Submission on New Zealand's Climate Change Target

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What does climate change mean for New Zealand?

The New Zealand Government's Discussion Document 2015 issued by the MfE[1] states:

> New Zealand has already warmed by about 0.9°C since 1900. Future temperature increases will depend on the level of future global emissions. Without concerted global action to reduce emissions, New Zealand's temperature is expected to rise by about 3.5°C by the end of the century.[2]

In response our submission has four key messages:

MESSAGE 1: The Need to Change Direction

New Zealand needs a proactive strategy to reduce its net carbon dioxide (CO_2) emissions rapidly and ensure that these become zero during this century. This is required in order to be consistent with the UNFCCC[3] aim to keep the global average temperature increase to less than 2°C, and it is based on the IPCC[4] science assessments that have also been approved by governments.

The MfE request for submissions mentions a transition to a low emissions world, but does not include the UNFCCC long-term target that New Zealand has already agreed to, and focuses on a short-term perspective. This fails to address the fact that we now have to limit the sum of all our future CO_2 emissions to less than 30 more years of the current rate.

MESSAGE 2: Economics: Uncertainty, Competition and Cost

The correct strategic response to uncertainty is twofold: first, act decisively to reduce uncertainty wherever possible, especially with regard to long-term incentives facing the private sector; and second, adopt policies that will minimise regret in worst-case outcomes – for example, non-availability of international offset credits.

Competitiveness does not have to be threatened by a domestic carbon price provided that appropriate border adjustments are applied, as with goods and services tax, for example. The cost estimates commissioned by the Government are inflated by the study design, and even the inflated figures are trivial compared with the issues at stake. The modelled cost of effective carbon pricing is one-off, in contrast to the on-going and rising costs of adaptation.

[1] New Zealand Ministry for the Environment
[2] Ministry for the Environment *New Zealand's Climate Change Target Discussion Document,* 2015, 5, citing Intergovernmental Panel on Climate Change Fifth Assessment Report.
[3] United Nations Framework Convention on Climate Change
[4] Intergovernmental Panel on Climate Change

MESSAGE 3: Structural Change and Long-term Commitment

The need to reduce New Zealand's CO_2 emissions in line with 2020 and 2050 targets demands measures of transformational change and innovative leadership from Government if it is to address the issue with credibility at the Paris Climate Conference 2015 and direct New Zealand towards a zero-carbon economy.

Any meaningful reduction requires a co-ordinated strategy across all affected sectors if it is to penetrate the fog of confused thinking that currently exists. We propose the establishment of a carbon budget and a climate commission to address issues on a non-partisan and long-term basis.

MESSAGE 4: Pathways for Change

The Discussion Document[5] provides a brief overview of new opportunities created by a low carbon trajectory, all of which we support. However there seems little logic in simultaneously funding further fossil fuel exploration. Rapid carbon emission reductions can be achieved via the transport and energy sectors, driven by targets of 100% renewable energy electricity generation and zero-net emissions industrial production by 2050.

Piecemeal policy implementation, coupled with low funding, has meant that plans for low-carbon initiatives around renewable energy, afforestation, and new-technology uptake have not been established and there is no recognition of the timeframe required. We need to identify quickly the best opportunities for sector emissions reduction and prospects for upscaling, while also opening up options for new possibilities in the future.

[5] MfE, *New Zealand's Climate Change Target Discussion Document*, 15

WHY THE MfE QUESTIONS ARE NOT ENOUGH

We appreciate the opportunity to submit to the 'New Zealand's Climate Change Target Discussion Document' and understand that a genuine effort has been made to provide it. Even so, there appears to us in this important document to be a significant disconnect between the government's suggestions and questions and CO_2 emissions projections.[6] It nowhere demonstrates how it plans to achieve New Zealand's existing CO_2 emission reduction targets for 2020-2050.

Nevertheless we hope that the consultation process initiated by this document is part of an ongoing conversation and a starting point for improved transparent and timely negotiations on New Zealand's mitigation strategy at the Paris Climate Conference.

The questions raised by MfE for discussion are not well balanced and do not address the urgency that is now necessary in order to keep New Zealand consistent with its obligations under the UNFCCC protocol. In particular:

- The "Objectives" section on p. 7 (leading to **Q1**) sets out three objectives for a New Zealand contribution but does not start with any specific national or international target. So how can a consensus be reached unless there is a clear goal?
- The mention of costs here implies that these relate only to mitigation of greenhouse gas (GHG) emissions and ignores the costs of climate change effects unless we are part of a global collective response. Given that Treasury has already recognised that an El Niño-related drought's effect on agricultural production can decrease our GDP by ~1% in a year, we should be proactive to avoid these types of seasonal climate extremes becoming more common.
- While a "global transition to a low emissions world" is necessary, this avoids mentioning the clear IPCC statements that we need to stop all further net CO_2 emissions during this century (i.e. reduce emissions to zero) in order to be consistent with the agreed UNFCCC target of limiting global warming to 2°C. As we cover below, the time frame for achieving this is already disturbingly short.
- The "Comparison with others" section on p. 11 (leading to **Q2**) notes that the nature of New Zealand's emissions and economy are not the same as those for other countries with lower per capita CO_2 emissions than other developed countries. We have an economy heavily based on agricultural exports, which involves high methane (CH_4) and nitrous oxide (N_2O) emissions. However, the sources of our CO2 emissions are very similar to those in other countries and the bigger issue is that they are increasing much more rapidly than most Annex I countries, (Figure 1). As noted above, control of this gas is critical for keeping to 2°C.
- Reference to carbon offsets and forest sinks is again focused on the short-term perspective. It does not address the need to reach a sustainable basis and pathway for zero CO_2 emissions.
- The "How will our targets affect our households" section (leading to **Q3**) again mentions the cost of reducing emissions and ignores the cost of not reducing them. It ignores the growing issue for households in coastal areas or low lying areas where damages due to storm surges and flooding are becoming serious and also New Zealand's vulnerability to landslides triggered by heavier rainfall leading to closure of state highways. Where are these costs being considered?

[6] Leining, C., 2015, *New Zealand's Journey toward a Low-Emission Future: Today's Climate Change Landscape, Motu Note* #16, 9, Motu Economic and Public Policy Research, Wellington.

- The standard response that whatever actions New Zealand takes will have no effect on climate outcomes is unconvincing. Our view is that a small country like New Zealand can have a disproportionate impact on global climate ambition when we take vigorous and ambitious action, and this will have a globally beneficial effect in terms of climate outcomes.
- The growing concerns of the reinsurance industry about climate-related damages, and recent statements on increasing risks by the Insurance Council of New Zealand[7], show that the MfE document is not setting out a balanced approach for considering costs.
- The statement in Box 7 about carbon pricing is misleading. The IPCC showed that, when a standard discount rate of 5% is applied, mitigation costs for 2030 are US$20 – 55 per tonne, or NZ$27 – 75 at current exchange rates[8]. It is more relevant to consider a potential reduction in GDP. The average estimate for this reduces New Zealand's GDP growth over the next 16 years from 36% to 34.3%. But this is before including the benefits of reduced climate change and risks for larger effects have to be anticipated due to other types of future change.
- The summary of costs given here is also ignoring options for simply redirecting our current large investments in transport and infrastructure, so as to make them consistent with reducing CO_2 emissions. The statement that costs increase rapidly as targets get more ambitious is based on a limited form of economic model analysis which has already been criticised by some as inadequate. In essence, simplified general equilibrium models such as those used for the Discussion Document do not capture the non-linearities and opportunities associated with redirecting an economy on to a new growth path, especially when other economies are also making such a transition.
- The section "New opportunities" preceding **Q4**, by contrast, is clearly focussed on considering pathways to reduce CO_2 emissions. We agree with MfE on the importance of this.
- We also agree that the tone of the commentary in the Summary section and **Q5** (p. 17) is important. However, again its focus on agriculture is not the correct way of considering how we should meet the target of stabilising climate change. This also has a short-term focus on 10 – 15 years, whereas major companies in the private sector often have a 30-year or longer planning timeframe. When faced with uncertainty the appropriate response is to act decisively to reduce uncertainty and adopt policies that aim at least-regret outcomes (see Message 2).

The New Zealand Government needs to develop a clearer form of long-term planning and we set out a basis for achieving this below.

[7] Insurance Council of New Zealand: *Protecting New Zealand from Natural Hazards*, October 2014

[8] Figure 6.21 and Table SPM.2, In*: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [O. Edenhofer, et al. (eds.)], Cambridge University Press.

MESSAGE 1: The Need to Change Direction

1.1 New Zealand, together with all other countries in the UNFCCC process, has agreed that we should limit future global warming to 2°C[9]. This requires that total CO_2 emissions to the atmosphere become zero during this century as well as some significant reductions in the other major GHGs.

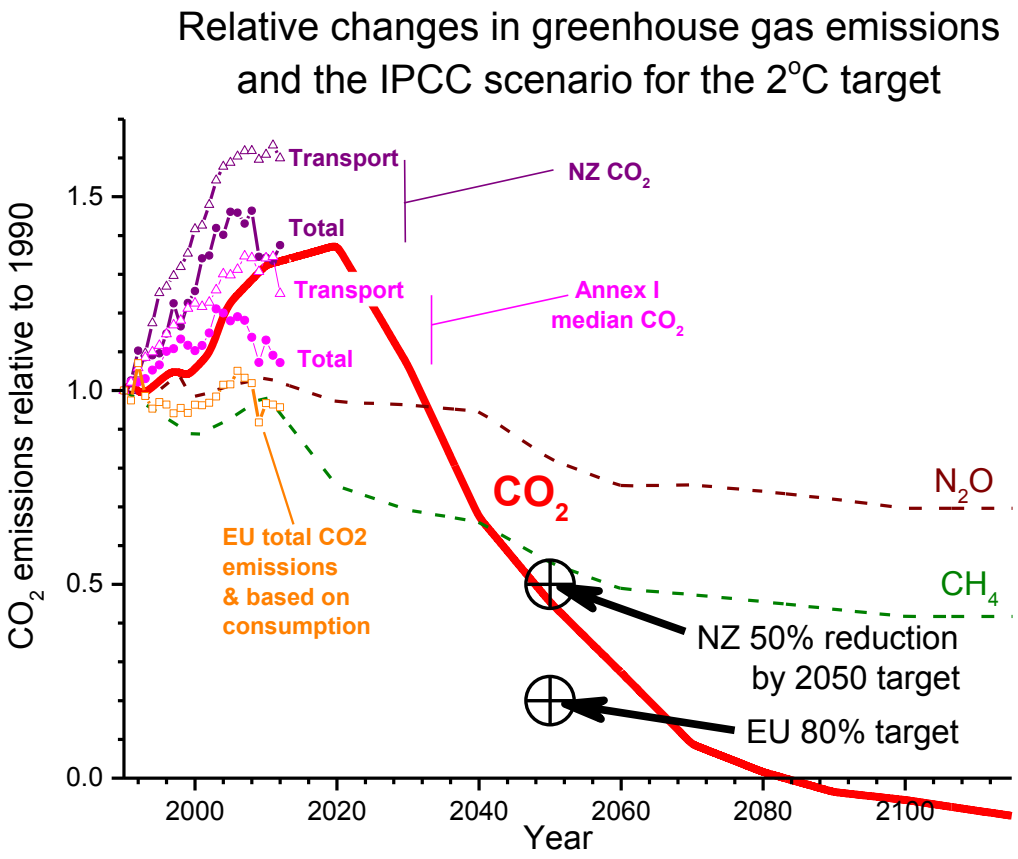

Figure 1. The curves to 2115 show relative changes in the global emissions for the three dominant GHGs - carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) - consistent with the 2°C target[10]. While this involves significant reductions in CH_4 and N_2O emissions, those for CO_2 have to become zero much more rapidly and then become negative based on removal processes. The four upper curves with data points show relative changes in total CO_2 emissions (excluding forestry) and in transport CO_2 emissions for New Zealand and the mid-range value for Annex I countries after excluding "Economies in Transition" and as reported to the UNFCCC. The lower data points are averaged over the 28 EU countries and are for consumption after taking account of offshore emissions related to all imported products[11].

[9] UNFCCC, 2009: *The Copenhagen Accord*. United Nations Framework Convention on Climate Change. http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf

[10] Moss, R.H., et al., 2010: *The Next Generation of Scenarios for Climate Change Research and Assessment*. Nature, 463, 747-756; IPCC, 2013: *Climate Change 2013 The Physical Science Basis, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [T.F. Stocker, D. Qin, G.K. Plattner, et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[11] Le Quéré, C., et al., 2014: *Global carbon budget 2013*. Earth System Science Data, 6, 235-263.

1.2 Figure 1 shows the IPCC's representative emissions reduction pathway for the three main GHGs consistent with the 2°C target by 2100, and New Zealand's changes in CO_2 emissions together with those for Annex 1 countries. While both CH_4 and N_2O play a significant role, the science has made it clear that terminating CO_2 emissions is necessary[12]. This is because CO_2 stays in the atmosphere for more than 10,000 years and is already higher than it has been since about three million years ago, when the earth was 2-3°C warmer and sea level was around 20 metres higher.

1.3 In order to have just a 66% probability of limiting global warming to 2°C, the total amount of CO_2 added to the atmosphere has to be kept to less than 3,200 $GtCO_2$. So far, 2,000 $GtCO_2$ have been emitted and, if current emissions were kept constant, this limit will be reached in about 30 years[13]. If we want to reduce the risk further, the limit would be lower.

1.4 If the global distribution of CO_2 emissions were to remain unchanged, then New Zealand would also have to limit all its future emissions to be equivalent to 30 years at the current rate. However, if the distribution of emissions changes, then it is most likely to do that by requiring developed countries to reduce their emissions more rapidly, as recently agreed between the USA and China and as planned by the EU. If the remaining global CO_2 emissions consistent with the 2°C target were distributed according to population, then we would only have 22 years of our current emissions remaining. Consequently, the earlier a New Zealand mitigation plan is implemented the less draconian the measures – for both economic costs and the increasingly costly adaptation measures.

1.5 While the government's aim for a 50% reduction from 1990 levels by 2050 would make a definite contribution to limiting global warming to 2°C, a 50 by 50 trajectory is not consistent with the rate at which most developed countries propose to reduce CO_2 emissions – e.g. the European Union greenhouse gas emission reduction of 80-95% on 1990 levels by 2050. So far our emissions are much larger than they were in 1990 and there is no clear plan for meeting even the 50 by 50 target. In fact there appears to be a distinct disconnection between the government's emission reduction targets and its current trajectory. Since 1990, our gross CO_2 emissions have increased by 37.5% and transport sector emissions have increased by 58.5%. Both of these increases are larger than that in our population, which has been 32.4%[14].

1.6 While the transport and energy sectors have had much larger increases in emissions than the agricultural sectors, these have flattened out over the last ten years[15]. Over that period the New Zealand GDP increased by 80% and this clearly shows that we can disconnect increasing productivity from CO_2 emissions.

1.7 In short, the UNFCCC Conference of Parties has agreed on "*a long term global goal to reduce GHG emissions so as to hold the increase in global average temperature below 2°C above pre-industrial levels*"[16]. Science has shown that this requires global CO_2 emissions to become zero during this century and the time frame for achieving this is getting shorter every year. If New Zealand is to maintain its reputation for environmental management then we should make reductions in our CO_2 emissions that are at least in step with what leading countries such as the EU are pledging, such as targets of 40% by 2030, and 80% by 2050.

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[12] Figure SPM.10, *Summary for Policymakers. In: Climate Change 2013 The Physical Science Basis, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Stocker *et al*. Cambridge University Press.

[13] Friedlingstein, P., et al., 2014: *Persistent growth of CO2 emissions and implications for reaching climate targets*. Nature Geoscience, 7, 709-715.

[14] http://data.worldbank.org/indicator/SP.POP.TOTL

[15] MfE, *New Zealand's Greenhouse Gas Inventory*, 2014a

[16] http://unfccc.int/science/workstreams/the_2013-2015_review/items/6998.php

MESSAGE 2: Economics: Uncertainty, Competition, Cost

The Government's consultation document highlights three economic issues as central to consideration of New Zealand's target: uncertainty, competitiveness, and cost. However, for all three the general thrust of the consultation document is inconsistent with basic economic principles.

2.1 Uncertainty

All will agree that there is pervasive uncertainty about the future evolution of global policy and global carbon markets. However the discussion document argues that this provides grounds for stepping away from ambitious target setting. This argument has no merit. When faced with uncertainty the appropriate response is twofold:

i) Act decisively to reduce or eliminate uncertainty wherever that can be done, and,

ii) Adopt policies that aim at least-regret outcomes in the event that uncontrollable uncertainties turn out to have unfavourable outcomes.

An example of the latter would be non-emergence of the global market in carbon credits that will be required for New Zealand to be able to pursue its present course of buying credits to offset rising domestic emissions. Heavy reliance on a hypothetical global carbon market to avoid rigorous domestic policies aimed at making progress towards a zero-carbon economy is patently an unwise response to the uncertainties Government faces.

Expanding on those two appropriate strategic responses we recommend the following approaches:

2.1.1. *Act decisively to reduce or eliminate uncertainty wherever that can be done.*

Restructuring of New Zealand's economy towards a long-term zero-carbon target will depend primarily on private-sector responses to market incentives. Government's key role is to ensure that market incentives are correctly set. While international uncertainties may be beyond the New Zealand Government's power to control, the same is not true of domestic uncertainties, which can be reduced with strong, coherent domestic policies. Central to removing the uncertainty for private-sector actors would be a domestic policy stance that gives clear, unequivocal and long-run price signals, and backs these up with instruments designed to entrench those signals against short-run fluctuations and shocks.

To date, Government climate-policy actions aimed to reduce private-sector uncertainty have been almost entirely directed to giving comfort to types of enterprises and investments that oppose progress on climate change. Perversely, Government policies and actions to date, under Labour as well as National, have maximised the uncertainties facing (*inter alia*) carbon forestry, the renewable energy sector, and vehicle purchasers (both large-scale fleet operators and individual households).

Government has a crucial role in reducing domestic uncertainty. Its ability to set New Zealand business and consumers on a clearly defined path towards zero non-biological carbon emissions should be exercised to the full, both in declaring its target and in designing domestic policies. The New Zealand Government cannot dictate the global carbon price - but it can and should dictate the domestic carbon price, at the very least to the extent of placing a floor under that price. This should be underwritten by bipartisan political commitments to

maintain the price at or above that floor, and with instruments introduced by which Government itself carries any residual uncertainty. For example, it could offer long-term hedging contracts to lock-in the minimum price at which forestry carbon absorption will earn revenues over the full harvesting cycle. It is far preferable for taxpayers to underwrite domestic investments in carbon reduction rather than to carry an undefined burden of contingent liability depending on the cost of buying-in overseas carbon credits.

2.1.2 *Adopt policies that aim at least-regret outcomes.*

This requires:

i) Some clear and objective description of the scope of the global uncertainties, identifying best-case and worst-case outcomes; and

ii) Some clear and objective policy design to ensure that in the worst-case New Zealand is not faced with catastrophic economic damage.

The consultation document fails to engage with either challenge.

2.2 Competitiveness

Whenever confronted with the prospect of having to pay charges on its carbon emissions, New Zealand business lobbyists continue to resort to the fallacious claim that a loss of competitiveness must follow. The discussion document seems captured by this claim. To see where the fallacy lies, it is sufficient to ask why New Zealand business does not raise the same objection to the imposition or increasing of GST – which is the tax that most closely mimics how a carbon tax (or its ETS equivalent) would work. The reason is that adjustments are automatically made to the prices of goods and services crossing the New Zealand border, both in and out, to keep local suppliers on the same price footing as their overseas competitors. The same border adjustments can, in principle, be applied to carbon charges, with the same effect of eliminating losses of international competitiveness while leaving all domestic businesses facing full carbon accounting and carbon charges on domestic activities. Border carbon adjustments in practice are more difficult and complex than GST adjustments, but they are emphatically not impossible to implement, and they sweep aside the self-interested lobbying narrative that treats carbon charges as a direct threat to the country's competitiveness. A clear template for the sort of measures that would be involved is provided by the Waxman-Markey Bill that passed the US House of Representatives in 2009[17].

2.3 Cost

The modelling conducted for the Government by Infometrics and Landcare Research throws up the familiar answer from two decades of such modelling, that imposing effective carbon taxes reduces national income by 1 or 2%. Considering what is at risk from future climate change, this cost is trivial – no more than the equivalent of a year (or less) of deferring the country's economic growth. The efforts in the consultation document to talk up the scale of

[17] The text of the American Clean Air and Energy Security Act (the Waxman-Markey Bill), HR2545 of the 111th Congress, can be found at *http://www.c2es.org/docUploads/hr2454_house.pdf* Border adjustments are covered in sections 767 and 768, pages 1116-1126. A discussion of the theory of border adjustments and their application in Waxman-Markey is Geoff Bertram, *'Border carbon adjustments and climate change policy'*, Chapter 9 in Jane Kelsey (ed) *No ordinary deal: unmasking the Trans Pacific Partnership free trade agreement*, Wellington: Bridget Williams Books, with the NZ Law Foundation, 2010.

this cost in language designed to intimidate ordinary householders is indefensible from an economic point of view.

What is lacking in the Discussion Document is a measured description of the implications and limitations of the modelling exercise, combined with an analysis that places the results in a proper context for comparison. What is now required is a central model run commissioned by MfE that takes into account the following:

(a) the role played by agriculture;
(b) the role played by forestry;
(c) other land use options;
(d) technological innovations triggered by a rising carbon price, up to at least $100 per tonne, and,
(e) behavioural responses that might shift the demand and supply curves resulting from the choices of consumers and producers.

The modelling, in short, was set up to maximise the cost of mitigation. Instead, the government and the public now need modelling that allows these costs to be weighed against large-scale values that would be lost through inaction on emissions. Many of these would be non-monetary, non-marketed, and hence inherently requiring informed and balanced deliberation and judgment, the proper role of a Climate Commission (next section).

MESSAGE 3: Structural Change and Long-term Commitment

3.1 New Zealand needs a national strategy to transparently support the global plan for reducing greenhouse gas emissions rapidly and ensure that CO_2 emissions reach zero during this century. Emissions reduction pathways are provided by the best available science[18] in order to be consistent with the UNFCCC aim of keeping the global average temperature increase to less than 2°C.

The MfE request for submissions mentions a transition to a low emissions world, but does not include the New Zealand's gazetted long-term target of 50% reductions on 1990 levels by 2050, and raises questions focused on a short-term perspective as discussed.

There are at least three requirements for success in achieving GHG emissions reduction in line with international best practice:

1. A process for carbon budgeting that is designed to follow a path achieving the zero CO_2 emissions target;
2. A government organisation/commission for implementing a national emissions reduction programme, informed by authoritative carbon budget data, and,
3. Alignment of the statutory role of Local and Regional Governments with Central Government in climate change mitigation and adaptation.

3.1.1 Carbon Budgeting

New Zealand's greenhouse gas emissions profile as described reflects the failure of the Emissions Trading Scheme to incentivise investment in low/no carbon technologies and move away from fossil fuels, encourage afforestation and acknowledge the social cost of carbon, as is its purpose[19]. The adoption of a carbon budget, designed with input from business, land use and community sectors would address these failures, enabling policy settings to be directed to overall emissions outcomes.

A carbon budget is essential in the treatment of carbon emissions as a scarce commodity; for planning for serious emissions; for predicting carbon flows and practical options to reduce them; for setting achievable targets, and for following a transparent and accountable process[20].

3.1.2 A Climate Commission

The process for establishing a carbon budget would be undertaken by a Climate Commission (Fig. 2). The United Kingdom government has already established such a commission. As an independent body, it would have responsibility for strengthening broad stakeholder participation in addressing climate change mitigation, recognising the importance of collaborating with local government, business, land use, health and community sectors. This

[18] IPCC, 2014: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [O. Edenhofer, et al. (eds.)], Cambridge University Press.
[19] http://www.mfe.govt.nz/climate-change/reducing-greenhouse-gas-emissions/nz-emissions-trading-scheme
[20] Terry, S., Sustainability Council of New Zealand, *Carbon Budgeting: Integrated Planning for Climate Action*, 2013

governance approach could foster a trusted, transparent, science-led process, which explores options and their costs, in order to devise sector action plans that reflect the carbon budget. This process involves estimating the impact of pricing instruments and non-price regulatory measures, and testing combinations against the government's financial constraints.[21]

3.1.3 The Statutory Role of Local and Regional Government in Climate Change

Thus far local and regional government have been constrained in the resource management of climate change issues with an overarching national policy framework including emissions pricing set by central Government because it does not want piecemeal policies emerging region by region. Meanwhile, the National Policy Statement on Renewable Energy lacks standards and an infrastructure to implement it efficiently while the reference to 'climate change' in section 7 of the Resource Management Act 1991 is to be 'dumbed down to natural hazards'[22]. Climate change is not a natural hazard: it causes some of them and local government has a key role in mitigation and adaptation.

Government recognition of the significant part that the regions and cities have to play to achieve them is vital if there is to be a 'bottom up' and not just a 'top down' approach to emissions reduction and adaptation.

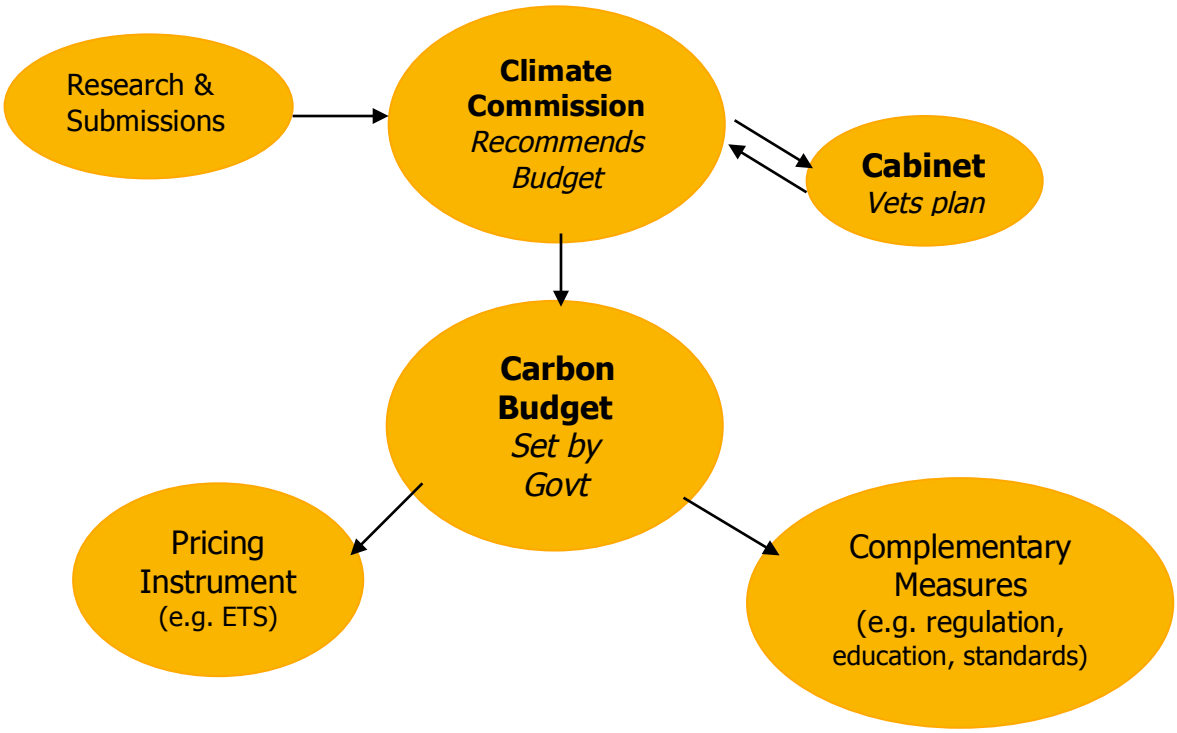

Figure 2. Role of a New Zealand Climate Commission, drawn from Terry, S. [Ref. 20].

[21] Terry, S., Sustainability Council of New Zealand, *Carbon Budgeting: Integrated Planning for Climate Action*. See also *The Carbon Budget Deficit*, Sustainability Council of New Zealand 2012.
[22] Palmer, G., QC. *New Zealand's Defective Law on Climate Change,* 15-16. 2015 Public Address

MESSAGE 4: Pathways for Change

The Discussion Document proposes a range of new opportunities created by a low-carbon trajectory and we support all of these. However we see little logic in simultaneously providing funding for petroleum and minerals exploration, which has recently increased by $5.8 million (around 200%) per year. During this time the oil and gas industry's payment to Crown Petroleum and Minerals has remained relatively consistent at between $6 m and $7 m per year[23]. The Government has also changed the tax regime for oil and gas exploration. According to the WWF report on Fossil Fuel Finance in New Zealand 2013, this has resulted in tax breaks increasing from around $0.2 m per year in 2008/09 to $35 m per year in 2012/13[24].

Meanwhile, transport and stationary energy (heat and electricity generation) emit 90% of our CO_2 emissions (Table 1). Opportunities for a dramatic reduction in these come from the rapidly reducing costs for renewable energy generation and the imminent electrification of the private and public transport fleet. We need to identify quickly the best opportunities for sector emissions reduction and prospects for upscaling, while also opening up options for new possibilities in the future.

<table>
<tr><td>2% Synth GHG</td><td colspan="2">43% Carbon Dioxide</td><td colspan="2">44% Methane</td><td>11% Nitrous Oxide</td></tr>
<tr><td>6% industry</td><td>17% Transport</td><td>22% Energy</td><td>6% Waste</td><td colspan="2">48 % Agriculture</td></tr>
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Table 1. Proportions of the three main greenhouse gases, and their sources in New Zealand (Discussion Document, Fig. 2).

Although New Zealand already has a high level of renewable electricity, generation from fossil fuels still accounted for 25% of this in 2013[25] and while this is high by international standards it does not reflect the abundance of renewable sources that are actually available. For example, it is recognised internationally that New Zealand's Cook Strait is the world's best potential source of tidal power generation but there was a retreat from development of these systems in 2013 due to a lack of long term planning[26] and South Korea has now taken over the world leadership of this technology. Consequently we disagree that because of our existing high renewable energy electricity generation, further emission reduction costs in the energy sector are high. We also disagree that there is less potential to reduce CO_2 emissions as increased renewable electricity generation will create options for new uses of electricity. In addition to the Government's conditional target of 90% renewable energy electricity generation by 2025, New Zealand should target 100% renewable energy electricity generation and zero-net emission industrial production by 2050[27] supported by disincentives in the use of fossil fuels.

[23] Ministry of Business, Innovation & Employment, *Annual Reports*, 2009 - 2013
[24] WWF-NZ: *Fossil Fuel Evidence in New Zealand*, 2013, 14.
[25] MfE, 2015: *New Zealand's Greenhouse Gas Inventory 1990–2013*.ME 1195, Ministry for the Environment. http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990-2013
[26] New Zealand Herald, 6 November 2013, *"Plug pulled on tidal turbine projects"*
[27] Leining, C., and Kerr, S., *Shaping New Zealand's Contribution to a Low-Emission Future*, Motu Economic and Public Policy Research, 7.5.2015

There are two main low cost options:

4.1 Further development of wind, geothermal, and solar photovoltaic electricity generation. This would be more viable if there were a carbon price that reflected the social cost of carbon. This could be linked to the closing of carbon intensive coal-fired generation at Huntly;

4.2 In the transport market, the take-up of electric cars, bikes, buses and trains is likely to be rapid, powered by the additional renewable energy electricity generation. As use of electric vehicles increases, carbon emissions reduce, and co-benefits in terms of air quality, especially in currently congested cities, accrues. In addition, there is potential for electricity to substitute for heat in certain industrial and domestic (e.g. heat pump) applications[28].

Forest Owners Association President, David Rhodes, recently concluded that New Zealand will miss its existing 2050 emissions reduction target and that longer-term objective of halving emissions by 2050 will never be achieved unless the Government takes action[29]. Also despite significant revisions to estimates of New Zealand's LULUCF emissions these still show there was less uptake of CO_2 in 2012 than in 1990[30]. While MPI is running an Afforestation Grant Scheme and a Permanent Forest Sink Initiative[31], the funding to support these initiatives is minor and so the rate of restoration is very small compared to that of deforestation in the 19th century. Studies have shown there is a potential for a much more comprehensive approach to afforestation that would be economically beneficial by leading to less risk of landslides and erosion due to increasingly extreme rainfall events, but that this requires a clearer long term strategy[32].

What does climate change mean for New Zealand?

We have all been impressed by how, after uncertain beginnings, all parties in New Zealand have come together to resolve the issues emanating from the Treaty of Waitangi 1840. At the outset of that journey, many were confused, doubtful and uncertain as to the merits of the arguments in favour of settlement. But finally, with cross party commitment to the truth of what needed to be done, a great deal has been achieved. We now need this commitment for climate change but it will only occur with transparent and informed debate.

What is certain is that if New Zealand does not make all-out efforts to rapidly reduce its carbon emissions we will suffer along with others a very high chance of exceeding the UNFCCC 2°C target and losing the prospect of stabilising future climate. Leaving mitigation of climate change to others is also not an option for a country whose international reputation, and so overseas trade opportunities and our economy, depend on maintaining a clean green image.

"It's not enough that we do our best; sometimes we have to do what's required".
Winston Churchill

[28] Chapman, R., informal communication, May 2015
[29] Radio New Zealand, www.radionz.co.nz, 16.2.2015
[30] Table 6.1.7, MfE, 2015: *New Zealand's Greenhouse Gas Inventory 1990–2013*.
[31] http://www.mpi.govt.nz/funding-and-programmes/forestry/
[32] Ewers, *et al*, 2006: *Past and future trajectories of forest loss in New Zealand*. Biological Conservation, 133, 312-325.

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From 2002 to 2007, Martin was Director of the IPCC Working Group I Technical Support Unit which produced the Fourth Assessment Report on Climate Change for governments and won the Nobel Peace Prize. He has been author of more than sixty peer reviewed science papers and has also contributed to ten books on climate change, including four of the major IPCC reports.

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Shonagh is a former Environment Court Judge, was Chair of the Board of Inquiry, which addressed revised New Zealand Coastal Policy Statement 2008-9. This is a mandatory document under the Resource Management Act 1991, which took account of climate change on New Zealand's coasts. Subsequently she has written on perspectives of climate change under the Resource Management Act and chaired two Boards of Inquiry on wind farms.

Dr Geoff Bertram, Institute for Governance and Policy Studies, Victoria University of Wellington:
Geoff's long history of economic research has led to over 100 publications. They include analysis of emissions trading and CGE modeling of carbon taxes for the Ministry for the Environment in the early 1990s, and then participation in Working Group III of the IPCC Second Assessment. He co-authored, with Simon Terry, *The Carbon Challenge: New Zealand's Emissions Trading Scheme* (2009).

Emeritus Professor Peter Barrett, Antarctic Research Centre, Victoria University of Wellington:
Peter developed an interest in modern climate and ice sheet behaviour from four decades of research into Antarctica's geological history, including offshore drilling. He also helped produce *Thin Ice – the Inside Story of Climate Science,* www.thiniceclimate.org, to be broadcast in the United States this summer on American Public Television, and to be marketed globally by APT Worldwide.

Suze Keith, Wellington:
Suze is a recent graduate from the Post Graduate programme in Environmental Studies at Victoria University of Wellington. Prior to returning to university she was an active member of Sustainable Dunedin City, worked in various roles at the Department of Conservation, and she now acts as the marketing advisor to the *Thin Ice – the Inside Story of Climate Science* film project.

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