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DISCUSSION PAPER 2008 / 1

Actions speak louder than words:

Adjusting the New Zealand economy to a low emissions world

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The New Zealand Institute

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‘Actions speak louder than words’ is the second discussion paper in a research project that the New Zealand Institute is conducting to develop recommendations on New Zealand’s policy response to climate change.

EXECUTIVE SUMMARY

Global climate change is likely to have a significant impact on the New Zealand economy over the next several decades and beyond, and there is a reasonable likelihood that New Zealand will need to make significant reductions in its emissions. In response, New Zealand needs to develop a clear strategy to guide its response to the effects of climate change and commit to the actions required to enable New Zealand to reduce its emissions in a meaningful way.

The Institute has recommended that New Zealand adopt a fast follower strategy with respect to emissions reduction and that it should, as a starting point, aim to reduce its emissions to 30% below their 1990 level by 2050. Although this will be challenging for New Zealand, given the nature of its emissions profile, New Zealand needs to begin to reduce its emissions in a meaningful way in order to position it to operate successfully in a low-emissions global economy.

So far, however, New Zealand's public debate has been heavy on aspiration with less focus on the actions required to reduce emissions to the extent required. Although discussing aspirations can be useful in motivating action, the priority needs to be on taking tough action to reduce emissions in order to position New Zealand to compete in a low-emissions world. The contribution of this report is to examine the nature of the adjustment process, and the options that are open to New Zealand.

Reducing New Zealand's emissions will be challenging

Reducing New Zealand's emissions will require a major change in New Zealand's current course and speed. New Zealand's emissions have been growing strongly, and are 25% higher than in 1990. To halt this growth and reduce emissions well below their 1990 level will require a significant shift in the functioning of the New Zealand economy.

Without meaningful action, New Zealand's emissions are likely to continue to increase. New Zealand will need to substantially improve its rate of emissions intensity improvement. This will be a challenging process. The available negative cost abatement opportunities will not be sufficient to deliver the emissions reductions that are required.

The challenging nature of this process is not an argument for inaction. Rather it emphasises the need to act seriously. Significant reductions in New Zealand's emissions will require sustained action. This will involve substantial improvements in the emissions efficiency of the existing New Zealand economy, as well as a shift in the New Zealand economy towards reliance on lower emissions types of economic activity.

The aim is to adjust the New Zealand economy to a lower emissions mode of operating so that it can compete successfully in a low-emissions global economy. For this reason, the focus of the analysis in this report is on actions to reduce New Zealand's domestic emissions. Although emissions reduction targets can also be met by purchasing emissions credits from other countries, this will do little to adjust the New Zealand economy to operate in a low-emissions world. The best way in which to position New Zealand to compete is to reduce domestic emissions.

A modest start has been made

Actions can be taken to improve the emissions efficiency of the New Zealand economy through emissions pricing and regulatory measures. Over the past several months, the government has announced measures to reduce New Zealand's emissions, including an emissions trading scheme, a 90% renewable electricity generation target, and tighter fuel efficiency standards.

The measures announced by the government to date are a step in the right direction, and will generate a reduction in New Zealand's emissions. Overall, however, we estimate that the various policies will only serve to reduce New Zealand's domestic emissions in 2050 to about their 1990 level. The level of emissions reduction is not sufficient to adjust the New Zealand economy so that it is well positioned to compete in a low-emissions world.

The limited materiality of the announced measures reflects the relatively limited abatement opportunities available to New Zealand rather than being due to deficiencies in the announced policies. Additional steps can and should be taken to increase the emissions efficiency of the New Zealand economy, such as a commitment to upgrade New Zealand's efficiency standards over time in line with other countries as well as more significant investments in public transport and communications technology. But a broader range of actions will be needed.

Additional measures are required

To achieve significant reductions in emissions will require a change in the composition of the New Zealand economy. In particular, New Zealand should encourage the development of strengths in low emissions types of economic activity. Developing these strengths will require deliberate action in order to ensure that New Zealand is an attractive location for this type of activity relative to other countries. This means that investing in education, research, and communications infrastructure, are potentially important elements of New Zealand's policy response to climate change.

It is sometimes argued that an aggressive response to climate

change will lead to economic transformation as firms change their operations and business models. Although this view has some validity, it is more appropriate to see economic transformation as central to climate change policy. Indeed, unless the New Zealand economy is transformed, so that its economic growth is less reliant on emissions intensive activities, it is difficult to see how New Zealand will be able to significantly reduce its emissions. Actions to transform the economy need to be much more of a priority.

New Zealand should also seek to manage its exposure to international consumer and governmental action through a broader range of actions. For example, investing in building a world-leading environmental brand may reduce the likelihood that consumers penalise New Zealand goods and services even if they have a high emissions content. And New Zealand should be constructively engaged in the international climate change negotiations to ensure that its unique circumstances are recognised.

Actions speak louder than words

New Zealand needs to establish a programme of action sufficient to achieve a significant reduction in its emissions. Unfortunately, despite the ambitious talk of aspirations for carbon neutrality or deep reductions in emissions, the commitments and proposals made to date do not seem likely to deliver emissions that are below their 1990 level. This gap between rhetoric and reality creates reputational risk for New Zealand and continues New Zealand's history of over-promising with respect to emissions reduction as was the case with its Kyoto commitments.

Indeed, the actions announced to date position New Zealand as a follower and do not seem adequate to position New Zealand to compete in a low-emissions global economy. This means that New Zealand continues to face a major economic exposure to the possibility that overseas governments or consumers require New Zealand to make substantial reductions in emissions.

New Zealand should slow down the rhetoric and speed up in terms of the hard work of reducing New Zealand's emissions. Actions that reduce New Zealand's domestic emissions in a meaningful way speak louder than words.

1 INTRODUCTION

Global climate change is likely to have a significant impact on the New Zealand economy over the next several decades and beyond, and there is a reasonable likelihood that New Zealand will need to make significant reductions in its emissions. In response, New Zealand needs to develop a clear strategy to guide its response to the effects of climate change and commit to the actions required to enable New Zealand to reduce its emissions in a meaningful way. Unfortunately however, a disconnect has emerged between statements of New Zealand's aspirations with respect to emissions reduction and the actions that have been announced to date.

New Zealand's response to climate change is a serious issue and it requires a serious debate about both the appropriate objectives and the actions that will reduce New Zealand's emissions. This report examines the policy actions that are required to adequately manage New Zealand's exposure to climate change and to adjust the New Zealand economy so that it can operate successfully in what is likely to be an increasingly low-emissions global economy.

New Zealand is the second most emissions intensive economy in the OECD, and its emissions have been growing strongly. New Zealand's emissions are currently about 25% higher than in 1990 and, after offsets are included, New Zealand is projected to exceed its Kyoto target by more than 10%. In this context, the likelihood that New Zealand will need to significantly reduce its emissions below their 1990 level creates a significant economic exposure for New Zealand.

A previous New Zealand Institute report argued that in order to manage New Zealand's economic exposure to climate change, New Zealand should begin immediately to move to a lower emissions mode of operating (Skilling & Boven (2007b)). Because of the potential costs involved in reducing emissions, we recommended that New Zealand adopt a fast follower approach with respect to emissions reduction, with the pace of emissions reduction being influenced by the actions of other governments, shifts in market conditions, and technological developments.

As a starting point, we recommended that New Zealand aim to reduce its domestic emissions to 30% below their 1990 level by 2050 and that New Zealand position itself to efficiently achieve even deeper reductions in emissions over time if that is required. Given that New Zealand's emissions are projected to continue to increase, achieving this initial target will require substantial changes to be made.

This report examines the type of actions that are required to adjust the New Zealand economy to a lower emissions mode of operating so

that it is better positioned to compete successfully in a low-emissions global economy.

The government has recently announced a range of policies aimed at reducing New Zealand's emissions, such as the broad parameters of an emissions trading scheme and a comprehensive Energy Strategy. But is New Zealand acting with an appropriate level of ambition and what further actions are required?

This report begins by describing the scale of the challenge that New Zealand faces in terms of achieving meaningful reductions in emissions, and develops a framework for action. Section 3 describes the role of policy measures aimed at improving New Zealand's emissions efficiency, and assesses the impact of the government's announced policies. Section 4 focuses on the importance of policies designed to develop low-emissions strengths in the New Zealand economy. Section 5 examines ways in which New Zealand can reduce its exposure to changing consumer preferences and the potential for international government action. Section 6 concludes.

2 A FRAMEWORK FOR ACTION

New Zealand has a significant economic exposure to the indirect effects of global climate change. As outlined in the Institute's previous report, there is a reasonable likelihood that international government action will require New Zealand to commit to significant emissions reduction or that consumer preferences will shift decisively away from emissions intensive goods and services.

A key policy challenge facing New Zealand with respect to climate change is to efficiently manage this economic exposure by adjusting to a lower emissions mode of operating. However, the nature of New Zealand's emissions profile means that it is likely to be challenging to reduce New Zealand's emissions in order to respond to this changing world.

Given this, we believe that a fast follower approach in terms of emissions reduction is the appropriate strategic approach to manage New Zealand's exposure. New Zealand should start to move now to reduce its emissions, doing so at a pace that reflects the actions taken by other governments, changes in market conditions, and technological progress.

Given the emissions intensive nature of the New Zealand economy, and the relatively limited emissions abatement opportunities currently available to New Zealand, achieving substantial reductions in emissions is likely to be challenging and require significant change. Although there are some negative cost abatement opportunities available, as well as some commercial opportunities for firms who can respond to emerging consumer demand for low-emissions goods and services, there will be costs associated with significantly reducing New Zealand's emissions.

Despite the costs associated with reducing New Zealand's emissions, it is important that New Zealand act now to reduce its emissions in a meaningful way and to position New Zealand to be able to reduce its emissions even more significantly in the future. The process of adjustment to a low-emissions world will likely be more efficient if it is commenced now so that it can be undertaken in a relatively measured manner. As with an insurance policy, New Zealand should be prepared to pay an up-front cost to commence the adjustment process in order to avoid a more significant adjustment cost in the future.

In particular, we proposed an indicative aspiration of a 30% reduction in emissions by 2050 relative to the 1990 level. To achieve this target we proposed that New Zealand aim to reduce its emissions to their 1990 level by 2020 and thereafter to reduce emissions by 1% a year. And New Zealand should position itself to make even deeper reductions in the reasonably likely event that this is required. Such a pathway should position New Zealand to be able to respond rapidly and efficiently if further

action is required in terms of reducing emissions.

This proposed pathway is contingent in nature, and should be reviewed on a regular basis to ensure that the pace of emissions reduction is appropriate. For example, if developed countries commit to the 60-80% reductions in emissions by 2050 that are argued to be required to hold global temperature increases to a manageable level, it may be that New Zealand will need to aim to reduce its emissions by more than the proposed initial 30% target by 2050.

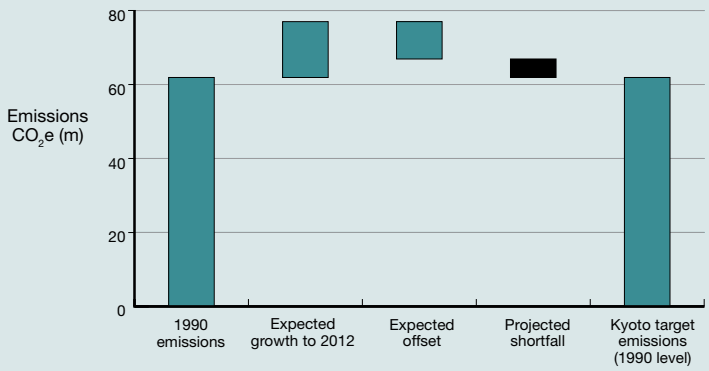
THE CHALLENGE AHEAD

Reducing New Zealand's emissions to achieve a target like 30% below the 1990 level by 2050 will require a significant change in course and speed. To give a sense of the scale of the challenge ahead, the following discussion examines the type of improvements in emissions intensity that New Zealand will need to deliver.

Figures 1 and 2 describe the historical and projected growth in New Zealand's emissions of greenhouse gases. Between 1990 and 2005, New Zealand's emissions grew by 25% because of large increases in emissions in the agriculture, transport, and power sectors. This growth in emissions was driven by growth in the economy and by a relatively low rate of improvement in emissions intensity in the New Zealand economy.

By 2012, emissions are projected to be about 20-25% higher than in 1990. After taking various offsets into account, New Zealand's emissions are likely to exceed its Kyoto target by more than 10%. The failure to meet New Zealand's emissions target under the Kyoto Protocol is why New Zealand is required to purchase emissions

FIGURE 1: NEW ZEALAND'S GREENHOUSE GAS EMISSIONS



Note: Growth, offset, and shortfall based on quantum used to calculate Kyoto liability in September 2007. Offsets are due to Land Use, Land Use Change and Forestry activities. CO_2e = greenhouse gas emissions in equivalent tonnes of carbon dioxide.
Source: United Nations Framework Convention on Climate Change; Treasury; Ministry for the Environment.

credits to cover this amount. This liability is currently estimated to be about $720 million.[1]

In order to achieve various emissions reduction targets, more is required than simply moderating the pace of emissions growth. New Zealand needs to reverse its current trajectory.

Current projections are that New Zealand's emissions in 2012 will be around 77 million tonnes.[2] In the Institute's last report, we proposed that New Zealand's emissions be reduced to the 1990 emissions level of 62 million tonnes by 2020 and then by a further 30% to around 43 million tonnes by 2050. To achieve this target, or more demanding targets such as the National Party's '50 by 50' goal, will require New Zealand to move quickly to halt the ongoing growth in its emissions and then deliver meaningful reductions in emissions.

Reducing emissions significantly will be demanding in the context of a growing New Zealand economy. As a matter of arithmetic, the path of New Zealand's emissions over the next several decades will depend on the rate of growth in the economy as well as the emissions intensity of that growth. New Zealand improved its emissions intensity by 3.4% a year between 1990 and 2005, meaning that fewer emissions were generated for each unit of economic value. Assuming that this historical rate of intensity improvement continues over the next several decades until 2050, New Zealand's emissions in 2050 can be forecast for a range of economic growth rates.

Figure 2 shows clearly that a significant change in direction is required, even to hold New Zealand's emissions at their current level. If the New Zealand economy were to grow at a 2% annual real rate until 2050, a reasonable estimate of New Zealand's growth prospects, with the historical rate of intensity improvement, New Zealand's emissions in 2050 would be 94 million tonnes, or over 50% higher than in 1990. At a 3% real growth rate, New Zealand's emissions in 2050 would be 135 million tonnes, well over twice their 1990 level.

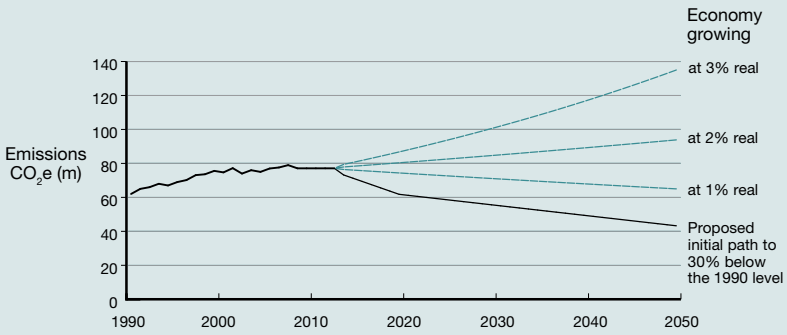
Table 1 describes the emissions intensity improvements required to achieve various emissions reduction targets under different economic growth rates. The three targets are the Institute's proposed 30% target by 2050, the National Party's 50% target, and a 70% target of the type described as possible in the Institute's last report under the 'perfect storm' scenario.

These calculations show that significant improvements in New Zealand's emissions intensity are

[1] *This liability estimate assumes an emissions price of US$11.90 a tonne and a USD/NZD exchange rate of 0.7557. Both of these assumptions are clearly subject to considerable uncertainty.*

[2] *The official projection for 2008-2012 is 81 million tonnes a year. However, Climate Change Minister David Parker has estimated the emissions trading scheme will reduce emissions by 20 million tonnes over the 2008-2012 period, so we have subtracted 4 million tonnes a year from the official number to reflect this.*

FIGURE 2: NEW ZEALAND'S FUTURE EMISSIONS



Note: Projection 2013 to 2050 includes emissions intensity improvement of 3.4%. CO_2e = greenhouse gas emissions in equivalent tonnes of carbon dioxide.
Source: Statistics New Zealand; Ministry for the Environment.

required to achieve a 30% reduction by 2050 under reasonable economic growth rates. If the New Zealand economy grew at a 2% annual real growth rate, for example, reducing emissions by 30% would require more than a 50% improvement in the annual rate of emissions intensity improvement, from 3.4% annually to 5.3%. And if the economy grew at a 3% real rate, the annual emissions intensity improvement rate required would need to almost double to 6.2%.

Achieving the more demanding reduction targets require sustaining even higher levels of emissions intensity improvements. Delivering a 50% reduction in emissions by 2050, for example, would require an annual intensity improvement of 6.1% if the

TABLE 1: REQUIRED EMISSIONS INTENSITY IMPROVEMENTS, 2012-2050

Economic growth rate	2050 emissions target (below the 1990 level)		
	30%	50%	70%
1.0%	4.4%	5.2%	6.5%
1.5%	4.9%	5.7%	7.0%
2.0%	5.3%	6.1%	7.4%
2.5%	5.8%	6.6%	7.8%
3.0%	6.2%	7.0%	8.3%

Note: Growth rates shown are real.
Source: Statistics New Zealand; Ministry for the Environment; New Zealand Institute calculations.

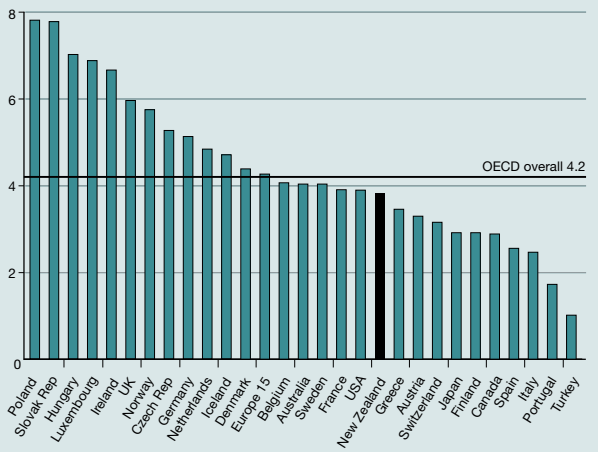
economy grew at a 2% real rate and an improvement of 7.0% if the real economic growth rate was 3%.

These are demanding rates of emissions intensity improvement. Indeed, these improvement rates are in excess of those generated by all but the very top performers in the OECD over the past couple of decades. As shown in Figure 3, annual improvement rates at this level represent performance that is well within the top quartile of the OECD. New Zealand will need to move from being a below average performer to a country that is close to the current frontier in terms of improving its emissions intensity.[3]

Of course, policies to constrain the growth in emissions have only just been introduced in New Zealand (and overseas), and these policies are expected to increase the rate of emissions intensity improvement over time. And it is likely that lower emissions technologies will become available over time as more investment is focused in this area.

The historical rate of emissions intensity improvement described in Figure 3 can probably be regarded as a lower limit for these reasons. In particular, it is likely that New Zealand will be able to generate emissions intensity improvements in excess of 3.4% a year if it commits seriously to doing so. So the purpose of this discussion is not to suggest that the required rates of emissions intensity improvements cannot be achieved, but rather to provide a sense of the scale of the improvements required. A step change is needed rather than a marginal improvement.

FIGURE 3: ANNUAL IMPROVEMENT IN EMISSIONS PER UNIT OF GDP, CAGR, 1990-2004



Note: CAGR is Compound Annual Growth Rate. Data not available for Korea or Mexico. Estimates made by OECD to achieve comparable timeframe for Slovak Rep and Poland. Dataset expressed in international dollars to enable cross country comparison, may differ from calculation in local currency due to exchange rate variation.
Source: United Nations Framework Convention on Climate Change; OECD.

[3] *The estimate reported for New Zealand in Figure 3 differs slightly from the 3.4% annual emissions intensity improvement mentioned earlier, because of the exchange rate conversion.*

IMPLICATIONS

This simple analysis serves to highlight the potential challenges associated with achieving meaningful reductions in New Zealand's emissions over the next few decades. Determined and serious action that is sustained over decades will be required to significantly reduce New Zealand's emissions.

The process of adjustment to a lower emissions economy, although necessary, will involve incurring costs. It is of course true that there are negative cost abatement opportunities available, such as energy efficiency measures, in which emissions can be reduced while also lowering costs. However, the likely materiality of such measures is such that they will not deliver a significant proportion of the emissions reduction required.

The United Nation's Intergovernmental Panel on Climate Change (IPCC), for example, estimate that negative cost opportunities globally could reduce emissions by about 6 billion tonnes out of a current global total of 49 billion tonnes. Similarly, McKinsey's global abatement cost curve analysis estimated low or negative cost abatement opportunities at about 7 billion tonnes globally. These savings represent about 15% of 1990 global emissions. More recent estimates by McKinsey in the context of the UK and the US generate similar proportions of negative cost abatement opportunities.

Such estimates suggest that realising all the available negative cost abatement opportunities would only move global emissions half way back to their 1990 level as global emissions have grown by almost 30% since 1990. These negative cost abatement opportunities are not sufficient to reduce emissions below their 1990 level.

There is no particular reason to believe that New Zealand's negative cost opportunities are significantly different than these global numbers. On one hand, the absence of major industrial processes in New Zealand may mean that there is a smaller proportion of such abatement opportunities. On the other hand, however, because New Zealand is starting from a lower base in some areas such as energy efficiency standards there may be more potential. It seems reasonable to estimate that New Zealand's negative cost abatement opportunities are also in the order of 10-15% of 1990 emissions (that is, around 6-9 million tonnes).

Action should clearly be taken to take advantage of these negative cost abatement opportunities, but it should be recognised that New Zealand's negative cost abatement opportunities will likely only deliver a small proportion of the emissions reductions that are required.

There may also be some economic upside from reducing emissions that are due to emerging market opportunities. Indeed, there have been claims that responding aggressively to climate change will generate significant economic opportunities for New Zealand. However, although it seems likely that some New Zealand firms will be able to benefit from these emerging opportunities, we have not yet been able to identify material examples of commercial potential that will be created as a consequence of New Zealand adopting a demanding national emissions reduction target. A failure by firms to adjust to climate change will likely be costly, but this does not mean that there is significant economic upside from New Zealand being a first mover.[4]

And it is not enough to simply identify emerging global opportunities due to emerging demand for low-emissions goods and services. New Zealand firms need to be able to take advantage of these opportunities by developing products and business models that give them a competitive advantage in global markets. This will be demanding for many New Zealand firms.

At a national level, then, it is likely that transitioning to a low-emissions economy will involve cost and disruption. Significant changes are required. Although some have argued that this type of transition will come at low economic cost, pointing to estimates of a small GDP impact over the next several years (Infometrics (2007)), this seems unlikely. This type of general equilibrium modelling is not without value but it is unlikely to capture the full economic significance of disruptive changes like the response to climate change (Kerr (2007)). Large economic changes seldom come at low cost because they involve labour and capital moving out of some sectors and into others, as was seen in the economic reform process of the 1980s.

Indeed the actions required to adjust the New Zealand economy to a lower emissions mode of operating are likely to have a more substantial impact on the New Zealand economy than are many of the policies included in the government's economic transformation agenda. For example, a commitment to a 50% emissions reduction by 2050 is equivalent to a statement that there will be significant restructuring of the New Zealand economy, as this scale of reduction cannot be achieved in the context of the current economy on currently available technology.

As we argued in our last report, it is necessary for New Zealand to act now to reduce emissions. But this is going to be hard, and there should be a good understanding of the scale of the challenge associated with significantly reducing New

[4] *In any case, the incentive to innovate will be driven primarily by the conditions in global markets rather than the conditions in New Zealand.*

Zealand's emissions. One of the aims of this report is to provide some clarity as to the nature and scale of the response that will be required.

PRIORITIES FOR ACTION

New Zealand's climate change policy needs to focus on adjusting the New Zealand economy so that it can operate successfully in a low-emissions global economy. To do this, New Zealand needs to act to begin to reduce its emissions.

New Zealand's targeted emissions reductions can be achieved through domestic reductions or by financing emissions reductions in other countries (generally achieved by purchasing emissions credits). In theory, these two approaches should have the same impact in terms of reducing global emissions.

However, the process of adjusting the New Zealand economy to operate in a low-emissions world requires actual reductions in New Zealand's domestic emissions. Although the ability to purchase emissions credits from overseas is a valuable option, this does little to position New Zealand to operate successfully in a low-emissions world. To the extent that initial targets, such as the Institute's proposed 30% reduction target, are met by purchasing credits rather than reducing domestic emissions, it means that meeting more demanding reduction targets will need to be achieved by writing a larger cheque to purchase additional credits. It is also not clear that New Zealand can build a sustainable national brand by paying other countries to reduce their emissions, while doing little domestically.

This is not a claim that New Zealand should never purchase emissions credits to meet its global commitments to emissions reduction. But the first priority should be to reduce New Zealand's domestic emissions. So the focus of this analysis is on the ways in which New Zealand can reduce its domestic emissions, and does not consider the option of meeting emissions reduction targets through the purchase of emissions credits from other countries.

In order to provide insight into the priorities for action in reducing New Zealand's domestic emissions, it is useful to decompose emissions growth into three parts: the volume effect, the efficiency effect, and the composition effect.

The *volume effect* captures the growth in emissions that is due to the growth of the economy. That is, if the economy grows the volume effect would see emissions grow as well reflecting emissions from increased economic activity. But while slower economic growth is a way to slow emissions growth – this is the key reason that countries like Russia have reduced their emissions relative to their 1990 level – this is unlikely to be the preferred approach to reducing New Zealand's

emissions. It is taken as a given that policy ought to be aimed, to the maximum extent possible, at reducing emissions while continuing to promote income growth.

Fortunately, it turns out that most developed economies have been able to reduce their emissions intensity over time, producing fewer emissions for each unit of economic value. Because economies have become more efficient in terms of the emissions generated to produce a given amount of economic output, emissions growth has been lower than overall economic growth across the developed world. Figure 3 described the emissions intensity improvements that OECD countries have made since 1990. The average improvement across these developed countries is 4.2% a year.

New Zealand's performance over this period has been below average. Although New Zealand is making progress in terms of improving its emissions intensity, the rate of improvement is much less than that generated by many other developed countries and places New Zealand at 18th out of 28 OECD countries.

The emissions intensity of the economy can be changed in two ways: through the efficiency effect as well as through the composition effect. The *efficiency effect* measures the change in emissions intensity within each sector. Have particular sectors, such as dairy or manufacturing, become more efficient over time in terms of producing fewer emissions for each unit of output? The efficiency effect captures the overall change in emissions intensity across the economy achieved by various sectors becoming more or less efficient, assuming that the sectoral composition does not change.

The other channel for changing emissions intensity is the *composition effect*. This effect captures the change in national emissions intensity due to shifts in

DRIVERS OF EMISSIONS CHANGES

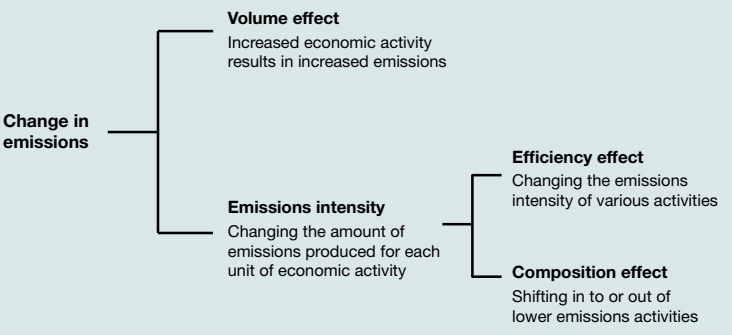
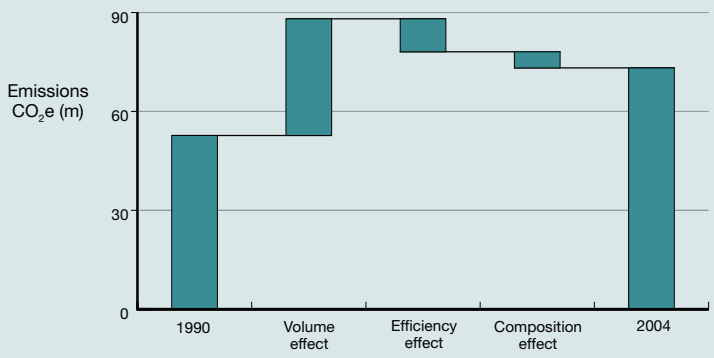


FIGURE 4: CHANGE IN GREENHOUSE GAS EMISSIONS IN NEW ZEALAND, 1990-2004



Note: Household emissions excluded. CO_2e = greenhouse gas emissions in equivalent tonnes of carbon dioxide.
Source: Statistics New Zealand; New Zealand Institute calculations.

the composition of the economy towards lower or higher emissions sectors. Holding the emissions intensity of various sectors constant, has there been a shift into more or less emissions intensive sectors? For example, over time, developed economies have tended to shift away from high emissions sectors such as heavy manufacturing into lower emissions sectors such as those in the services economy. This trend has generated an improvement in the emissions intensity of these countries.

Figure 4 describes how these three factors have contributed to the recent New Zealand experience in terms of emissions growth. Between 1990 and 2004, New Zealand's emissions grew by about 21% while the economy almost doubled in size. The effect of this economic growth is captured in the volume effect. New Zealand's emissions intensity has improved because of contributions from both the efficiency and the composition effects.

The efficiency effect has contributed about two thirds of the overall improvement in New Zealand's emissions intensity. These gains are widely spread across the economy, with improvements in emissions intensity occurring in many sectors.

The composition effect has also made a significant contribution, reducing New Zealand's annual emissions by about 5 million tonnes. Between 1990 and 2004, there was a shift into less emissions intensive activities. Notably, there was significant growth in the services economy, which tends to be less emissions intensive, and away from manufacturing. However, to the extent that there is a shift into the emissions intensive dairy sector on the back of strong international demand and prices, the contribution

of the composition effect may be less positive in the future.

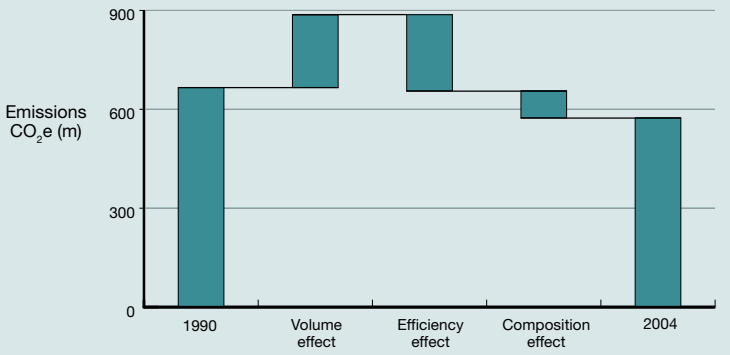
The importance of both of these channels of improvement seems to be common across other developed economies.[5] Consider, for example, the UK experience. As described in Figure 5, the UK economy has grown strongly over the past decade or so, approximately doubling in size, but the UK has managed to reduce its total emissions by almost 15% over this period.

This has been made possible because of significant contributions from both the efficiency and composition effects. The efficiency effect has generated about 70% of the overall improvement, as sectors across the UK economy have substantially improved their emissions intensity. The composition effect has also been powerful, accounting for about 30% of the improvement, with the UK economy moving away from manufacturing into areas such as financial services.

This historical New Zealand experience, as well as the international experience, provides guidance for New Zealand in terms of priorities for action. Much of the New Zealand policy debate has been focused on the efficiency channel, aiming to make existing types of economic activity less emissions intensive by introducing a price on emissions, encouraging energy efficiency, and so on.

However, the contribution of the composition effect in reducing emissions growth indicates that this channel ought also to be a focus for policy. Mechanisms that shift New Zealand's economic activity towards lower emissions areas are likely to be an important part of New Zealand's climate

FIGURE 5: CHANGE IN GREENHOUSE GAS EMISSIONS IN UK, 1990-2004



Note: Household emissions excluded. CO_2e = greenhouse gas emissions in equivalent tonnes of carbon dioxide.
Source: Office of National Statistics, UK; New Zealand Institute calculations.

[5] *Other studies also identify important contributions from both of these effects.*

change response, in addition to conventional measures such as the pricing and regulation of emissions. Indeed, the composition channel may have particular value to New Zealand given the relatively limited abatement opportunities available.

And in addition to reducing the emissions intensity of the New Zealand economy, enabling the New Zealand economy to grow while significantly lowering New Zealand's emissions, New Zealand should also be acting to manage the risk that it will be required to make significant emissions reductions. In particular, New Zealand should seek to reduce the likelihood that global consumers or international governments act to require New Zealand to reduce its emissions more rapidly than it is able given the structure of its economy. New Zealand can do this by acting to strengthen its environmental brand as well as advancing its interests in the international negotiations on global climate change.

The process of adjusting New Zealand to a low-emissions world will require making progress in terms of improving the emissions efficiency of the economy, encouraging growth in low-emissions sectors, as well as managing external risks. By broadening out climate change policy beyond simply pricing and regulating emissions, it is likely to be possible to find lower-cost ways of adjusting the New Zealand economy to a lower emissions mode of operating and positioning New Zealand to succeed in a low-emissions global economy. The following three sections discuss these three areas for policy focus in New Zealand's climate change strategy in greater detail.

3 IMPROVING NEW ZEALAND'S EMISSIONS EFFICIENCY

New Zealand is the second most emissions intensive economy in the world largely as a result of its agricultural sector, which generates significant emissions of methane and other greenhouse gases.

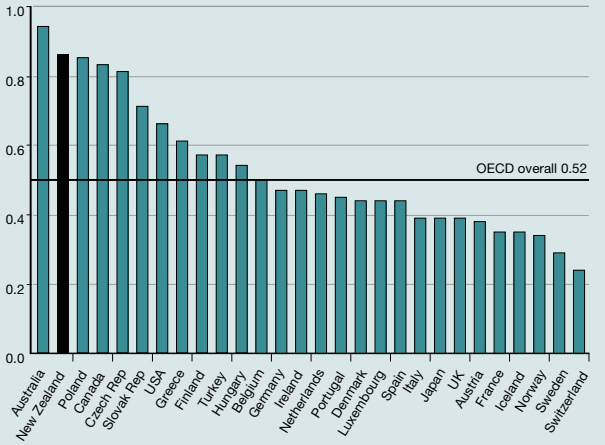
Indeed, the profile of New Zealand's emissions is highly distinctive in the context of developed countries. Carbon dioxide emissions are a much smaller proportion of New Zealand's greenhouse gas emissions than the developed country average, with methane emissions representing a much more significant component. Figure 7 notes that, in 2005, 35% of New Zealand's greenhouse gas emissions came from methane and 47% came from carbon dioxide, compared to world averages of 16% and 75% respectively. This means that global progress in developing technologies to reduce carbon dioxide emissions will likely have less impact on New Zealand's emissions.

Figure 8 shows the profile of New Zealand's emissions by sector.

Agriculture accounts for about half of New Zealand's emissions of greenhouse gases. To generate a material reduction in New Zealand's emissions, it will be necessary to make significant progress in reducing emissions in large emitting sectors such as agriculture, transport, and power. Significant growth in emissions has been observed across the major sectors since 1990, particularly the transport sector in which emissions grew by 62% between 1990 and 2005.

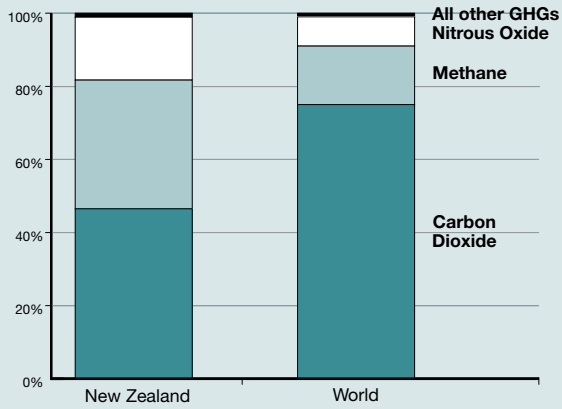
Delivering substantial reductions in emissions across these sectors will require contributions from both price and non-price measures. Establishing a price on emissions, such as those delivered through the government's proposed emissions trading scheme, is a critical first step to ensure that emitters internalise the full impact of their decisions. However, it is widely recognised that although imposing a price on emissions is necessary and worthwhile, it will not be sufficient

FIGURE 6: GREENHOUSE GAS EMISSIONS PER UNIT OF GDP, 2004



Note: Data not available for Korea or Mexico.
Source: United Nations Framework Convention on Climate Change.

FIGURE 7: GREENHOUSE GAS EMISSIONS BY TYPE



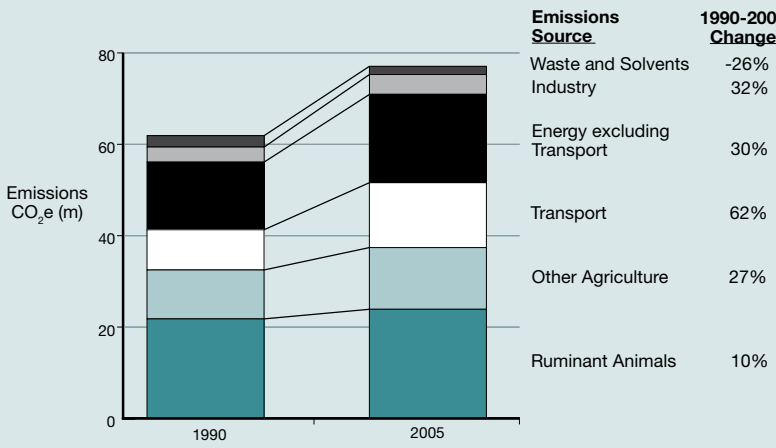
Note: New Zealand data 2005; World data 2004. GHG = greenhouse gas.
Source: Ministry for the Environment; Netherlands Environmental Assessment Agency.

to substantially reduce emissions (Stern (2006), IPCC (2007)). A broader range of actions will need to be taken.

These non-price-based mechanisms include regulatory and legislative instruments to encourage actions to reduce emissions. Having measures in place to directly target the quantity of emissions should be seen as a necessary complement to emissions pricing. The Prime Minister's Taskforce on Emissions Trading in Australia noted that the evidence "suggests a role for well-targeted energy efficiency policies that would complement the introduction of an emissions trading scheme".

Indeed, the existence of substantial amounts of negative cost abatement opportunities in which, by definition, there is a

FIGURE 8: NEW ZEALAND'S GREENHOUSE GAS EMISSIONS BY SOURCE



Note: CO_2e = greenhouse gas emissions in equivalent tonnes of carbon dioxide.
Source: Ministry for the Environment; United Nations Framework Convention on Climate Change.

While pricing emissions will lead to some improvements in energy efficiency, there is evidence that households and firms do not always take up opportunities for seemingly cost-effective improvements in energy efficiency. It appears there are significant non-price barriers including lack of information, informational asymmetries, split incentives (the benefit from undertaking energy efficiency measures does not flow through to those incurring the cost), and other behavioural factors.

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price-based incentive to take action to reduce emissions suggests that price signals are not enough. Capturing many of these abatement opportunities requires regulatory measures, such as stricter building standards and minimum standards for the fuel efficiency of vehicles.

Over the past several months, the government has proposed a range of policies and initiatives that are designed to reduce New Zealand's emissions. The following discussion summarises the key policies, their likely impact in terms of positioning New Zealand to compete in a low-emissions world, and considers what else remains to be done.

Emissions trading scheme

The government has recently announced the proposed structure of its emissions trading scheme (ETS), which will include all sectors and all greenhouse gases. The coverage and design of this scheme is world-leading; to the best of our knowledge no other planned or actual scheme is as ambitious in terms of covering all sectors and all gases. This means that over the next several years, all sectors of the New Zealand economy will begin to be exposed to a price on their greenhouse gas emissions.

As noted earlier, there are two ways in which an emissions trading scheme will assist New Zealand to reduce its emissions. The first contribution occurs because the pricing of emissions will send price signals to emitters to reduce their emissions. For example, an emissions price will encourage firms to invest in new technology and operating practices to lower their emissions and will encourage consumers to reduce their demand for emissions intensive goods and services.

The second contribution is through allowing New Zealand emitters to purchase emissions credits from overseas. The New Zealand government will issue a certain number of permits to various sectors, in line with its nominated emissions reduction targets, and emitters will bid for these permits. This enables the government to control New Zealand's net contribution to global greenhouse gas emissions. But

New Zealand's actual domestic emissions can be higher if New Zealand emitters purchase credits from international sources.

The intuition is that a global emissions trading scheme will allow for global emissions to be reduced in the most efficient way possible. If emissions can be reduced at lower cost in other countries than in New Zealand, the argument is that it will be more efficient for New Zealand to purchase the emissions credits from these countries than incur the costs associated with reducing New Zealand's domestic emissions.

However, as noted above, purchasing emissions credits from other countries will not make a significant contribution in terms of positioning New Zealand to operate effectively in a low-emissions environment. It also means that further reductions can only be achieved by purchasing additional credits. The focus should be on reducing New Zealand's domestic emissions. For this reason, this discussion will only consider the extent to which the ETS will act to reduce New Zealand's domestic emissions through the price mechanism.

The impact of emissions pricing on New Zealand's domestic emissions depends on both the emissions price faced by New Zealand emitters and the responsiveness of emissions behaviour to this price. Estimates of likely emissions prices range widely. The government's current price estimate for the first Kyoto period is $15.60 a tonne. But there is considerable uncertainty with respect to the price that will prevail both during the first Kyoto commitment period (2008-2012) and beyond.

Over the next 10-15 years, most price forecasts are in the $30-70 range. Deutsche Bank, for example, project that the emissions price in the European ETS will be €35 a tonne (about $70 a tonne at current exchange rates) through to 2020. A recent Point Carbon survey found that the expected 2020 price was €23 a tonne (about $45 a tonne).

New Zealand has chosen to be part of the emerging global trading system. This means that New Zealand will be a price taker on international markets in terms of the price of these credits. The global price will be driven by the number of permits issued on global markets by other governments as well as global progress in reducing emissions. The decisions taken by the New Zealand government will not have a material impact on the price that prevails on the open market.

This means that a key risk around the proposed design of the ETS is that it exposes New Zealand to the significant uncertainty that exists with respect to the global emissions price. As currently designed, there are no safety valves in the system to prevent the New Zealand economy being exposed to a very high

emissions price before all of New Zealand's trading partners are also exposed. There is a need to ensure that New Zealand's exposure to a high global emissions price is well managed. The proposed Australian approach, in which an annual maximum price is set, may be worth considering in this regard.

So what sort of reduction in domestic emissions can reasonably be expected from the ETS, given this range of expected prices? Although a price-based mechanism can be expected to lower emissions, some behaviours seem insensitive to price. For example, there is a well-documented reluctance to invest in energy efficiency initiatives even when the payback period is very short.

In terms of the impact on the energy sector, pricing of emissions will increase the price of electricity and this should reduce demand. By way of example, an emissions price of $25 a tonne would raise residential electricity prices by about 11% and a $50 a tonne price would lift electricity prices by about 20%. And in terms of transport, a $25 carbon tax would lead to a 6c per litre increase in the price of petrol (about 3-4% of the prevailing retail price for petrol).

However, emissions prices at these levels are unlikely to have a significant impact on demand and therefore on emissions. Demand for electricity and petrol is relatively insensitive to price. For example, the Ministry of Economic Development's modelling shows a 20% responsiveness of demand to petrol prices, which means that a 10% price increase is expected to lead to a 2% long term demand reduction. Previous analysis of a $15 carbon tax suggested a price increase of 3-5% and an emissions reduction of around 1%. Similarly, electricity demand by both households and firms is relatively insensitive to price increases. The Ministry of Economic Development estimate a 20-30% long-term responsiveness.

The impact of the ETS on the forestry sector is expected to be more significant. The Ministry of Agriculture and Forestry estimates that about 114,000 hectares are at risk of deforestation between 2008-2012 without an emissions price (representing about 3.4 million tonnes of emissions a year). There is also an expectation that the emission price will slow the rate of dairy conversion, although it is difficult to know how significant this will be.

Given the relatively low responsiveness of emissions behaviour to pricing, a high emissions price will be required in order for significant reductions in New Zealand's domestic emissions to be achieved. This is also the case in other countries. As one example, analysis published recently by the Confederation of British Industry estimated that an emissions price of €60-90 a tonne (roughly $120-180 a tonne) would be required to reduce UK emissions by 60% by 2050.

In sum, exposing the New Zealand economy to a meaningful emissions price is a positive step and will assist in constraining the growth in New Zealand's emissions. In addition, the revenue raised by the government through auctioning emissions permits can be used to reduce other taxes or to ease the costs of adjustment in moving to a low-emissions economy.

But there is a need for realistic expectations in terms of the potential for emissions pricing to deliver substantially lower domestic emissions. Indeed, the official view appears to be that the major expected contribution of the ETS is not to reduce New Zealand's domestic emissions but rather to allow New Zealand to reduce its contribution to global emissions by buying credits in other markets. This may reduce New Zealand's contribution to global emissions, but it will do little to position New Zealand in terms of reducing New Zealand's domestic emissions. Additional measures will be required to significantly reduce New Zealand's domestic emissions.

Energy (excluding transport)

Emissions from the energy sector currently amount to 33.5 million tonnes, accounting for over 40% of New Zealand's total emissions in 2005, having grown by 42% between 1990 and 2005. The government has set a target that the energy sector will be carbon neutral by 2040. By 2050, it is estimated that achieving this carbon neutrality target will involve avoiding over 50 million tonnes of emissions a year relative to the base case scenario.

Emissions from the transport sector account for about 40% of total emissions from the New Zealand energy sector, and are

subject to a variety of specific policy measures. Accordingly, this discussion will consider the transport sector, and the remainder of the energy sector, separately.

In terms of the energy sector excluding transport, the government estimates that achieving carbon neutrality by 2050 will require avoiding almost 30 million tonnes of emissions annually.

The government has announced a range of policies to reduce energy sector emissions, which focus on both the demand and supply sides of the market. On the supply side, the government has specified a target that 90% of New Zealand's electricity generation is to come from renewable sources, up from about 70% currently. This additional renewable capacity is expected to come from a mixture of hydro, wind, and geothermal capacity.

By 2050, this additional renewable capacity is likely to generate reduced emissions of about 7 million tonnes a year relative to the business as usual trajectory. This saving represents about 7% of New Zealand's projected 2050 emissions. However, even with this commitment to renewable energy, emissions from electricity generation in 2050 could be higher than in 1990.

Meeting this target for additional renewable capacity will require significant investment by profit-driven firms, both private and SOEs. These firms will need to have an expectation of an appropriate commercial return to justify the investment, even with the ban on new thermal generation capacity.[6] For major investments in renewable energy to be economic from today's standpoint, significant increases in prices are required. On some estimates, the cost of electricity generation would need to increase from $60-65 per megawatt hour to $85-100 per megawatt hour. And the Electricity Commission estimate that a $45 a tonne carbon price is required to make renewable energy break even with conventional energy.

The heavy reliance on renewable energy raises reasonable concerns about risks to the security of New Zealand's electricity supply; for example, dry or non-windy years may lead to reduced generation capacity. Indeed, very few countries have a 90% reliance on hydro and wind for electricity generation. The need to have reasonable security of supply means that New Zealand will need to retain some back-up thermal generation capacity.

However, renewable energy is an area in which New Zealand has distinctive advantage compared to many other countries. So in terms of priority areas for reducing New Zealand's emissions, it makes sense for New Zealand to seek to develop this capacity.

On the demand side, energy efficiency measures offer potential

[6] *The government has instructed its SOEs not to invest in further thermal generation capacity, and has introduced legislation to constrain the building of new thermal capacity by any investor.*

in terms of reducing New Zealand's emissions. The government has announced a range of energy efficiency and conservation measures, which include regulations around minimum energy standards, stricter construction standards, and the like. Many of these measures are likely to be low or negative cost over time, with reasonably short payback periods on investment, and are good things to do for reasons independent of climate change. For example, there are significant health costs associated with low quality housing that is damp and draughty.

We estimate that energy efficiency and conservation measures, which act to reduce the demand for energy, could generate savings of about 1-2 million tonnes a year. The impact of these measures on emissions is muted because much of the energy consumed by households will come from renewable sources; although firms and households may become more energy efficient, 90% of the energy saved is expected to come from renewable sources.

Overall, the various policy measures to reduce emissions from the energy sector seem appropriate. Taken together, we estimate that the announced measures seem likely to reduce New Zealand's emissions by about 8-9 million tonnes in 2050. This will deliver only about 30% of the emissions reduction required to achieve the specified target of carbon neutrality in this sector by 2050, and would leave emissions higher than in 1990. New Zealand is starting from a relatively advantaged position in terms of a heavy reliance on renewable energy, and this reduces the size of the abatement opportunities in the energy sector.

Over time, it may be possible to go further as new technologies emerge. Indeed, about 60% of the progress required to achieve carbon neutrality in this sector is expected to come from the emergence of new technologies such as carbon sequestration. The assumption that technology will become available over the next few decades that allows for the more efficient reduction of emissions seems reasonable.

In order to benefit, New Zealand needs to ensure that these technologies are adopted as they become available. However, there do not seem to be any policies aimed at deliberately encouraging rapid take-up. New Zealand should seek to position itself as a fast follower in terms of adopting international standards and technologies, rather than lagging international best practice as New Zealand has in the past. If New Zealand does not benefit from technological progress, energy emissions will remain significantly higher than their 1990 level in 2050.

The remainder of the government's target is expected to be met through purchasing emissions credits from overseas (about 10% of the target). The government estimates that the purchase of 6 million tonnes annually will be required in 2050 to achieve this target.

Transport

Transport emissions accounted for about 18% of New Zealand's 2005 greenhouse gas emissions, having grown by 62% between 1990 and 2005. This is more than twice the growth rate of New Zealand's overall emissions. This increase has been due to very significant growth in the size of the vehicle fleet. Road transport (mainly light vehicles) accounts for 85% of transport emissions, domestic aviation less than 10%, and rail and marine transport account for about 5%. International transport, mainly aviation, is excluded from this total but represents an additional 20% of transport emissions.

The government has set a target of making the transport sector carbon neutral by 2040. Achieving this target will require avoiding about 25 million tonnes of emissions every year by 2050. Achieving carbon neutrality will be a demanding task because transport sector emissions are expected to increase by over 40% by 2030 as the size of New Zealand's vehicle fleet continues to increase.

As noted in the earlier discussion on the ETS, the introduction of an emissions price will reduce transport sector emissions because people are likely to choose to travel less and will have an incentive to improve the emissions efficiency of their vehicles. However, the available evidence suggests that this will have a relatively modest impact on reducing emissions.

The government has also been tightening fuel efficiency standards on imported cars. This would deliver an emissions reduction of about 2 million tonnes a year, or about 15% of current transport emissions.

This is long overdue. Taken as a whole, New Zealand has one of the oldest and dirtiest car fleets in the developed world. In addition to reducing emissions, this move will also make a positive contribution to public health by improving the air quality.

The government has also announced other measures to reduce emissions from the transport sector. For example, a 3.4% biofuels requirement by 2012 has been announced, which is likely to generate a saving of 300,000 tonnes a year. And increased investment is being made in public transport, such as the electrification of more of the rail network.

We estimate that these pricing and regulatory measures will save approximately 4-5 million tonnes a year. This will mean that emissions from the transport sector in 2050 will be around 10-15% higher than in 1990. So as it stands, we estimate that the announced policy initiatives are only expected to make a relatively small contribution towards the achievement of the government's carbon neutrality target.

Over half of the emissions reductions that are required to achieve carbon neutrality in the transport sector are expected to be delivered by technological progress or other changes in behaviour. The government has provided some examples of how such progress could contribute to achieving emissions reductions; for example, being able to move to an 85% reliance on biofuels and the widespread deployment of electric or hydrogen cars. Most of this technology is likely to come from overseas, and capturing the benefits from this progress will rely on New Zealand being prepared to adopt this new technology as it becomes available.

The government also expects in 2050 that about 6 million tonnes of emissions credits will need to be purchased annually on the open market to achieve carbon neutrality in this sector. This could have a very significant price tag attached to it. At a $40 price for example, this would cost $240 million a year, and will do little to assist New Zealand to shift to a low-emissions mode of operating.

It turns out that only about 15% of the progress to achieving carbon neutrality in the transport sector will be delivered by the policy measures announced to date, about 25% through purchasing offsets, with about 60% due to assumed progress.

This is an area in which more can and should be done. For example, New Zealand should make an ongoing commitment to improve vehicle efficiency standards in line with progress made in other countries. To give a sense of the materiality of this, adopting the fuel efficiency standards of the European

Union might save an additional 4 million tonnes of emissions a year.

New Zealand also needs to make a more significant investment in public transport. Although the government has increased funding for public transport over the past several years, more is needed in order to give people an alternative to private cars. Without strengthened public transport capacity, significantly reduced growth in transport emissions is less likely.

Widespread deployment of a high speed broadband network also has the potential to make a substantial contribution in this regard. High speed broadband is likely to make a significant contribution to reducing New Zealand's emissions intensity by enabling remote work, videoconferencing, and the like.[7] This technology reduces the need for travel, and may be particularly significant for a remote country like New Zealand with a reasonably dispersed population.

There is a growing body of international research that describes the emissions savings that such technology can generate (Pamlin (2007)). Using the assumptions made in these studies, including some Australian research, it seems reasonable to expect emissions reductions of around 2-3 million tonnes a year. And New Zealand may achieve disproportionate benefits because of New Zealand's physical remoteness from other countries and the current state of the public transport network.

Research and land-use

Agricultural emissions account for about half of New Zealand's emissions, and have grown strongly since 1990. Ruminant animal emissions have increased by about 10% since 1990 and other agriculture emissions have increased by about 27%. The major sources of emissions from the agriculture sector are methane from ruminant animals, accounting for about two thirds of the sector's emissions, and nitrous oxide. The extent to which progress can be made in reducing agricultural emissions will have a significant impact on the extent to which New Zealand can reduce its overall emissions.

Unfortunately, opportunities to reduce agricultural emissions are limited in the near term and are uncertain going forward. The most promising near-term opportunities are better management practices as well as new technologies to reduce nitrous oxide emissions, called 'nitrification inhibitors'. Under ideal conditions, these inhibitors may reduce the majority of emissions but performance varies based on climate. Reducing New Zealand's nitrous oxide emissions by one quarter may be possible.

The means of reducing methane emissions are not well understood currently but appear limited. Overall, an expectation of a 10-15% reduction in methane emissions is ambitious given current technology. This means that agricultural emissions are not likely to fall below

[7] *Refer Skilling & Winton (2007) for a discussion of some of these benefits.*

15% below 1990 levels, unless there is a research-led breakthrough.

Developing the scientific basis for reducing agricultural emissions should be a priority for New Zealand action. New Zealand is the developed country most exposed to these emissions and has much of the expertise required to make progress. Agricultural emissions are not the focus of world efforts for mitigation. But it is an area in which New Zealand should aim to develop a world leading position. In short, research in this area matters significantly to New Zealand and should be a priority.

And in addition to the benefits that may come from reduced agricultural emissions, this research may be used as the base for developing valuable commercial technology.

The government has announced that it will invest an additional $40 million over the five years to 2012 on research that is aimed at reducing emissions from the agricultural sector. The Pastoral Greenhouse Gas Consortium, a joint initiative with private and public sector funding, will receive $5 million annually for the next five years, focused on various mitigation opportunities. The government has also committed an additional $22 million over the next five years on technology transfer.

This level of funding seems like an appropriate commitment, and it is not clear that additional funding could be used productively in the short term given the limited numbers of available researchers.

In terms of forestry, the government has targeted a net increase of 250,000 hectares by 2020 compared to 2007. This may reduce emissions by up to 7 million tonnes annually, depending on the type of trees that are planted. This is expected to be achieved through the incentives generated by the emissions price, and through

direct financial grants such as the Permanent Forest Sink Initiative and the Afforestation Grant Scheme. Given these incentives and the historical rates of planting, this target looks reasonable.

DISCUSSION

Although the government has chosen not to specify an overall national target for emissions reductions, it has nominated various sector targets such as carbon neutrality in the energy and transport sectors. When all of these sector targets are combined, we estimate that the implied target for emissions reduction is approximately 40% relative to the 1990 emissions level by 2050. Table 2 describes the various targets that the government has nominated and their respective contributions to the overall emissions reduction target.

The government has announced various policies and initiatives designed to deliver reductions in emissions. By 2050, our estimate is that the announced policy measures will lead to emissions being at most 30 million tonnes lower than they would otherwise have been. The impact of these policies is summarised in Table 3.

It is possible that greater impact will be achieved if, for example, the investment in agricultural research leads to significantly reduced methane emissions, but this is impossible to quantify. And the ETS is likely to deliver additional domestic emissions reductions, but the uncertainty with respect to both price and demand responsiveness, make these gains difficult to estimate.

The government's base case scenario is for New Zealand's emissions to be about 100 million tonnes in 2050. So the impact of the policies announced to date is to reduce New Zealand's annual emissions to about 70 million tonnes. This is above the 1990

TABLE 2: EFFECT OF DECLARED TARGETS IN 2050

Government targets declared	2050 emissions reduction (m tonnes CO2e per annum)
Energy excluding Transport Carbon neutral in energy by 2040 Carbon neutral in stationary energy by 2030 Carbon neutral in electricity by 2025 90% of electricity renewable by 2025 with no new fossil-fuel generation	29
Transport Carbon neutral in transport by 2040 By 2040, per capita transport GHG emissions will be halved One of first countries to widely deploy electric vehicles	26
Agriculture and land use Remain a world leader in agricultural emissions reduction science By 2020 net increase in forest area of 250,000 hectares over 2007	No impact estimated ~7
TOTAL REDUCTIONS TARGETED	~62
Resulting percentage below 1990 emissions	~40%

Note: Estimated reduction includes offset purchases. Emissions growth as forecast by MED in Low Carbon Energy Scenario for energy sector, all other sectors projected, with modification, based on past rates of change.

TABLE 3: ESTIMATED IMPACT OF CURRENT POLICIES BY 2050

Initiatives to achieve emissions reductions	Impact (m pa)	Associated costs and considerations
Energy excluding Transport Efficient and renewable electricity system ~24 programmes as well as restriction on fossil-fuel based generation and shift to 90% renewable Energywise Homes ~20 programmes Energywise Business ~35 programmes	8-9	Increased cost of electricity generation Increased wholesale and retail prices Capital costs such as solar heaters, insulation Compliance costs
Transport Biofuel sales 3.4% of fuel Energywise Transport ~30 programmes	4-5	Price of fuel Capital costs of abandoned assets Compliance costs
Research and land use Remain a world leader in agricultural emissions reduction science By 2020 net increase in forest area of 250,000 hectares over 2007	~7 ~7	Research funding
Emissions impact quantified	<30	
Additional initiatives Emissions Trading System	TBD	High prices likely to be required to achieve emissions reductions
Total emissions reduction	TBD	

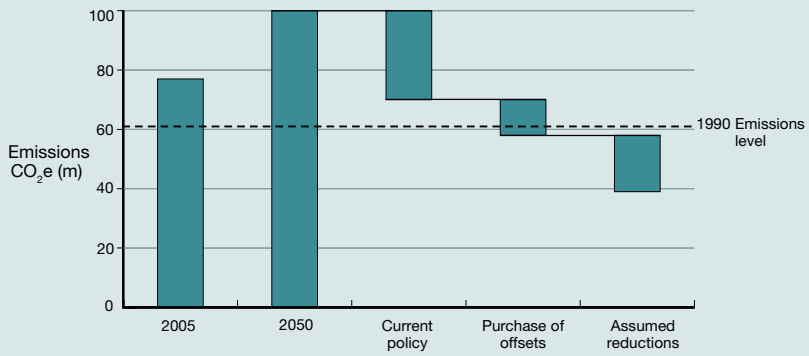
Note: Agricultural emissions impact based on reducing methane by 15% and nitrous oxide by 25%. Some programs have not had estimates made of potential impact, many have overlapping effect.
Source: Ministry for the Environment; Ministry of Economic Development; New Zealand Energy Efficiency and Conservation Strategy; New Zealand Institute calculations.

level of emissions of 62 million tonnes. However, given the inherent uncertainty of these estimates, and the potential contribution from the ETS, it is probably fair to say that these policies will reduce New Zealand's 2050 emissions to about their 1990 level.

These policies then represent a good start, but more is needed. Indeed, the policies announced to date will deliver less than half of the reductions required to achieve the government's implicit target of a 40% reduction in emissions – and also fall well short of the 30% reduction that we proposed.

As noted in Figure 9, the two other mechanisms that are being relied on to deliver further reductions in emissions are developments in technology and the purchase of emissions credits.

FIGURE 9: CURRENT EMISSIONS REDUCTIONS PLANS FOR NEW ZEALAND



Note: Impact of ETS beyond 2012 is not included in current policy.
Source: Ministry for the Environment; Ministry of Economic Development; New Zealand Institute calculations.

It is reasonable to assume that technology will emerge over the next few decades that will assist in reducing New Zealand's emissions. However, in order to capture these benefits, New Zealand needs to position itself to adopt this technology as it becomes available. Historically New Zealand has not been a rapid adopter of international standards and technology, which is why, for example, New Zealand's car fleet is so old. Importing new standards and technology will enable New Zealand to make progress in reducing emissions at roughly the same pace as other developed countries. New Zealand should make a commitment to upgrade its standards in line with progress in other countries.

Participating in the global emissions trading system, and being able to purchase emissions credits on the open market, allows New Zealand to cap its contribution to global emissions. But this is not a complete substitute for action in reducing New Zealand's domestic emissions.

New Zealand cannot position itself to operate successfully in a low-emissions world by relying in large measure on the purchase of credits. Otherwise, in the event that New Zealand was subsequently expected to reduce its emissions to 50% below 1990 levels, the main option open to New Zealand would be to purchase additional emissions credits.

Taken together, the announced policy actions do not seem sufficient to position New Zealand to compete in a low-emissions environment. As noted above, we believe that further progress could be made, such as committing to introduce tighter standards on vehicle emissions over time and encouraging the uptake of technology such as videoconferencing that reduces the need for travel. But these measures cannot reasonably be expected to deliver deep reductions in New Zealand's emissions.

The limited materiality of these actions to reduce emissions is largely due to the structure of the New Zealand economy and its emissions profile. It is not because of deficiencies in the policies announced to date. New Zealand has relatively few options to reduce emissions through the efficiency effect. The IPCC expects that 60-80% of global emissions reductions will come from "energy supply and use and efficiency in industrial processes". However, New Zealand already has a high proportion of renewable energy and industrial processes represent less than half of New Zealand's emissions, implying reduced emissions in other sectors will have to be achieved to meet substantial reduction targets. Australia, by comparison, with a larger industrial sector and a greater share of coal-fired electricity generation, has some more immediate ways in which to reduce its emissions.

There is scope for New Zealand to reduce its emissions through the

efficiency effect. But increasingly costly measures will need to be taken to achieve the emissions reductions that are required if this channel is the sole mechanism available. The next section will investigate the potential for reductions in New Zealand's emissions to be achieved through a shift in the composition of the New Zealand economy towards low emissions areas.

4 BUILDING LOWER EMISSIONS STRENGTHS

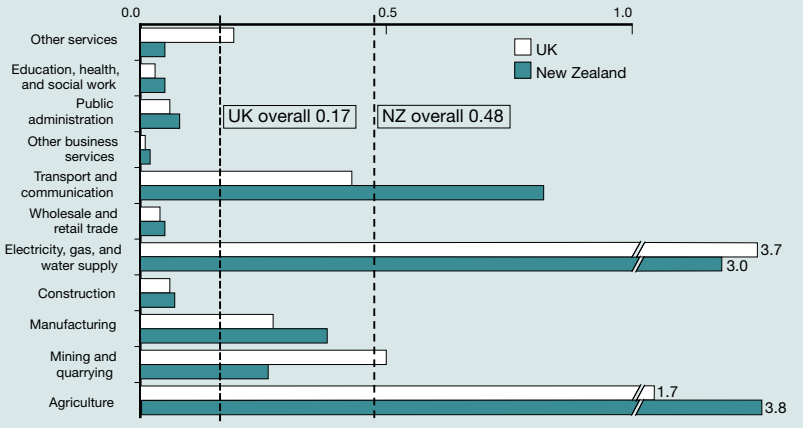
New Zealand is a highly emissions intensive economy, and its economic growth continues to be relatively emissions intensive in nature. Even with various measures to reduce the emissions intensity of New Zealand's economic growth profile, reducing New Zealand's emissions in a significant way will remain difficult if new lower emissions intensity strengths are not developed in the New Zealand economy. Indeed, as noted earlier, committing to demanding targets for emissions reduction is equivalent to committing to transform the New Zealand economy.

Although more abatement opportunities will likely become available to New Zealand over time as technology develops, the fundamental challenge is that New Zealand's areas of comparative advantage are in emissions intensive sectors such as dairy and tourism. And these parts of the economy are likely to be important drivers of New Zealand's economic growth over the coming decades. This generates a significant exposure for the New Zealand economy.

The following discussion examines the potential for New Zealand to reduce its emissions by shifting the sectoral composition of the New Zealand economy towards lower emissions sectors.

There is substantial variation in the emissions efficiency of various sectors, as shown in Figure 10. In New Zealand, for example, emissions intensity expressed in terms of tonnes of emissions per unit of economic value varies across sectors by a factor of almost 200, from 0.02 in Business Services to 3.8 in Agriculture against an overall average of 0.5. Relative to the most efficient category of Business Services, Manufacturing is 20 times less efficient and Transport and

FIGURE 10: EMISSIONS INTENSITY BY SECTOR, 2004



Note: Household emissions excluded.
Source: Statistics New Zealand; Office of National Statistics, UK.

Communications is 40 times less efficient.

As discussed in section 2, there is clear evidence that changes in the composition of the economy are a major driver of changes in national emissions over time. The UK, for example, has reduced its emissions growth while generating strong rates of economic growth in part by shifting towards low-emissions activities. Ireland has constrained its emissions growth largely because its rapid economic growth was focused in the relatively low-emissions IT and services sectors. And about one third of the improvement in New Zealand's emissions intensity since 1990 has been due to a shift into lower emissions activities in the services economy.

An important part of positioning New Zealand to succeed in a low-emissions global economy should be to act to reduce New Zealand's reliance on emissions-intensive sources of growth. This will involve a change in the structure of New Zealand's economic activity. This is not a claim that New Zealand should exit, say, the dairy industry in order that economic resources can flow into other lower emissions sectors. Clearly New Zealand has an economic advantage in emissions intensive agriculture, and this will be an important part of New Zealand's economic future. But it is an argument that generating an increasing share of growth from lower emissions areas of the economy is a vital part of the task of reducing New Zealand's exposure to climate change.

So what sort of contribution could the composition effect deliver in terms of assisting New Zealand to reduce its emissions? Consider the following calculations that give a sense of the materiality of the potential contribution. Assume that New Zealand generates a 2% real economic growth rate, and continues to deliver a 3.4% emissions intensity improvement each year, until 2050. If the composition of the economy remains unchanged over this period, with all sectors growing at the same rate, New Zealand's emissions would be about 93 million tonnes by 2050 or about 150% of the 1990 level.

However, if half of New Zealand's growth came from a low emissions intensity sector, such as business services, and the remaining half from the existing economy, emissions would reduce to 63 million tonnes or just over 100% of 1990 emissions. And if all of New Zealand's growth to 2050 is generated by the low-emissions sector, with no growth in the other parts of the existing economy, New Zealand's 2050 emissions would be 33 million tonnes or just over 50% of New Zealand's 1990 emissions. These reductions would be additional to the types of emissions intensity improvements described in the previous section.

These different scenarios are not intended to be predictions but rather to give a sense of the potential

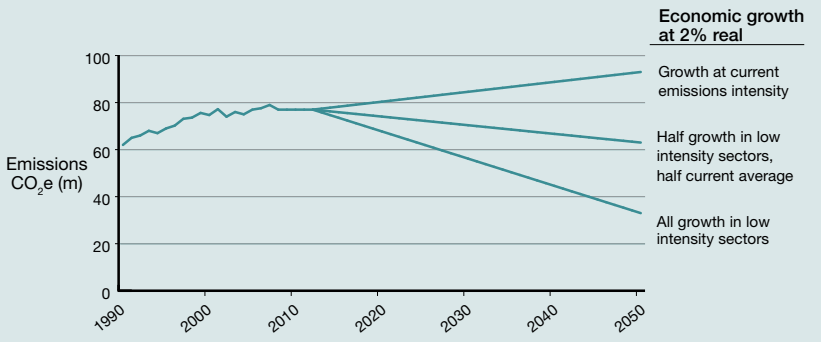
significance of the composition effect. It suggests that shifting the growth of the New Zealand economy towards low-emissions activities, such as business services or the creative industries, has the potential to have a significant impact on New Zealand's emissions. But does it necessarily follow that this effect should be a direct focus of policy in New Zealand?

To some extent, the composition effect should operate automatically. There is a well-documented tendency across the developed world for countries to move out of emissions intensive activities such as manufacturing into the services economy (for reasons independent of the response to climate change). This is a key reason that the composition effect has been substantial in many developed countries even without deliberate policy encouragement, such as emissions pricing.

However, New Zealand has not participated in this trend to nearly the same extent. Unusually for a developed economy, New Zealand has a large agricultural sector for reasons relating to its small scale, remote location, and natural resources. New Zealand's export profile is dominated by the primary sector and by tourism, which are both emissions intensive. The location of New Zealand's global comparative advantage is the major reason why New Zealand is the second most emissions intensive economy in the OECD.

Little change to this economic structure appears likely in the short to medium term. Indeed, strong growth is observed in New Zealand's agricultural sector and this is projected to continue with high dairy prices that seem likely to persist on the back of booming international demand. As a consequence, it is likely that resources will continue

FIGURE 11: FUTURE EMISSIONS UNDER VARIOUS GROWTH MIXES



Note: 3.4% annual efficiency improvements achieved 1990-2004 assumed to 2050 across all activities. Low emissions intensity sector is 'other business services' with an emissions intensity of 0.02 compared to an average of 0.48. CO_2e = greenhouse gas emissions in equivalent tonnes of carbon dioxide.
Source: Ministry for the Environment; New Zealand Institute calculations.

to flow into the dairy sector and relatively unlikely that emissions from the dairy sector will reduce in substantial measure (unless new technology becomes available).

This suggests that the process of transition to a lower emissions economy is unlikely to happen as readily in New Zealand as in other developed countries. And yet if New Zealand does not adjust, the effects of climate change are likely to represent a substantial risk to New Zealand's competitive position. So what can and should be done?

PRIORITIES FOR ACTION

The various policy measures discussed in the previous section, which focus on pricing and constraining emissions, will create an incentive to reduce the emissions intensity of various activities. Some of this will occur through adopting better technologies and new modes of operating. But it will also create an incentive to change the sectoral composition of the economy. The price imposed on emissions will tend to make high emissions types of economic activity less economic, and encourage growth in less emissions intensive activities.

But more is required than simply a price signal that creates an incentive to move away from emissions intensive activities. It is also necessary that New Zealand provide a competitive platform for low-emissions activity so that there is a reason for the low intensity activity to be located in New Zealand. Increasingly, economic activity can choose to locate in many countries, and it is important that firms have an incentive to locate these low-emissions activities in New Zealand rather than in other competing locations. Otherwise emissions intensive activities will become less competitive in New Zealand, but there will be less growth in low-emissions sectors than could have been the case.

The priority should therefore be to create an environment in New Zealand that supports the growth and development of low-emissions sectors, and which compares favourably to other countries. This will require New Zealand to take a deliberate approach to encouraging a shift in the composition of the New Zealand economy rather than simply relying on the introduction of an emissions price to encourage this shift.

In particular, New Zealand should be looking to develop areas in which a small, remote economy can reasonably aspire to generate international competitive advantage. There is no point in trying to develop strengths in low-emissions activities in which New Zealand firms are unlikely to be able to successfully compete in global markets. The areas of focus ought to be both low emissions and also areas of prospective competitive advantage for New Zealand.

Outside of areas in which New Zealand has a natural resource endowment, New Zealand is most likely to be able to develop global competitive advantage in types of activities that are relatively insensitive to physical location or to scale. New Zealand's traditional business model has been to physically transport relatively heavy, relatively low value primary sector goods across long distances. This has been feasible because of the advantages in the production process.

But the challenge for New Zealand is to develop strengths in its economy that are suited to a small remote country competing in a low-emissions world. Given New Zealand's physical remoteness, it is likely that these will be high value to weight (and weightless) activities, as these activities are much less subject to some of the conventional disadvantages of remoteness (Skilling (2007b)).

New Zealand should aim to develop strengths in the 'weightless economy', in which economic value is generated from intangible activities. The weightless economy is made up of those firms whose outputs include services where knowledge is the key ingredient. Examples of weightless industries include software, financial services, health or marketing consulting, education, biotechnology, entertainment, and new media. The weightless economy also includes adding more knowledge-based value to physical products.

These new international strengths would supplement existing strengths in the primary sector and tourism. This type of activity is not intended as a substitute for New Zealand's traditional strengths. But the claim is that a greater portion of New Zealand's economic growth should come from these sectors.

These weightless activities tend to be relatively low emissions, both in production and also in terms of the efficiency of the supply chain. It is much more efficient to transport weightless services to market, both in terms of cost and also in terms of emissions. Rather than using physical supply chains, such as air and sea freight, there will be greater reliance on virtual supply chains such as communications infrastructure that are much less emissions intensive. This is of particular benefit to a remote country like New Zealand.

Given that these activities can be located in many countries, there is a need for New Zealand to act to make New Zealand the location of choice for these activities. To make significant progress in developing strengths in the weightless economy, there is a need for a coherent economic strategy to guide sustained policy action across a range of areas.[8] For example, there is a need to invest much substantially and systematically in research and education. This is likely to be the foundation for a knowledge-driven economy, but New Zealand's investment in these

[8] *Skilling (2007b) provides further discussion of some of these points.*

areas has significantly lagged other developed countries.

Providing world-class communications infrastructure is also a necessary part of ensuring that New Zealand is a competitive platform for weightless economic activity. And as described earlier, investing in communications technology has additional benefits in terms of reducing domestic emissions, as it becomes possible to undertake remote working and to videoconference rather than to travel.

More generally, the New Zealand business environment needs to be attractive to firms operating in low emissions types of economic activity. This means being competitive in areas including tax, access to capital, labour markets, and so on.

The weightless economy also extends to include some emerging business models that are being employed by New Zealand firms. Firms looking to expand from a New Zealand base may be able to strengthen their competitive position by undertaking outward foreign direct investment (FDI) or by locating their production presence closer to foreign markets (Skilling & Boven (2007a)). Relative to a business model of exporting goods from New Zealand, such a business model is likely to generate lower emissions as well as reduced production and distribution costs. For example, the decision of F&P Appliances to locate a part of their production presence in Ohio, in order to be closer to customers, means that their supply chain generates fewer emissions and that the company becomes more profitable.

Continued reliance on a business model in which New Zealand transports relatively heavy, relatively low cost goods across long distances is unlikely to be sustainable in an environment in which climate change is more of a factor. And there is an issue as to the commercial desirability of this model in any case, in terms of increasing oil prices and the increasing importance of speed to market.

These decisions will be firm-specific, but the policy environment should be supportive of firms that choose this type of business model rather than being discouraging or critical of such firms. Recent policy announcements, such as reforming the international tax regime and refocusing New Zealand Trade & Enterprise on outward FDI are steps in the right direction in this regard.

DISCUSSION

The key reason for New Zealand's high level of emissions intensity is the structure of the New Zealand economy, and the government's climate change policy response should extend to acting to shift the New Zealand economy towards a structure that is less emissions intensive and accordingly is less exposed to the effects of climate change. To deliver substantial reductions in New Zealand's emissions will require significant shifts in the composition of the New Zealand economy in addition to policies that impose a price on emissions.

Indeed, given the relatively limited abatement options available to New Zealand, policies aimed at shifting the composition of the New Zealand economy may well have an impact that rivals that of the policies aimed at increasing New Zealand's emissions efficiency. So to what extent is this recognised in terms of government policy?

Recent speeches by government Ministers have increasingly linked New Zealand's response to climate change to economic policy. Michael Cullen, for example, has noted that "The Labour-led government sees New Zealand's response to climate change and our pursuit of sustainability as central to our work to transform the economy. We are confident that the economic benefits of greater sustainability will be substantial". And several other Ministerial statements have made the argument that an aggressive response to climate change will generate significant opportunities for New Zealand firms, as well as creating the environment for economic transformation.

As we have argued previously, it is likely that some New Zealand firms will be able to create economic value through building a brand around sustainability or low-emissions activities. But it is not clear how large these benefits are. And some caution may be appropriate in expecting significant gains. New Zealand has not performed well in terms of seizing the economic potential of global markets (Skilling & Boven (2005)). Given this

context, caution seems warranted in expecting that changes in the external environment caused by climate change will lead to economic transformation in a spontaneous manner.

And, of course, if these benefits do exist, it may make it more difficult to reduce New Zealand's emissions. For example, if a national brand built on sustainability stimulates demand for New Zealand's food and beverage products or tourism, New Zealand's emissions are likely to increase.

In any case, the primary policy perspective to date has been a view that an ambitious response to climate change can be used as a lever to achieve economic transformation in New Zealand. This argument clearly has some validity to it.

But it is more appropriate to see economic transformation as a vital component of New Zealand's response to climate change. Unless the New Zealand economy develops new strengths in low emissions types of economic activity, it will be much more challenging for New Zealand to deliver meaningful reductions in emissions. Transforming the economy in this way is central to the task of responding to climate change.

The centrality of economic transformation to New Zealand's climate change response does not seem to have been recognised by government decision-makers, in terms of either public statements or, more importantly, in terms of concrete policy action. There is no clearly articulated strategy to move the New Zealand economy in a low emissions direction in a meaningful way. To take just one example, broadband policy is not currently motivated by a desire to develop low emissions strengths in the New Zealand economy. And yet it may be that genuinely world-class communications infrastructure is central to ensuring that the New Zealand economy can compete in a low-emissions environment.

A much more significant policy commitment to transforming the New Zealand economy is a key part of positioning New Zealand to successfully compete in a low-emissions global economy. This requires deliberate policy attention. Otherwise the risk is that emissions intensive economic activity becomes uneconomic in New Zealand, but that New Zealand does not attract and retain low-emissions activity, and New Zealand's economic performance slows.

5 MANAGING NEW ZEALAND'S EXTERNAL EXPOSURE

New Zealand's economic exposure to the effects of climate change is, in large measure, an international exposure. In particular, New Zealand is exposed to the risk that overseas consumers and governments choose to sanction goods and services, or countries, which do not satisfy particular requirements with respect to reducing emissions.

Although there is uncertainty as to how markets and governments will respond to climate change over the next few decades, there is a reasonable likelihood that New Zealand will be required to make substantial reductions in emissions. The Institute's last report described some of these risks. It may be, for example, that consumer preferences shift in a decisive manner away from emissions intensive goods and services. This would potentially reduce demand for New Zealand food and beverage products as well as international tourism to New Zealand. And perhaps even more likely, it may be that international governmental action will require deep reductions in emissions to be made, with countries that do not make the required reductions facing economic and trade sanctions.

As the discussion in the previous sections indicates, achieving large reductions in emissions will require disruptive changes in the New Zealand economy. So in addition to acting to reduce emissions by improving New Zealand's emissions efficiency and encouraging the development of low emissions strengths, New Zealand should act to manage the risk that consumers or governments require New Zealand to make substantial emissions reductions in a rapid way.

This section will examine ways in which New Zealand can act to manage its exposure to consumer or governmental demands to significantly reduce its emissions. For example, it may be that consumers will be less likely to penalise New Zealand goods that have a high emissions content to the extent that New Zealand is able to project a positive brand image. And it may be possible for New Zealand to make its case in international climate change negotiations in such a way as to reduce the probability that international governmental action requires New Zealand to make significant reductions in emissions.

SHIFTING CONSUMER PREFERENCES

New Zealand needs to act to manage the risk that consumer demand for New Zealand sourced goods and services weakens as a consequence of concerns about climate change. Clearly, for example, New Zealand needs to respond to arguments like food miles by presenting a New Zealand side to the story. New Zealand has already taken some actions in terms of commissioning academic research and beginning to communicate this publicly. This needs to be an ongoing priority.

But perhaps an even more important priority is to develop and communicate a strong environmental brand. It seems likely that consumer interest and concern about issues such as the environmental integrity of goods and services, food safety, and the environmental impact of tourism, will increase over time. Particularly in developed countries, people are more likely to demand goods and services that are environmentally friendly. New Zealand has a particular exposure to these preferences, given that its major exports are food and beverage and tourism. Consumer concern and awareness about climate change is only one part of a broader interest in environmental issues.

To the extent that consumers see New Zealand as committed to environmental best practice, as well as making serious efforts to reduce its emissions, it becomes less likely that New Zealand goods and services will be penalised in markets. And a strong environmental reputation will have a positive effect on New Zealand's ability to attract tourists, migrants, and possibly firms.

Environmental quality is an area in which New Zealand has some distinctive advantage relative to most other developed countries, and in which it can reasonably aspire to be world-leading. New Zealand is not well placed to be a world leader in terms of its commitment to reduce emissions, but New Zealand can build a world-leading national brand around its environmental integrity.

New Zealand, of course, has a well-established clean and green national brand, which has been at the core of much of New Zealand's national advertising (for example, the 100% Pure campaign). But New Zealand cannot afford to take this brand for granted. It is necessary to invest more significantly behind New Zealand's environmental brand to ensure that New Zealand remains globally distinctive.

Indeed, New Zealand has some environmental issues, as noted in various reports including a 2007 OECD Environment Performance Review. The OECD report contains specific recommendations for action to strengthen New Zealand's environmental outcomes, such as

improving the water quality of lakes and rivers, reducing the incidence of particulates, and reducing solid waste. Some of the measures mentioned earlier, such as stricter fuel efficiency standards for vehicles, will also be useful in this regard. New Zealand's investment into environmental outcomes should be increased to ensure that New Zealand continues to deserve its clean, green brand.

Such actions are likely to both manage New Zealand's risk exposure to shifting consumer preferences in response to climate change as well as potentially enable New Zealand firms to capture economic opportunities.
The New Zealand government should act to position New Zealand on dimensions where it can compete successfully. Rather than focusing on building a national brand by adopting an aspiration for demanding emissions reductions, an area in which New Zealand is disadvantaged relative to other countries, New Zealand should play to its strengths by investing more significantly in strengthening its globally distinctive environmental brand. In particular, New Zealand should aim to ensure that its clean, green national brand is sustainable.

GOVERNMENT ACTION

New Zealand is exposed to the risk that international governmental action will require substantial commitments of New Zealand in terms of reducing emissions. For example, there were serious calls at the recent Bali talks for developed countries to commit to 25-40% reductions in emissions by 2020, with ongoing reductions through to 2050 perhaps to 60-80% below the 1990 level. And statements have been made by political leaders in Europe arguing for trade or economic sanctions to be imposed on countries that do not deliver meaningful emissions reductions.

This potential creates a significant exposure for New Zealand because, relative to other developed countries, New Zealand has few options to deliver substantial emissions reductions. The New Zealand economy has relatively few abatement opportunities in agriculture, has a very high proportion of renewable energy, and so on. Even returning New Zealand's emissions to their 1990 level by 2020, as we have proposed, will be a demanding process. This reality means that New Zealand needs to work to ensure that allowance is made for its particular circumstances when various targets are negotiated in an international context.

The government understands the need for New Zealand to make this argument. The Prime Minister recently noted the need for international negotiations to "recognise New Zealand's unique circumstances", presumably allowing for a lower reduction target because New Zealand has fewer options to reduce its emissions below the

1990 level. And New Zealand's negotiators and others continue to make this case.

But mixed messages are being sent to the international community. At the same time as making these statements, New Zealand is talking about its desire to be a world leader and its aspiration for carbon neutrality. These have been interpreted in international commentary as meaning that New Zealand is making commitments to very substantial reductions in emissions. This may make it more difficult for New Zealand to negotiate advantageous terms with regard to targets for emissions reduction.

At the recent Bali conference, for example, New Zealand was reported in the international media as being one of three countries to commit to carbon neutrality (along with Costa Rica and Norway).[9] This is understood to be the same as achieving zero net greenhouse gas emissions. This may not be the government's intention, but it is not surprising that this is how it is commonly understood.

This exposes New Zealand to a reputational risk that expectations are unrealistically raised as to what New Zealand is able to deliver. If New Zealand is understood to commit to world-leading targets and then fails to deliver, New Zealand's international reputation may be diminished. Ultimately, national brands are built on actions not words. In the context of climate change, this means real progress in reducing New Zealand's domestic emissions.

Where New Zealand is distinctive – for example, in terms of having a very high share of renewable energy and being able to move to a carbon neutral energy sector – New Zealand should advertise this widely. But New Zealand needs to be careful not to claim too much in case New Zealand ends up compromising its negotiating position or creating reputational risk.

It is important that New Zealand continues to be constructively engaged in the international negotiations. This will enable New Zealand to ensure that these international discussions are informed by a New Zealand view, particularly in areas in which New Zealand has a direct interest (such as agriculture and forestry). And being an early mover in establishing a comprehensive emissions trading scheme may help to signal to the international community that New Zealand is serious about responding to climate change.

The most powerful way in which New Zealand can manage these risks and build a sustainable brand is through demonstrated progress in reducing its emissions. But, in the meantime, care should be taken not to increase New Zealand's exposure by being understood to commit to something that New Zealand cannot deliver.

[9] *Both Costa Rica and Norway have committed to a clear plan of action to deliver against their carbon neutrality targets. Indeed, Norway has had a carbon tax since the early 1990s.*

6 CONCLUDING REMARKS

Climate change is a serious economic issue for New Zealand. New Zealand needs to begin the process of adjustment to a lower emissions mode of operating so that it is better positioned to compete successfully in a low-emissions global economy. Reducing emissions in a meaningful way will require a significant change in the functioning of the New Zealand economy. New Zealand needs to move from having strongly growing emissions to a pathway in which its emissions are declining in a significant and sustained manner.

The emissions intensive nature of the New Zealand economy, combined with the relatively limited abatement opportunities available, make significant reductions in emissions relatively difficult to achieve. It is important that there is a clear understanding that this process, although necessary, will be demanding and is likely to be disruptive.

Recognition of the difficulties in reducing New Zealand's emissions is not an argument for inaction. Indeed, the challenges involved in reducing New Zealand's emissions add to the urgency of commencing this process. New Zealand needs to act quickly to reduce its emissions levels because if it does not, it will find it difficult to compete in what is reasonably likely to be a low-emissions world. But it is important that New Zealand policy is informed by a clear view on both the strategic objectives and the actions required to deliver on this objective.

However, there seems to be a significant gap in the public debate between the stated aspirations of various political parties, such as carbon neutrality or '50 by 50', and the actions that have been committed to or proposed. Although claims continue to be made that New Zealand should be a world leader with respect to its response to climate change, the policies announced to date are likely to have only a reasonably modest impact in terms of reducing New Zealand's emissions.

The announced policies will likely reduce New Zealand's emissions back to around their 1990 level, and will constrain emissions growth into the future, but will make a limited contribution in terms of reducing New Zealand's emissions below this level. This reflects the relatively few options that are open to New Zealand in terms of emissions reduction.

Indeed, the announced policies will only deliver a small proportion of the emissions reductions required to achieve the targets that the government has proposed, such as a carbon neutral energy and transport sector. The majority of the progress is expected to come through the purchase of emissions credits as well as New Zealand being able to benefit from technological progress.

Overall, our sense is that New Zealand is following much of the developed world in terms of actions to reduce emissions, not in a particularly rapid way, and is not acting in a sufficiently serious way to position itself to compete in a low-emissions world. This means that New Zealand faces a substantial economic exposure. More needs to be done to reduce New Zealand's domestic emissions in order to ensure that New Zealand is acting as a fast follower rather than a slow follower.

For example, New Zealand should make a commitment to follow other developed countries in adopting new efficiency standards as they are upgraded. And there should be a clear policy for encouraging the rapid adoption of new technology to reduce emissions as it becomes available, to ensure that New Zealand is able to reduce its emissions at a pace similar to other countries. More significant investments in public transport and communications technology will also make contributions in this regard.

A key priority for action is to develop internationally competitive strengths in low emissions areas of economic activity in New Zealand. This will require deliberate policy action to position New Zealand as an internationally attractive location for this type of economic activity. Rather than a view that responding to climate change will lead to economic transformation, it should be understood that economic transformation is a vital part of New Zealand's response to climate change. This needs to be the focus of much more action. New Zealand remains heavily reliant on emissions intensive sources of economic growth.

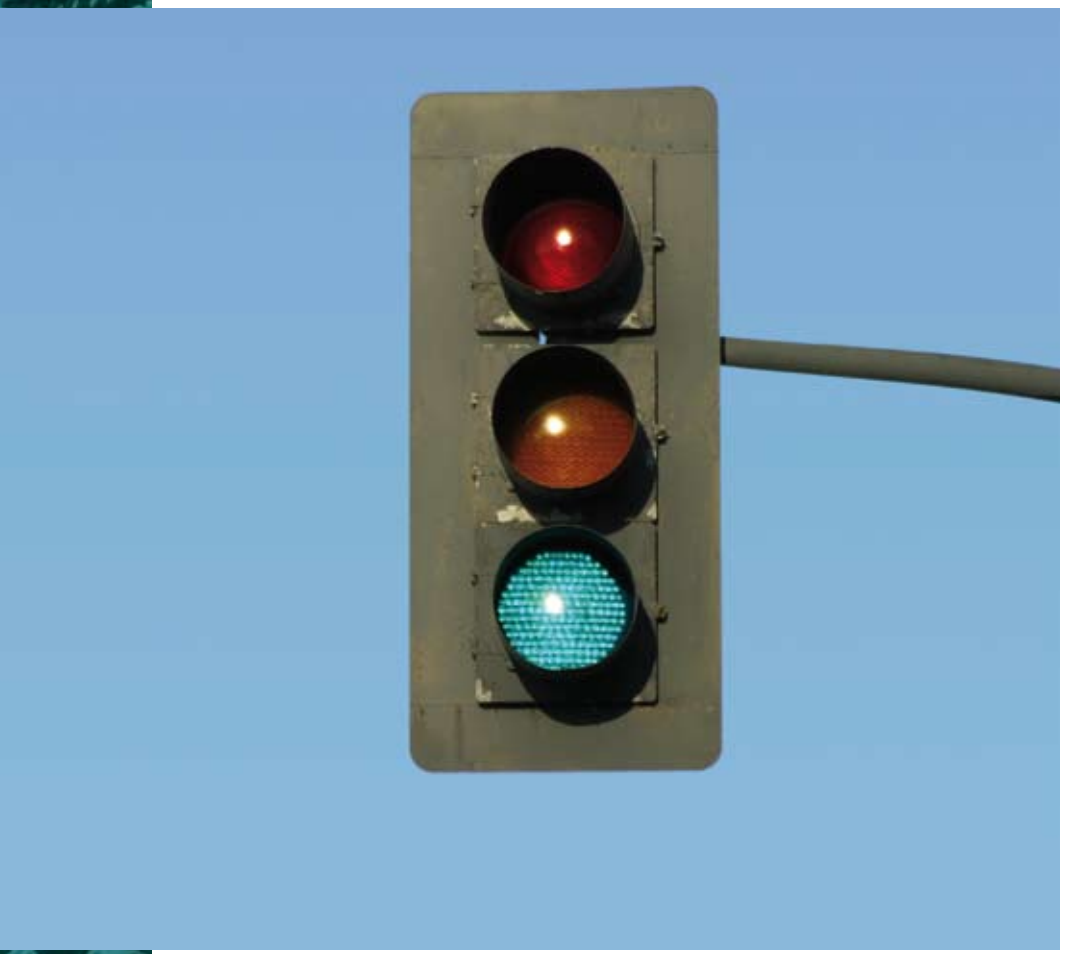
And New Zealand needs to manage its exposure to international governmental action and shifting consumer preferences. In particular, New Zealand should invest more significantly behind its clean, green national brand to ensure that this point of distinction is sustainable. New Zealand should also be actively engaged in the international discussions around climate change to ensure that its particular interests and circumstances, particularly around agriculture, are recognised.

New Zealand needs to move with real seriousness of purpose across a broad range of policy fronts in order to respond to climate change. New Zealand's climate change policy should be seen in broader terms than simply the pricing and regulating of emissions, to include environmental policy and policies to develop new areas of economic strength.

Much of the public debate in New Zealand has been focused on the aspiration rather than on the materiality of the actions required to deliver the required level of emissions reduction. Although setting aspirational targets can be a valuable tool for motivating action, the risk with the current debate is

that it may serve as a substitute for action. There is a danger that the public will believe that the announced policies are sufficient to adjust the New Zealand economy to a lower emissions mode of operating, and that little else remains to be done.

New Zealand has a history of over-promising and under-delivering with respect to climate change. To avoid repeating this experience, it is important that the rhetoric used be more closely linked to reality. New Zealand should position itself as a fast follower and urgently commence the process of adjusting its economy to operate in a low emissions way. More determined action to reduce New Zealand's emissions than that announced to date is required in order to position New Zealand to compete in what will likely be a low-emissions world.



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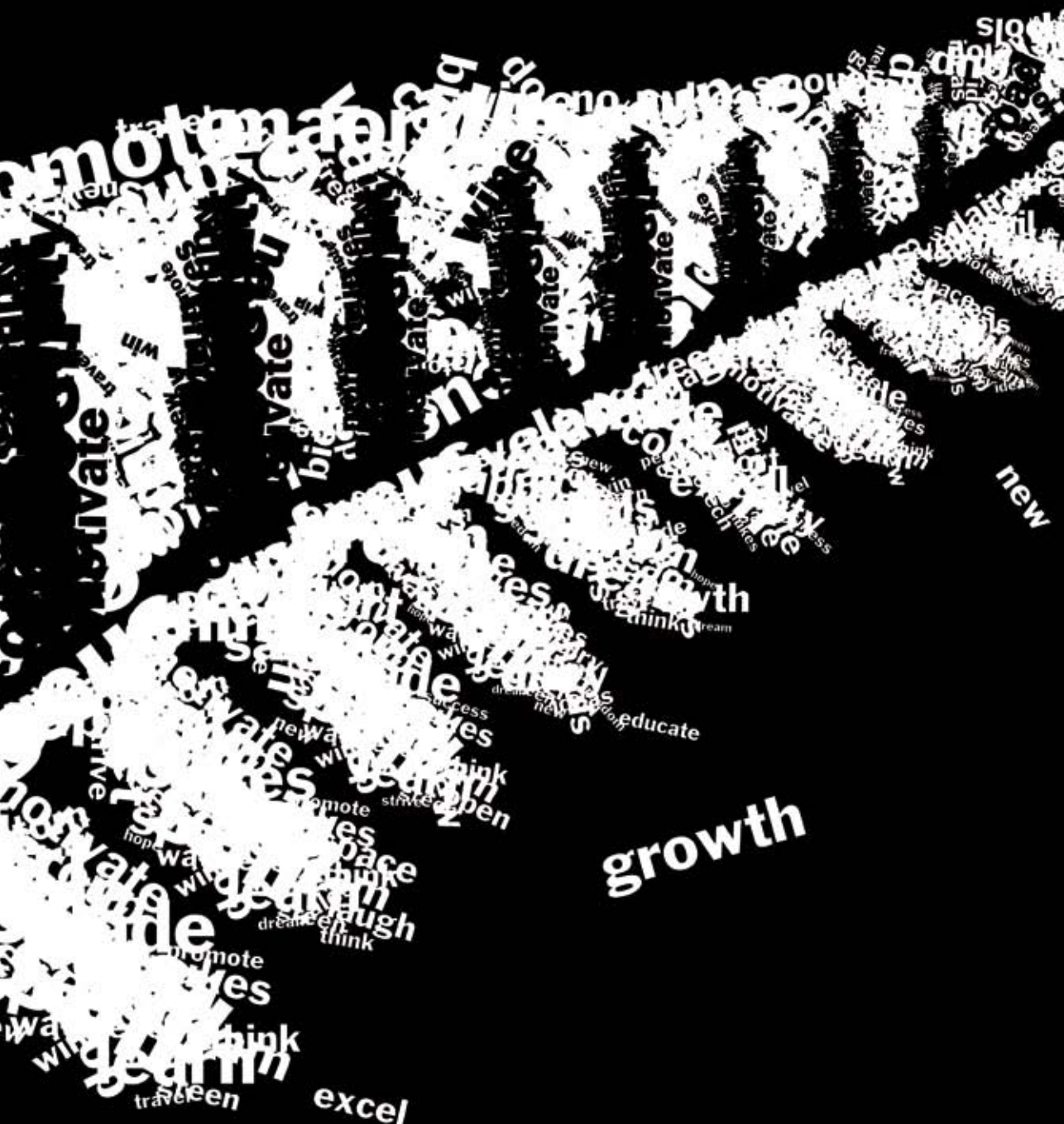

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