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Meeting the Challenge of a Low-Emissions Economy

Abstract

The impacts of climate change threaten the productivity, incomes and well-being of all humanity. Climate change has been described as the 'greatest market failure the world has ever seen'. In 2017 the government asked the Productivity Commission to 'identify options for how New Zealand could reduce its domestic greenhouse gas emissions through a transition to a lower emissions future, while at the same time continuing to grow incomes and wellbeing'. New Zealand can achieve a successful low-emissions economy, but there will be challenges. The commission's recently released draft report provides insights into how and where the country can best achieve emission reductions and the types of policies and institutional architecture required to drive the transition.

Keywords low-emissions economy, climate change policy, transition, emissions pricing, innovation, institutions, pathways

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The impacts of climate change threaten the productivity, incomes and well-being of all humanity. Nick Stern describes climate change as 'the greatest external effect in human history' in his eponymous *The Economics of Climate Change: the Stern Review* (2007). Increases in global temperature are already causing, and will continue to cause to an increasing extent, widespread impacts on human, economic and natural systems. Impacts include heatwaves and extreme rainfalls, more frequent droughts and cyclones, water scarcity, threats to food security, dangerous flooding caused by sea level rise, ocean acidification, and major extinction of species of flora and fauna. The damages expected from only a small rise in the global temperature are severe.

The economic costs of escalating climate risks are daunting. For example, the Economist Intelligence Unit warns that the 'tail risks' of climate change could cause an eye-watering US$43 trillion worth of global assets in present value terms to be wiped out by 2100. Others estimate that failure to act to lower emissions will reduce global GDP by as much as US$72 trillion by 2060 (Citigroup, 2015). The effects of climate change are inextricably entwined

with human health. The work of the 2015 Lancet Commission on Health and Climate Change concluded that anthropogenic climate change threatens to undermine the past 50 years of gains in public health, and, conversely, that a comprehensive response to climate change could be 'the greatest global health opportunity of the 21st century' (Lancet, 2015).

New Zealand is committed to being an active participant in the international response to the challenge of climate change (through the 2015 Paris Agreement), principally by making substantial reductions in its greenhouse gas emissions. In 2017 the government asked the Productivity Commission to 'identify options for how New Zealand could reduce its domestic greenhouse gas emissions through a transition to a lower emissions future, while at the same time continuing to grow incomes and wellbeing' (Productivity Commission, 2018, p.1). In 2018, James Shaw, as the new government's minister for climate change, signalled a more ambitious agenda and asked the commission to include the target of achieving net zero emissions by 2050 in its analysis.

The transition to a low-emissions economy will mean that New Zealand will look very different in 2050, and even more transformed by 2100. During the transition, action to mitigate greenhouse gas emissions will require real and significant changes, affecting households, businesses, industries, cities and regions. It is no exaggeration to say that a shift from the old economy to a new, low-emissions economy will be profound and widespread, transforming land use, the energy system, production methods and technology, regulatory frameworks and institutions, and business and political culture. Of course, this transformation is a global phenomenon, and some (e.g., the OECD, the World Economic Forum, PwC) refer to decarbonisation as a 'mega-trend' that will reshape the global economy over the next several decades.

In the coming years, New Zealand's governments (central and local), businesses and society will make a series of key choices that will influence the structure of the economy and the cost of reducing greenhouse gas emissions. The broad purpose of the commission's inquiry is to recommend actions that the government might take to reduce New Zealand's emissions given the levers within its control, and recognising that some influential factors are outside its control. The commission's draft report, released in April 2018, provides insights into how and where the country can best achieve emission reductions and the types of policies required to drive the transition. It explores the challenges, opportunities, benefits and costs of alternative transition pathways and makes specific policy recommendations.

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Climate change is a problem unlike any other, both because of its scale and because it is about the near and far future. An important theme in our inquiry is that a long-term perspective must be introduced into politics and policymaking, domestically and internationally. The long-term nature of climate change and the deep uncertainty about many aspects of the future require political commitments and a durability that spans many generations. It is future generations who will live with the consequences of actions taken, or not taken, today to reduce emissions and curb the impacts of climate change. It is therefore not surprising that, in their submission to this inquiry, Generation Zero – a youth-led organisation in New Zealand – say, 'We believe a Zero Carbon Act, backed by cross-party agreement, is the most urgent and important law that our next Parliament could legislate' (Generation Zero, 2017, p.3).

New Zealand's role in tackling global climate change

New Zealand produces among the highest greenhouse gas emissions per person in the world. This is despite having an electricity system that is overwhelmingly powered by renewables. The explanation for such high perperson emissions lies substantially in New Zealand's large agricultural sector, which accounts for nearly half of New Zealand's total emissions and which exports a very high proportion of its output. Yet the fastest *growth* in emissions in recent years has come from rapid population growth and the associated growth in the light vehicle fleet.

While per person emissions are high, New Zealand's total emissions make up less than 0.2% of global emissions. Actions in New Zealand will not make an appreciable difference to the global climate change trend. This exemplifies the public policy challenge of climate change. It is a classic example of the 'tragedy of the commons', in which individuals tend to overly focus on value to themselves without taking into account the detriments of their actions to the whole community. The 'commons' in this case is a truly global resource – the shared atmosphere upon which life depends – and its limited ability to absorb greenhouse gas emissions without giving rise to climate disruptions that are enormously damaging to life on the planet. So, while it is small, New Zealand's size does not justify inaction. Indeed, quite the opposite. Around 30% of global emissions come from small emitters. Collectively, small economies do matter and a global, concerted effort by all is needed to solve this issue.

Further, by achieving a successful transition to a low-emissions economy, New Zealand has a major opportunity to influence others. It can reduce the risk of other countries failing to pursue mitigation pathways because they either do not know how to, or do not think it can be done while continuing to grow incomes and well-being. This is likely to be particularly relevant in areas where New Zealand has

expertise and experience (e.g., pastoral greenhouse gas mitigation). New Zealand's capacity to influence will be the greater if it can point to its own credible and substantial mitigation progress.

Overcoming myopia and managing uncertainty

New Zealand has had climate change policies in place for some time, but it has not taken effective action to lower its emissions. This reflects the problems that lie at the heart of climate change policy: time inconsistency in policy settings (the tendency to continue to put off hard decisions) and uncertainty about the future.

While the costs of change are immediate and real, the benefits may not be clear for many years. The nature of democratic political systems (where the political executive governs based on short-term electoral cycle mandates) tends to favour short-term interests over long-term interests (Averchenkova and Bassi, 2016; Boston, 2016; Hovi, Sprinz and Underdal, 2009). This presents a problem for any government wanting to credibly commit to a long-term policy response and makes the formulation of enduring policy solutions hard. The governor of the Bank of England, Mark Carney, puts it this way: 'climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix' (Carney, 2015). The temptation is to push the responsibility onto others, most likely future generations. Yet without durable and ambitious policies now, the signals for firms and households to move their production and consumption towards less emissions-intensive options will be weak at best.

So stable and credible climate policy settings, starting now, must lie at the heart of a transition to a low-emissions economy. The private sector and civil society must be able to plan and take long-term decisions with confidence. As the parliamentary commissioner for the environment puts it, '[u]nderwriting a long-term reorientation of the economy away from fossil fuel dependency requires policy stability decoupled from the short-term ebb and flow of politics … It requires a broadly shared commitment to steady progress' (Parliamentary Commissioner for the Environment, 2018, p.17).

The Productivity Commission's draft report makes concrete proposals for a stable and credible policy environment and a set of actions to enable New Zealand to transition to a low-emissions economy. These proposals are that the government should:

- send a strong signal that it is committed in the long term to the transition to a low-emissions economy and provide transparency about future policies to achieve this;
- use emissions pricing to send the right signals for investment, innovation and mitigation;
- enact laws and build institutions that underpin policy settings, with clear targets and accountability for action, and that act as a commitment device for future governments to continue the development and implementation of long-term policies to combat climate change;
- harness the full potential of innovation through making it a priority and devoting significantly more public resources to low-emissions research, and to the deployment and adoption of low-emissions innovations;
- ensure that other supportive regulations and policies are in place, to address non-price barriers, encourage the transition, and manage serious adverse impacts on lower-income households and affected businesses. This acknowledges that emissions pricing is not sufficient on its own to change behaviour and reduce emissions;
- support investment in low-emissions technology, infrastructure and other activities, through leadership and by mobilising new sources of finance.

Together, these steps will provide an enabling platform that will shape incentives for producers and consumers to reduce their emissions, make the right investments and come up with new ideas.

Getting emissions pricing right

An emissions price is the price an emitter pays for each unit of greenhouse gas they release into the atmosphere. Properly designed and implemented, emissions pricing is a powerful policy instrument to reduce emissions. A single emissions price provides a strong incentive to reduce emissions at least cost. It decentralises decisions to invest, innovate and consume across the economy to people who have the best information about opportunities to lower emissions given their circumstances. An emissions price is also pervasive through the whole economy, shaping resource and investment decisions across all emitting sectors and sources. Ensuring that emissions are appropriately priced is an essential step in New Zealand's approach to climate change mitigation.

> The commission considers that the New Zealand emissions trading scheme (ETS) should remain the centrepiece of New Zealand's emissions reduction efforts as it has the potential to provide pervasive and visible emissions pricing.

Several tools exist to apply emissions pricing – including taxes, market-based schemes such as 'cap and trade', and hybrid combinations – and each tool can be designed in a variety of ways. For the purposes of credibly moving towards a low-emissions economy, gaining certainty over the quantity of emissions that will be permitted is vital. The commission considers that the New Zealand emissions

trading scheme (ETS) should remain the centrepiece of New Zealand's emissions reduction efforts as it has the potential to provide pervasive and visible emissions pricing. However, the ETS needs to be made credible and effective.

The emissions price created through the ETS needs to rise considerably. Previous prices have been so low as to make the scheme ineffectual in changing firm and household behaviour. Just what level of pricing will be required cannot be known precisely. However, specialised modelling and other available evidence suggests that New Zealand's emissions price will need to rise to levels of the order of $75 a tonne of CO_2 equivalent (CO_2e) and possibly over $200 a tonne over the next few decades to achieve the domestic emissions reductions needed to meet New Zealand's international commitments. Robust and transparent domestic caps on the supply of New Zealand units (NZUs) (one NZU is a permit to emit one tonne of CO_2e) are needed to drive a higher emissions price to materially influence production and consumption decisions.

Expectations about future emissions prices are important for driving investment in new technologies. To ensure clear and credible investment signals, the government should provide guidance about the path of future emissions prices. A key step is setting rolling five-year quantity caps on emissions within the ETS, to provide certainty about the future supply of NZUs.

Land use change, agriculture and emissions pricing

Land use will need to change substantially if New Zealand is to transition to a low-emissions economy. Modelling undertaken for the commission suggests that land planted in forests over the next three decades may need to increase by between 1.3 million and 2.8 million hectares, mostly converted from marginally profitable beef and sheep farms. Growth in horticulture (from a relatively small base) will likely also play a significant role in reducing agricultural emissions. The needed rate of land use change is comparable to the rate at which, over the last 30 years, beef and sheep farms have been converted to forestry, dairying and other uses.

Reducing agricultural emissions, particularly from dairying, will also be important. Scope exists for further modest reductions in emissions intensity, through higher productivity and wider adoption of current low-emissions practices. Research into new technologies has the (uncertain) potential to further reduce agricultural emissions in the medium to long term. Yet the potential pay-off from successful research justifies scaling up current efforts.

There are strong political incentives to avoid making long-term policy decisions that will have short-term cost and impacts, but benefits that manifest well into the future.

An emissions price that covers all land use, including agriculture, should be the main driver of land use change. A well-designed and stable ETS will incentivise land use change, including more afforestation, as well as a search for, and adoption of, low-emissions practices and technologies in agriculture. To reflect the trade-exposed nature of the sector, current technological limits and the short-lived nature of methane (an important, but not the only, agricultural greenhouse gas), the entry of agriculture into the ETS needs to be carefully designed.

The government can best support the rural transition through stable policy, pricing emissions and supporting innovation. Transparency and advanced notice will provide clear signals while helping to avoid significant economic and social dislocation in the transition to a low-emissions rural economy over the next three decades.

Stable and enduring laws and institutions

There are strong political incentives to avoid making long-term policy decisions that will have short-term cost and impacts, but benefits that manifest well into the future. Well-designed laws and institutions can play a critical role in providing a strong signal about future policy intentions and act as a 'commitment device' to help drive the development and implementation of a long-term policy response to climate change.

New Zealand has an existing climate change regulatory framework, but it is not underpinned by a credible commitment to a low-emissions transition. New Zealand needs a reformed statutory framework, one that will lock in long-term thinking, encourage policy stability and provide the right signals, yet allow flexibility about the precise path to the long-term goal: essentially ensuring that an eye is kept on the long-term compass while letting the tiller be adjusted along the way. A new architecture for New Zealand's climate change legislation should be built on principles of transparency and accountability, with a backbone based on mandatory processes. It should include the following mutually reinforcing elements:

- Legislated and quantified long-term greenhouse gas emissionsreduction targets to clearly signal the policy destination. Targets should be informed by science. This is central to the credibility of the climate change statutory and institutional framework. Mitigation targets should distinguish between short-lived and long-lived greenhouse gases. Emissions of some gases (such as CO_2) can stay in the atmosphere for centuries. Emissions of long-lived greenhouse gases must be reduced to net zero at a minimum. Other greenhouse gases (such as methane (CH_4)) dissipate comparatively quickly. They will need to reduce, but not to net zero, to stabilise temperature.
- A system of successive (say, five-year) 'emissions budgets' that translate long-term targets into clear short- to medium-term emissionsreduction goals. The budgets provide visible stepping stones to achieving the long-term targets and help reinforce steady action on, and accountability for,

achieving them. The emissions budgets would also guide the determination of caps in the ETS.

- An independent expert advisory body (a climate commission) to provide objective analysis and advice to the government on the scale of emissions reductions required over the short to medium term (i.e., by recommending emissions budgets) to meet long-term targets, reflecting scientific evidence as well as considerations of economic and social impacts. A climate commission, set up as an independent Crown entity, would help to insulate policymaking from short-term political pressures, promote stability and predictability, expand climate policy debate, and improve transparency and accountability. Decision rights should not be delegated to the climate commission, but it would have a role in identifying regulatory and other barriers, or opportunities and priorities, to reduce emissions. It would also regularly assess New Zealand's progress towards meeting agreed budgets and targets. Effectively, a climate commission would be the custodian of New Zealand's climate policy and longterm climate change objectives.

As noted, long-term political commitment and durability are essential to the success of climate change laws and institutions. Substantial cross-party support for the core elements of statutory and institutional arrangements will help provide policy permanence regardless of the make-up of the government.

Developing the government response to the climate commission's recommendations to meet emissions budgets and targets will be a substantial and challenging policy process. It will require ongoing leadership from the centre of government, and policy alignment across government to navigate the long and uncertain journey to a profoundly different low-emissions future.

Harnessing the full potential of innovation

Innovation comes in many forms and is unpredictable. Yet it is the closest thing to a 'silver bullet' to enable humanity to meet the challenge of avoiding damaging climate change. It also holds out the opportunity to combine the transition to low emissions with dynamic and creative improvements in national well-being. While the form, timing and impact of innovation are highly uncertain, a country's policies and institutions significantly affect its innovation performance. They need to enable and encourage researchers and business organisations to both create new low-emissions technologies and deploy existing low-emissions technologies.

The processes of innovation and economic change are strongly path dependent. This can make it difficult to shift an economy from polluting to clean technologies. Delay in making the transition can increase the productivity gap between the polluting and clean technologies and make the transition longer and costlier in terms of slower growth during the transition (Acemoglu et al., 2012).

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New Zealand's record as an innovative economy is mixed. Lacklustre productivity growth in the economy partly reflects low investment in research and development for business and other issues in its innovation ecosystem, including a patchy record at commercialising research and skill shortages. Yet within this broad picture, pockets of successful innovation exist.

Transitioning to a low-emissions economy calls for directed technical change in New Zealand's energy and transport systems, land use, buildings and industrial processes. In many areas New Zealand will be a technology taker. This requires capacities and resourcing to identify, absorb, adapt and deploy technologies from offshore. Yet in certain areas New Zealand should invest in the full menu of basic and applied research, commercialisation, infrastructure and skills.

Given the imperative to reduce emissions, the government should devote significantly more resources to low-emissions innovation than the modest and inadequate current allocation. Well-designed and implemented support for low-emissions innovation is likely to have pay-offs for New Zealand's wider economic performance and its international reputation. Through innovation, New Zealand can make a material contribution to combating dangerous climate change at a global level.

The right climate policies are likely to trigger new waves of global investment, innovation and discovery. If a country designs its policies to foster learning and flexibility, then new opportunities will arise. The transition to low emissions may represent a very attractive path that could, if economic history is a guide, stimulate dynamic, innovative and creative growth.

Complementary regulation and policies

While stable policy and emissions pricing are needed to change behaviour and promote investment, they will not be sufficient to promote a fair and efficient transition, or to maximise New Zealand's opportunities from the transition. Put more strongly, 'it is theoretically both unsound and impractical to rely on carbon pricing only' (Stiglitz and Stern, 2017). This is because of market or government failures, or because a market-only solution could involve unacceptable costs or distributional consequences. Complementary regulation and policies can help to create and deploy mitigation technologies, support behaviour change by firms and households, and manage risk. Such complementary measures can also lower the emissions price that would otherwise be needed.

In traversing sources of emissions in New Zealand, our inquiry found areas for complementary regulation and policies. For example, transport is one of the largest and fastest-growing sources of emissions in New Zealand. Transport is also a sector where lower-emission alternatives to fossil-fuel vehicles are both available (e.g., public and active transport modes) and emerging (e.g., electric and other low-emission vehicles), and where there is scope to improve the efficiency of vehicle use (e.g., through congestion charging).

Electric vehicles (EVs) offer some of the most promising mitigation opportunities for New Zealand, but their uptake faces several barriers, such as high prices relative to fossil-fuel vehicles, anxiety about their limited travel range, and poor public understanding of their benefits. The government can offset some of these barriers by:

- introducing a 'feebate' scheme, in which importers would either pay a fee or receive a rebate, depending on the emissions intensity or fuel efficiency of the imported vehicle;
- providing funding for some EV infrastructure projects to fill gaps in the charging network, which would be commercially unviable for the private sector;
- raise awareness and promote uptake of low-emission vehicles through leadership in procurement; and
- require imported new and used fossil-fuel vehicles to meet rigorous emissions standards. New Zealand is one of a handful of developed countries without vehicle emissions standards, and risks becoming a dumping ground for high-emitting vehicles from other countries that are decarbonising their fleets.

Electricity is another area for complementary policies. An efficient and well-functioning electricity system will play a central part in the transition to a low-emissions economy. New Zealand's largely decarbonised electricity sector is a major advantage. Yet considerable scope exists to further increase the supply of electricity from renewable sources, such as wind (the cost of which has been falling rapidly) and geothermal (which still produces some emissions). Distributed electricity generation and the ability of some consumers to reduce their demand when electricity supply is short will also play an increasingly important part in a low-emissions economy. But additional steps will be needed to manage growing complexity and risks to system stability, and to ensure a level playing field for different types of technology and service providers. The regulatory framework governing the electricity market should be updated to allow consumers to become more informed and have the potential to become active buyers and sellers of electricity.

A lesson from history is that productive and successful economies position themselves to handle the disruptive nature of major transitional change and seize opportunities.

There are also opportunities to use regulation to reduce emissions from waste. Only around one-third of waste emissions are covered by existing waste management or climate change policies. The waste disposal levy should be extended to all known, consented waste disposal sites, and increased over time to encourage better waste management. Local authorities should also be given greater support to regulate farm dumps and other unknown waste disposal sites, such as through the Resource Management Act and the Waste Minimisation Act.

Pathways to a low-emissions economy

Several pathways to a low-emissions economy are possible, and many factors could affect the rate and scale of change. Whether and when these factors will emerge cannot be predicted with much accuracy. Despite this uncertainty, it is possible to imagine different pathways towards a low-emissions economy. These scenarios can be useful for informing policy decisions around priorities and trade-offs and for gauging the implications of different rates of economic change.

Modelling can throw light on whether an emissions target is feasible, the measures needed to achieve a target at least economic cost, and the character of alternative pathways, and give a quantitative picture of what needs to happen by when to reach a target. Yet modelling has well-known limitations and is not prediction. The transition to a low-emissions economy for any country will be a long journey to a known and desired destination, but through very uncertain terrain.

Modelling commissioned for the inquiry suggests that New Zealand can move to a low-emissions economy (i.e., 25 megatonnes of net CO_2e emissions by 2050) at an emissions price rising to between $75 a tonne of CO_2e and $152 a tonne of CO_2e by 2050. Also, New Zealand could reach the more ambitious target of net zero greenhouse gas emissions by 2050 with emissions prices rising to between $157 and $250 a tonne of CO_2e by 2050 (with the higher figure arising when technological change is slow). While far above the current level of around $21, these prices are comparable with the emissions prices that it is estimated will be needed in other developed countries to deliver the objectives of the Paris Agreement to limit global temperature rise to under 2°C.

The modelled pathways reveal three key drivers of lower emissions: the expansion of forestry; the electrification of New Zealand's light transport fleet; and changes to the structure and methods of agricultural production. Emissions reductions in agriculture can come from both technological and structural change. For example, synthetic protein could disrupt traditional farming, and, even in its absence, further shifts in land use could occur – mostly away from marginal beef and sheep farming towards forestry, and possibly from pastoral farming to horticulture.

Expanding forestry can achieve large reductions in net emissions up to 2050. Yet heavy reliance on forestry will create challenges in the longer term because it is not possible to expand without limit the land area under forest. With continued emissions reductions required after 2050 to maintain net zero, New Zealand will need to find other ways to reduce emissions. But it has time to consider options and seek new technological solutions.

A lesson from history is that productive and successful economies position themselves to handle the disruptive nature of major transitional change and seize opportunities. The New Zealand economy is not as nimble as it needs to be, especially in core aspects like innovation and shifting resources from less productive to more productive activities. These overarching economic competencies will play key roles in determining the success of New Zealand's transition to low emissions.

Many benefits from the transition

Many estimates of the scale of expenditure necessary to drive a transition to a low-emissions economy are in the range of 1–3% of GDP per year (Stern, 2015).[1] An important framing point is to think about the potential cost of transitioning to a low-carbon economy as an investment, rather than as a net cost on the economy, the government or taxpayers (Romani, Stern and Zenghelis, 2011). With all nations playing their part, there is the huge return in the form of avoiding catastrophic climate damage. Much of the investment will come from the private sector. For example, the International Energy Agency estimates that, globally, additional energy investment needed to decarbonise will cumulatively be in the order of US$36 trillion by 2050 (International Energy Agency, 2012). If New Zealand businesses are to the fore in tackling their emissions, investment opportunities will surely arise for them globally. Areas could include low-emissions technologies in electricity, transport, heating and cooling, industrial processes and agriculture.

Importantly, investing in cutting greenhouse gas emissions will produce significant co-benefits, beyond reducing climate risk. These co-benefits include:

- Cleaner air, and reduced rates of illness and mortality caused by air pollution. Pollutants from fossil-fuel vehicles (particularly those that run on diesel) are associated with respiratory illnesses such as asthma, impaired lung development and function, and heart, brain and general health issues. A shift to a low-emissions vehicle fleet would remove these pollutants.
- Cleaner water, and less harm to biodiversity. As an emissions price is progressively extended to agriculture, and farmers take greater steps to use nitrates effectively, water pollution will reduce. Greater afforestation could also help reduce soil erosion and the resulting siltation of waterways.
- The dynamics of discovery and learning will see the emergence of new technologies and firms. These will provide opportunities for employment, exports and productivity gains. A higher emissions price will foster greater demand for emissions-reducing technologies. A reinvigorated and refocused innovation system will put more effort into developing and applying new ideas that offset, reduce or remove greenhouse gases. New Zealand has already proved a fertile ground for developing such technologies, and scope exists to considerably expand New Zealand's contribution to global knowledge.

Meeting the challenge

New Zealand can achieve a successful low-emissions economy, but there will be challenges. Action is urgently needed, for we stand at a crossroads of fundamental decisions that will shape New Zealand's future economy and climate. Delaying action will compound the transition challenge, making it much more costly and disruptive, and limiting viable and cost-effective mitigation options in the future. And if we don't act now, New Zealand risks being left behind in technology and economic opportunities.

New Zealand has experienced economic and social transformations before, and the scale of change involved in the transition to a low-emissions economy looks comparable to some of those earlier transitions. This is a 30-year transition. Looking back in history, other examples of profound change occurred over similar timeframes. Moreover, these changes eventually enhanced community well-being despite, at first, appearing highly disruptive and threatening.

The transition to a low-emissions economy is potentially a powerful, attractive and sustainable growth story – one marked by greater resilience, more innovation, more liveable cities, robust agriculture and stronger ecosystems ...

The transition to a low-emissions economy is potentially a powerful, attractive and sustainable growth story – one marked by greater resilience, more innovation, more liveable cities, robust agriculture and stronger ecosystems (Stiglitz and Stern, 2017). Iwi will play an important role in the process of change as significant partners in transforming the New Zealand economy over the coming decades.

To succeed and realise the potential benefits of the transition, careful policy design will be critical. The commission's draft report sets out the policy architecture for New Zealand to transition to a low-emissions economy, while continuing to grow income and well-being. Clearly there is much uncertainty about what lies ahead, how a low-emissions economy will evolve, and what this will mean for New Zealand. An important task of government is to be

clear on New Zealand's ambition to achieve a low- or zero-emissions economy. It needs to establish credible and stable policies and institutions so that businesses, households and consumers can plan, invest, and embrace the opportunities of a low-emissions future. There does not need to be a trade-off between economic prosperity and the preservation of the planet. With the right policies, and plenty of Kiwi ingenuity and commitment, the two can go together.

1 Interestingly, if we assume that New Zealand's GDP grows at 1–3% per year, this means that by 2050 the country will need to wait only one more year to 2051 to reach the GDP it would otherwise have reached in 2050 without this expenditure on reducing emissions.

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