to establish or change land-use rules and regulations are complex and slow; it can take more than eight years on average to develop a new land-use plan and four years for councils to amend an existing one. This is in part related to the resistance of land- and homeowners to urban development that could affect the value of their properties and the character of their neighbourhoods. Local interest groups have often used the extensive rights of appeal under the RMA to thwart development of wider public interest (NZPC, 2016). Against this background, special legislation was passed for the development of Auckland's land-use plan (the Auckland Unitary Plan). The process combined extended public publication at the early stages of the process with limited rights of appeal once the plan is approved. The 2015 Resource Legislation Amendment Bill (under discussion at the time of writing) envisages a similar collaborative process. Information campaigns and demonstration projects could be used to influence the prevailing risk aversion and conservative attitudes.

A common set of urban environmental and economic indicators (e.g. housing density, housing quality, water and waste management, access to green spaces) would help benchmark cities and compare best practices, both within New Zealand and internationally. It would also improve transparency, support decision making and allow better evaluation of urban development and planning. Some cities collect and publish data on selected variables (such as water consumption and GHG emissions); however, these data are neither collected systematically nor compiled at national level. The newly-formed Auckland Council published its first comprehensive State of the Environment Report in 2010.

Land use and building regulations

In the context of legislative uncertainty and limited national guidance, many local authorities have struggled to develop effective tools to guide land use. Land use is predominantly managed through regulatory measures, taking the form of urban growth boundaries and zoning. To date, these tools have shown limited success in guiding urban form (e.g. achieving compact development objectives), while indirectly contributing to rising land and house prices in fast-growing cities. Land prices inside Auckland's urban growth boundary are nearly ten times higher than outside, while a suite of complex and restrictive land-use rules (e.g. building heights, minimum lot sizes, etc.) has made inner-city development more difficult and expensive (NZPC, 2016; OECD, 2015; Zheng, 2013). Some rules, such as parking requirements, may run counter to sustainability objectives (e.g. they favour private car use over other transport modes).

To ease pressures on housing supply, the proposed Auckland Unitary Plan would substantially revise land-use rules. Specifically, they would allow for significant intensification in some districts, while enlarging the urban area through a new, more flexible growth boundary. In addition, an accord between the government and Auckland Council established some 100 Special Housing Areas for new development with reduced consenting times and limitations for appeals. However, most of these areas are situated in greenfield areas, potentially frustrating intensification objectives. Any regulatory measure used to increase housing supply should be carefully assessed against its effects on urban form and its contribution to reducing fossil fuel consumption and related emissions from private car use and buildings, and soil and habitat degradation. At the same time, tackling the housing shortage will also require actions beyond land supply, including addressing bottlenecks in

the construction industry and reviewing tax provisions that favour real estate investment over other forms of long-term wealth accumulation.

The government has taken significant action to improve the quality of the built environment. Subsidies under *Warm Up New Zealand: Healthy Homes* retrofitted about 15% of the national housing stock. However, 30% of homes remain uninsulated, many of which are rental buildings. The government recently strengthened insulation requirements for rental properties (which will take effect in 2019). To avoid retrofitting needs for new housing, the government should consider modernising national building standards, which are below standards required in many other OECD member countries. New Zealand operates different voluntary building performance rating tools. Making assessments (e.g. for energy performance) mandatory for certain buildings, and gradually rolling out requirements to a larger share of the housing stock, would encourage the market to factor in energy efficiency into property prices. Building performance could also be linked to fiscal instruments (e.g. development contributions in Wellington are lower for buildings with strong environmental performance), or ease regulatory requirements (e.g. granting additional floor area for high-performing buildings).

Economic instruments for sustainable urban development

New Zealand should consider more systematic use of pricing instruments to achieve urban policy objectives. Some cities introduced pricing instruments in water and waste management, with positive results. Water charges helped per capita water consumption drop by roughly 30% since the introduction of universal metering and volumetric charging in Auckland, Tauranga and Nelson. Water consumption remains significantly higher in cities that do not charge for water supply by volume (e.g. Christchurch and Wellington). Current legislation limits the ability of cities to apply volumetric charges to wastewater services and make greater use of road tolls and congestion charges (NZPC, 2016).

There is also wide scope to make better use of pricing instruments to encourage efficient land use. Development contributions (levied to finance infrastructure) do not reflect the true cost of providing infrastructure to a specific area. This makes inefficient land use artificially cheap (e.g. “leapfrog development” that takes place away from existing infrastructure) and potentially accelerates urban sprawl. Limited distinctions between development contributions across building types and characteristics (e.g. size or energy efficiency) translate into weak incentives for developers to build high-performance buildings or low-impact infrastructure. Financial contributions (levied to reflect costs of development on the environment) are often charged at a fixed rate, rather than being based on the marginal environmental damage of development, and the Resource Legislation Amendment Bill proposed to remove them entirely. Property taxes (called *rates*) are mostly levied on the basis of capital value (rather than land value), which may favour greenfield over infill developments insofar as they are permitted.

Expansion of pricing instruments would also diversify funding options available to city councils; many councils need significant investment to accommodate population growth, including in water and wastewater, roads and public transport infrastructure. The central government finances about half of local roads or public transport, but entirely finances state highways; this creates incentives for local government to opt for state highway over local road and public transport solutions (PCE, 2016a). Funding heavily relies on property taxation (i.e. general rates), which implies large cross-subsidies from the general public and weakened incentives for councils to accommodate growth (as infrastructure investment may

lead to a higher tax burden on the community). User- and beneficiary-based funding (e.g. through road and water pricing and better targeted development contributions) would reduce the burden on the public budget; at the same time, it would contribute to better demand management and more efficient use of land and resources. There may be room for the tax system to capture windfall gains accruing to landowners from infrastructure improvement (e.g. betterment levies) and rezoning land for urban use (land-value capture) to pay for required infrastructure.

Recommendations on sustainable urban development

The policy and planning framework

- Examine how to improve procedures, criteria and timeframes for planning and decision making to allow for more integrated and timely management of natural resources and urban environment while preserving the ability for effective local participation.
- Consider making spatial planning mandatory for all urban areas with population over 100 000, while simplifying infrastructure and transport planning requirements; provide greater recognition and legal weight to spatial planning initiatives in smaller urban areas, and guidance on how spatial planning should be conducted; at the very least, clarify the hierarchical relationships and linkages across planning instruments for land use, infrastructure and transport and, where possible, align planning horizons and review periods.
- Broaden the scope of the National Policy Statement on Urban Development Capacity, or develop other legally binding measures to ensure that local planning processes and instruments i) recognise and encourage good urban design outcomes and principles for sustainable urban development; ii) identify and appropriately manage important or sensitive environmental systems; and iii) incorporate climate change mitigation goals and resilience against climate change and natural hazards.
- Facilitate the decision-making process to change existing land-use plans and reduce the scope for vested interests to thwart development of wider public interests (e.g. by front-loading public consultations and ensuring an independent expert review of proposed plans and suggestions from the public).
- Create a common set of urban environmental and economic indicators to increase transparency on cities' environmental performance, facilitate benchmarking and identification of best practices, inform decision making and allow for better policy evaluation.

Institutional framework and multi-level governance

- Establish a national co-operative structure comprising national institutions with responsibilities for urban-related matters (e.g. on the model of the Natural Resources Sector), with a view to improving horizontal and vertical policy co-ordination.
- Consider replicating the Auckland institutional reform in other major urban areas, with the necessary adjustments, and encourage partnerships among smaller municipalities with a view to overcoming institutional and land-use planning fragmentation.

Regulations and economic instruments for sustainable urban development

- Ensure that regulations in land-use plans pass robust cost-benefit analyses that consider environmental outcomes (including effects on transport, green spaces, etc.), as well as economic and social outcomes (including distributional consequences and intergenerational equity).

Recommendations on sustainable urban development (cont.)

- Make more systematic use of development contributions and rates to guide efficient and sustainable urban land use by: i) differentiating development contributions along the location and type of development to reflect the true cost of development on infrastructure and service provision; ii) considering adjusting development contributions and rates where development yields positive effects on the environment; and considering maintaining financial contributions or develop other instruments to reflect the environmental costs of developments.
- Remove barriers to road pricing (e.g. road tolls and congestion charging) and encourage councils to introduce volumetric charging for drinking water supply, with a view to foster efficient use of infrastructure and resources, while reducing the burden on local government budgets.
- Consider the use of betterment levies (e.g. through targeted rates) as an additional cost-recovery mechanism for infrastructure and services provision, especially where development and financial contributions do not apply; and explore alternative instruments to finance urban infrastructure, including taxing windfall gains occurring to landowners following rezoning of urban land (value capture).
- Review whether the current design of property taxation is aligned with land-use objectives and assess the potential benefits of shifting the property tax structure towards a land tax or to split rates.
- Assess the environmental, social and economic implications of the funding model for roads and public transport; promote innovation encouraging alternative options for public transport (e.g. car-sharing, demand-responsive transport in small or low-density cities), while continuing to expand and improve conventional public transport services.

Sustainable housing

- Improve the environmental performance of the building stock to reduce health impacts from poor insulation and the emission of air pollutants from inefficient heating by: i) modernising and strengthening national building standards; ii) establishing supplementary incentives to promote investment in insulation and modern heating in rental buildings; and iii) encouraging new housing to meet best practice urban design and sustainable housing principles.
- Ensure that areas of fast-track residential development (notably those created under the Special Housing Act) are screened against environmental impacts, especially against cumulative and irreversible impacts.

Notes

1. See Section 4 for water management.
2. The one-for-two arrangements (removed in mid-2016) had allowed non-forestry sector participants to surrender one emission allowance for every two tonnes of CO₂ emission, thereby halving the number of allowances needed.
3. The revealed technological advantage index measures the share of an economy's patents in a specific technology relative to the share of total patents owned. The index is equal to zero when the economy has no patents in a given field, equals one when the economy's share in the technology field is equivalent to its share in all fields (no specialisation) and rises above one when specialisation is observed.

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ANNEX

Actions taken to implement selected recommendations from the 2007 OECD *Environmental Performance Review of New Zealand*

RECOMMENDATIONS	ACTIONS TAKEN
Chapter 1. Environmental performance: Trends and recent developments	
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.	The Waste Minimisation Act 2008 requires product stewardship schemes to be developed for certain “priority products” where there is a high risk of environmental harm from the waste or significant benefits from recovering the product (no priority products have been declared to date). It also establishes a process for government accreditation of voluntary product stewardship schemes with businesses and organisations (14 voluntary schemes have been accredited to date).
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.	The National Coastal Policy Statement was promulgated in 2010. It will guide the next generation of coastal plans. The government held consultations for a proposed National Policy Statement for Indigenous Biodiversity, but this did not pass into law. The government plans to re-launch a stakeholder dialogue to develop a new national policy statement for biodiversity by late 2018.
Strengthen and harmonise monitoring of major pressures on biodiversity and ecosystems, both within and outside protected areas.	The Department of Conservation (DOC) has implemented a national system for monitoring of overall trends, trends for specific species and effect of management actions in protected areas, as well as a national database of freshwater ecosystems.
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.	Several marine reserves have been created. The Marine Reserves Act is being revised to provide for a greater variety of protected areas. The 2012 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act promotes the sustainable management of natural resources in the Exclusive Economic Zone. New Zealand participates in international marine protection measures (such as the International Plan of Action for Conservation and Management of Sharks) and organisations (such as the Commission for the Conservation of the Antarctic Living Resources, the Western and Central Pacific Fisheries Commission, and the Commission for the Conservation of Southern Bluefin Tuna).
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.	The 2002 Climate Change Response Act (and its subsequent amendments) remains the framework legislation addressing New Zealand’s climate-related international obligations. New Zealand set the targets of reducing greenhouse gas (GHG) emissions by 5% below 1990 levels by 2020, by 30% below 2005 levels by 2030 (nationally determined contribution or NDC), and by 50% below 1990 levels by 2050. Sectoral targets have not been set. Climate mitigation policy has largely relied on forest sinks and carbon pricing via the Emissions Trading Scheme, but a clear and comprehensive policy package has not been developed. In September 2016, the government announced the establishment of three expert groups on agricultural biological emissions, forestry and adaptation to build the evidence base on these issues.

RECOMMENDATIONS	ACTIONS TAKEN
<p>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.</p> <p>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).</p>	<p>Forestry was the first sector to enter the New Zealand Emissions Trading Scheme (NZ ETS) in 2008; emission allowances are issued against eligible emission removals from forest management. The Afforestation Grant Scheme (first established in 2008) promotes carbon sequestration and sustainable land use; other grant schemes are in place to encourage afforestation and carbon storage, reduce soil erosion, and improve water quality.</p> <p>In the agriculture sector, mitigation options have focused on increasing the productivity per animal and overall efficiency of farms, as well as on investment in research in new technology to reducing biological GHG emissions.</p> <p>The government, in co-operation with the business sector, has launched several initiatives to support research and development in reducing the environmental impact from agriculture, primarily on GHG emissions and water quality. New Zealand participates in research networks such as the Global Research Alliance on Agricultural Greenhouse Gases.</p>
Chapter 2. Environmental governance and management	
<p>Develop national regulations specifically concerning the management of hazardous waste and introduce mandatory and comprehensive systems for tracking its transport, treatment and disposal.</p>	<p>No action taken.</p>
<p>Clarify liability arrangements for the remediation of contaminated sites, and develop financing mechanisms that apply the polluter pays principle as fully as possible.</p>	<p>In 2011, the Ministry for the Environment reviewed the liability arrangements for contaminated land. Liability is limited to contamination created after the Resource Management Act (RMA) came into effect (1991) and rests with the current landowner who can pursue actual responsible parties. The government’s Contaminated Sites Remediation Fund (CSRF) was established in 2003 to assist landowners subject to eligibility and assessment criteria to remediate their contaminated land.</p>
<p>Ensure that national sustainable development objectives are reflected in territorial development plans and resource consents.</p>	<p>Since 2007, New Zealand has adopted four National Policy Statements (NPSs) and four National Environmental Standards (NESs). In accordance with the RMA, regional and territorial policies and plans must give effect to NPSs (i.e. national objectives and policies) and comply with NESs (i.e. technical rules).</p>
<p>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.</p>	<p>In 2014/15, compliance monitoring covered 60% of resource consents that required monitoring according to their conditions. More than 20% of resource consents were found to be non-compliant. The use of administrative enforcement tools is rather limited, corresponding to 30% of non-compliance cases in 2014/15.</p> <p>In the area of criminal enforcement, the Resource Management Amendment Act (2009) raised the maximum fine for convictions under the RMA from NZD 200 000 (for both companies and individuals) to NZD 300 000 for individuals and NZD 600 000 for companies (with an additional daily fine for a continuing offence).</p>
<p>Assure independent evaluation of the effectiveness of voluntary agreements and covenants in reducing environmental pressures from agriculture and forestry activities.</p> <p>Assure the effectiveness of voluntary agreements, requiring clear environmental performance targets, regular reporting and third-party auditing.</p>	<p>The “Sustainable Dairying: Water Accord”, concluded between the government and the dairy industry, establishes several measurable targets (e.g. for exclusion of livestock from waterways, installation of water meters at farms, and collection of nutrient management information). The multi-stakeholder Dairy Environment Leadership Group (DELG) oversees the accord’s implementation. An independent third party audits annual reports. DairyNZ and the Dairy Companies Association of New Zealand report to DELG annually on progress against accord commitments. Around 71% of the plantation forestry estate is under third party sustainable forest management certification. Forest Stewardship Council certification includes regular audits.</p>
<p>Expand availability of quantitative indicators and time series data related to environmental quality, assuring policy relevance and public access.</p> <p>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.</p>	<p>The Environmental Reporting Act (2015) provides a legal framework for national-level reporting. A first comprehensive <i>Environment Aotearoa</i> report was published in 2015. The Ministry for the Environment has partnered with local government to take forward the EMaR (Environmental Monitoring and Reporting) initiative, which aims to improve the collection, collation, publication and reuse of environmental data. Its public interface, the Land, Air, Water Aotearoa (LAWA) data discovery portal, has published freshwater and coastal water information to date. EMaR is also co-ordinating programmes of work to develop and implement National Environmental Monitoring Standards (NEMS). Multiple NEMS have been completed, and more are in progress.</p>
<p>Continue to promote the integration of environmental education in school curricula and in occupational training.</p>	<p>The Ministry of Education has issued guidelines for environmental education in schools. The national EnviroSchools programme has continued to expand, now covering nearly 1 000 establishments.</p>

RECOMMENDATIONS	ACTIONS TAKEN
Chapter 3. Towards green growth	
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.	New Zealand has extended the use of economic instruments to put a price on environmental externalities. It launched a GHG emissions trading system in 2008, piloted a nitrogen cap-and-trade system in the Lake Taupo catchment and introduced some new environmentally related taxes, namely the waste disposal levy and a levy on goods containing synthetic GHGs. Some local authorities use volume-based waste charges and volumetric water charges.
Further strengthen measures to promote energy efficiency in the transport, energy and industrial sectors (e.g. energy taxation and pricing, product standards, building codes).	The NZ ETS is the main pricing instrument to encourage energy efficiency improvements in the transport, energy and industrial sectors. Other measures include: support programmes for building insulation (Warm Up New Zealand programmes), voluntary energy performance rating for building (NABERSNZ, Home Star and Green Star), fuel economy labelling for vehicles, and road user charge exemption for electric vehicles.
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).	New Zealand has strengthened vehicle exhaust regulations and fuel quality standards. It applies fuel economy labelling for light vehicles and a voluntary heavy vehicle fuel efficiency programme, but there are no mandatory standards for vehicle fuel efficiency and emissions. Electric vehicles are exempt from the road user charge. Vehicle taxes are not differentiated according to vehicles' environmental and energy performance, and fuel tax rates do not take into account environmental costs of road transport.
Increase levels of official development assistance and continue to mainstream environmental concerns into ODA.	Spending on official development assistance (ODA) increased in 2010-15, and the government plans to increase the assistance to USD 1.2 billion over three years starting from 2015/16. In 2015, net ODA disbursement were 0.27% of gross national income (GNI), compared to the internationally agreed target of 0.7% of GNI. More than 40% of total ODA directly or indirectly targets environmental objectives. The Aid Programme Strategic Plan for 2015-19 integrates environment and climate change as cross-cutting issues.
Chapter 4. Water resources management	
Further expand the knowledge base concerning sustainable abstraction levels of key aquifers, and strengthen regulatory control of total allowable abstraction.	In 2015, GNS Science (a government-owned research company) mapped New Zealand's aquifers and estimated groundwater volumes. The Resource Management (Measuring and Reporting of Water Takes) Regulations 2010 require consented water abstractions over 5L/s to be metered and reported from November 2016. The National Policy Statement for Freshwater Management requires regional councils to set sustainable abstraction limits and to phase out any existing over-allocation. Information about interconnectivity between groundwater and surface water remains limited.
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.	A National Policy Statement for Freshwater Management was issued in 2011, and subsequently amended in 2014, to provide additional guidance to regional councils, including minimum standards for water quality in lakes and rivers. The National Environmental Standard for Sources of Human Drinking Water 2007 and the Health (Drinking Water) Amendment Act 2007 have strengthened drinking water legislation and the protection of drinking water sources.
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).	The Lake Taupo cap-and-trade nitrogen market was launched in 2011 to address diffuse source pollution. There are no other examples of economic instruments such as pollution charges and water quality trading.
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.	Water is allocated on a first-in, first-served basis. The transfer of water permits is permitted under section 136 of the RMA, but not used widely in practice. The 2016 <i>Next steps for freshwater: Consultation document</i> includes a proposal to better enable the transfer of water permits. There are no resource rental fees (abstraction charges) that reflect the environmental or scarcity costs.
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.	Industry representatives (dairy, horticulture, and sheep and beef) offer a range of environmental advisory services. Some regional councils require nutrient budgeting and farm environmental management plans. The Freshwater Improvement Fund, established in 2014, helps water users move to managing within environmental water quantity and quality limits. The Sustainable Farming Fund, launched in 2000, funds collaborative projects for improved water management. The environmental effectiveness of these initiatives has not been assessed. The "Sustainable Dairying: Water Accord" 2014 (a voluntary agreement between government and the dairy industry) has encouraged the uptake of environmental best practices (e.g. fencing dairy cattle off from waterways) more rapidly than would have occurred through new government regulations.

RECOMMENDATIONS	ACTIONS TAKEN
Chapter 5. Sustainable urban development	
<p>Expand measures to reduce health risks associated with poor indoor air quality, substandard housing and unsafe heating.</p>	<p>The <i>Warm Up New Zealand</i> programmes have provided subsidies to households for improving insulation and heating systems, and have contributed retrofitting nearly 20% of the housing stock. As from 2016, the <i>Warm Up New Zealand: Healthy Home</i> programme focuses on rental properties occupied by low-income tenants in high health needs. Regulations for ventilation of buildings have been strengthened. The 2016 Residential Tenancies Amendment Act strengthened floor and roof insulation requirements for social housing and rented homes (which will take effect in 2019). The National Environmental Standards on Air Quality include a design standard for new wood burners installed in urban areas; several regions impose stricter standards.</p>
<p>Review systems for charging users for waste and wastewater services, identifying opportunities to strengthen economic incentives for resource conservation and efficiency.</p>	<p>The Waste Minimisation Act 2008 established the Waste Disposal Levy, which is imposed on waste disposed in landfills (currently at NZD 10 per tonne, limited to landfills accepting household waste). Volume-based waste charges are applied in some cities.</p>
<p>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).</p>	<p>The 2010 Resource Management (Measurement and Reporting of Water Takes) Regulations requires water takes (of 5 litres/sec or more) to be measured and reported from November 2016. Some cities apply volumetric water pricing and established water-use efficiency goals (e.g. Auckland).</p>
<p>Expand and upgrade waste treatment and disposal facilities (e.g. landfills, hazardous waste platforms, wastewater treatment plants), promoting co-operation among territorial authorities where this will lead to economies of scale, and applying the polluter pays principle.</p>	<p>Agglomeration of eight local authorities to the Auckland Council provided preconditions for integrated waste management in the region. No other actions have been taken.</p>

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