Setting New Zealand's post-2020 climate change target

Introduction

This paper provides feedback for the Ministry for the Environment on behalf of the Royal Society of New Zealand (RSNZ) on the recently released consultation on *Setting New Zealand's post-2020 climate change target*[1]. The submission is provided on behalf of the Society by its New Zealand Climate Expert panel. The submission has been reviewed by a number of experts in the field of climate change, and the Council of the Society (see Appendix 1).

Preamble

The Royal Society of New Zealand welcomes this opportunity to make a submission on New Zealand's 'Climate Change Target' for 2030, i.e. the Intended Nationally Determined Contribution (INDC) from New Zealand to be tabled prior to the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC).

As New Zealand's independent statutory organisation that promotes and advances science, technology and the humanities the Society has as its core an Academy of elected Fellows which includes many of the country's leading scholars and scientists.

Our submission is based upon the science of climate and climate change, as encapsulated in the most recent (5th) Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), and in 'emerging issues' reports published by the Society. Our over-riding motivation is to prevent dangerous anthropogenic interference with the climate system (Article 2 of the UNFCCC).

The Society broadly agrees with the objectives for the consultation. We emphasize, however, that consideration must be given to the costs and impacts on society today in relation to the costs and impacts that would occur if we do not take sufficient action to mitigate anthropogenic interference with the climate system, and the opportunities and financial benefits that will arise as a result of technological developments to address this issue.

The Society would be happy to provide any further information or explanation of the points raised in this submission.

[1] http://www.mfe.govt.nz/climate-change/reducing-greenhouse-gas-emissions/consultation-setting-new-zealand%E2%80%99s-post-2020

What is most important to you?

The Society's key motivation is to ensure that New Zealand contributes effectively to the global effort to avoid dangerous climate change.

According to the best predictions available, to have at least a 67% chance of staying below a global average warming of 2°C relative to pre-industrial temperatures, cumulative carbon dioxide emissions must be restricted to less than 790 billion tonnes of carbon, of which 515 billion tonnes were already emitted by 2011. The remaining quota is equivalent to just 20 years of continued emissions at today's rate (as noted in the discussion document) and even less than 20 years if emissions continue to rise. The net allowable quota is much less than estimated reserves of fossil fuels. Even though it is a small emitter, New Zealand has no choice but to do all it reasonably can to reduce emissions of carbon dioxide. The cumulative impact of many small emitters, each playing their part to achieve reductions in emissions, can make a difference.

Even reaching 2°C warming will have significant impacts on sea level rise, precipitation events, droughts, temperature extremes and wildfires. Insufficient mitigation of emissions of greenhouse gases, primarily from burning fossil fuels, will lead to levels of climate change that would pose very serious risks for the global community. Substantial and sustained reductions in emissions can avoid this future, but significant action must be taken as a matter of urgency. It is not appropriate to do nothing now, for example by claiming that we must wait for the quality of predictions to improve or other, larger, emitters to take action. Rather, we must act now, taking a nimble approach where we can adapt our policy response as the science continues to develop and as technological opportunities present themselves.

This commitment to action is a crucial requirement for public policy on climate change. Recently, Professor William Nordhaus put it succinctly, in reviewing an influential book on climate change by G. Wagner and M. Weitzman:

> 'They emphasize that, for climate change, dealing with *possible* tail events[2] is the central task of policy. They argue that current policies are leading to a substantial chance (perhaps one in ten) that global temperatures will eventually rise by at least six degrees centigrade. This will, in their words, be "the end of the human adventure on this planet as we now know it." Policies should above all aim to cut off the possibility, the tail, of catastrophic temperature increases.'[3]

In light of this policy task, the Society considers the word 'ambitious' to be a critical part of the first objective for New Zealand's INDC. We acknowledge that climate change mitigation is a global collective action problem, and making a 'fair' contribution is important. For the past century, New Zealand has accumulated wealth through emission-intensive activities. Fair for New Zealand implies a greater contribution in reducing emissions per capita than many other countries that are still striving to meet basic development needs.

The Royal Society of New Zealand also considers that the third objective is important, but not exactly as is stated. New Zealand's contibution should be consistent with attempting a transition to an effectively zero net carbon emissions global economy well before 2100, preferably by around 2060 or 2070.[4]

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[2] A 'tail event' is an outcome located towards the outside edge of a distribution, in the 'tail'. This is typically a high-impact but unlikely event, sometimes known as a 'black swan' event.

[3] Nordhaus, W. (2015). A New Solution: The Climate Club. NY Rev Books(4 June) http://www.nybooks.com/articles/archives/2015/jun/04/new-solution-climate-club/

[4] http://climateactiontracker.org/global.html and Rogelj, J., Luderer, G., Pietzcker, R. C., Kriegler, E., Schaeffer, M., Krey, V., et al. (2015). Energy system transformations for limiting end-of-century warming to below 1.5 [deg]C. [Perspective]. Nature Clim. Change, 5(6), 519-527

As highlighted in the Society's Emerging Issues paper, "Facing the Future: towards a green economy for New Zealand"[5], New Zealand can deal with the challenges facing its natural systems, and make a number of economic, social and environmental wins by becoming a "green economy" as defined by the United Nations Environment Programme (low carbon, resource efficient, and socially inclusive). These co-benefits include enhanced societal well-being, improved environmental quality, and increased resilience of the economy.

What would be a fair contribution for New Zealand?

What do you think the nature of New Zealand's emissions and economy means for the level of target that we set?

New Zealand's economic activity is diverse. In broad terms, the country's prosperity depends heavily on being very well connected to the global economy and providing this economy with a wide range of exports, ranging across tourism services, educational qualifications, innovative technologies and biological products. Safeguarding our economy into the future is therefore tied to the economic health of our trading partners, the health of the global economy, and developments in technology that links us with our markets. The best way to ensure a healthy future for the New Zealand economy is to take a leading role in the transition to a zero-emissions future, by setting a clear example now.

How fast should New Zealand aim to cut emissions? A guiding consideration is what other developed countries 'need' to do by 2050, as suggested by the UNFCCC. Based on IPCC evidence and judgements about what might reasonably be expected of developed (Annex 1) countries, the UNFCCC proposed in 2007 that Annex 1 countries such as New Zealand should, for a 450ppm CO_2e target, aim for 80-95% emission reductions relative to 1990, by 2050.[6] We see no reason to adjust this goal for New Zealand, although the recent international discussion of a 1.5°C threshold suggests that, if anything, the 80-95% reduction target for 2050 might be made more stringent and narrowed to 90-95%.

Achieving significant emissions reductions in New Zealand at relatively low cost compared to other countries is challenging, given the shape of our emissions profile, and the already-high proportion of renewable electricity generation. However, there is scope for advances in renewable electricity generation (discussed later), some progress being made in reducing ruminant emissions, and New Zealand has the potential to further diversify agricultural production and better manage nitrogen in agriculture. Moreover, as there has been very strong emissions growth since 1990 from the transport sector, there are significant opportunities to reduce emissions in this sector, for example by fast-tracking moves towards a predominantly electrical light vehicle fleet within the next two to three decades. Contributions will also come from encouraging and sponsoring the use of public transport, and greater use of biofuels where there is a demonstrated net energy reduction. There are also opportunities to reduce emissions from industrial heat and waste. While targets under the UNFCCC are structured on a production basis, as responsible global citizens we should also consider New Zealand's contribution to global emissions on a consumption basis when designing our domestic mitigation policy response.

The IPCC Fifth Assessment Report makes it clear that the globe has a limited budget for greenhouse gas emissions if we are to avoid dangerous changes to the climate. In line with the figures from the IPCC report, and if we are to have a good chance (at least 67%) of keeping global warming below 2°C[7], the Society recommends that **New Zealand's target should be around a 40% reduction in net emissions relative to 1990 gross emission levels, by 2030**. The longer-term global goal should be zero emissions by

[5] http://www.royalsociety.org.nz/greeneconomy/

[6] UNFCCC. (2007). Synthesis of information relevant to the determination of the mitigation potential and to the identification of possible ranges of emission reduction objectives of Annex I Parties: FCCC/TP/2007/1: UNFCCC http://unfccc.int/resource/docs/2007/tp/01.pdf. See Table 4.

[7] http://climateactiontracker.org/global/193/Pledge-Pathways.html

around 2070 or earlier if we are to have a good chance of avoiding the most damaging effects of climate change. Even this target, should it be achieved by the global community, would still leave a one-in-three chance (on present predictons) that warming would eventually exceed 2°C.

How will our contribution affect New Zealanders?

What level of cost is appropriate for New Zealand to reduce its greenhouse gas emissions? For example, what do you think would be a reasonable impact on annual household consumption?

This is a difficult question to answer with a single number.There are several things to consider here.

The costs to the economy and to households given in the discussion document (Table 1, page 14) are calculated based on a number of assumptions[8], beyond the stated carbon price. They are calculated relative to a baseline assumption that business-as-usual has no cost, which is not realistic or reflective of our existing targets for 2020 and 2050. Since there are major uncertainties around future carbon pricing and the costs and benefits of future technologies, the figures quoted in the discussion document have large uncertainty ranges associated with them. They also fail to account for potential technology transformation, co-benefits from mitigation and any mitigation potential from the foresty sector. They assume that New Zealand will mitigate domestically only up to the global cost of carbon and then purchase offshore to cover the remainder of its contribution. As noted recently[9], lowering domestic greenhouse gas emissions will require changes in domestic patterns of production and consumption, but need not reduce wellbeing and in fact can offer significant economic opportunities and other co-benefits.

Costs imposed now must be considered in light of costs that would be incurred if we did nothing, or if we did too little to avoid dangerous changes in climate. Failure to take serious action on emission reductions has the potential to result in very significant social, political and economic instability globally, as a result of increased volatility in food supplies and water resources, and dislocation of populations as a result of sea level rise. This would have the potential to impose much greater costs upon the New Zealand economy than the mitigation-related costs outlined in the discussion document.

The Society therefore feels that decisions on acceptable costs of action need to account for the *value* we receive in return for our investment alongside scientific, social, cultural and moral considerations, amongst others. In effect, we consider that New Zealand must adopt a comprehensive approach based on life cycle assessment that considers both direct and indirect costs. That will almost inevitably incentivise us to invest capital early to make emission and cost savings downstream. We cannot make value judgments about costs without an understanding of benefits, and these are tied to the mitigation pathway choices we make and the climate impacts we avoid. The economic modelling presented is limited by its assumptions but is useful for reference. Costs and benefits to the economy as a whole and to households are relevant, but costs and benefits to businesses and institutions should also be considered. Costs should also be framed clearly in terms of underlying growth. The economy as a whole and household consumption are projected to grow significantly both with and without mitigation targets.

If we take the modelled estimates with their limitations, then the difference to annual economic growth over the 2020s for targets ranging from -5% to -40% for a given price is negligible across all targets modelled, especially taking into account income growth over the period (as shown in Appendix B of the Infometrics report). Furthermore, the discussion document reports that the difference to households between a -10% and -40% target is $500 per household per year and this is without assessing the economic value of co-benefits which would accrue to households under more ambitious action. If these

[8] http://low-emission-future.blogspot.co.nz/2015/05/reframing-costs-of-smart-climate-action.html
[9] http://www.royalsociety.org.nz/expert-advice/papers/yr2014/greeneconomy/

numbers stood up to more rigorous analysis, they would suggest that much greater ambition is possible with only a negligible marginal increase in cost.

The costs of climate change, if left unchecked, will make it increasingly difficult to be able to afford adaptation, let alone mitigation, because climate change will depress economic activity. And the longer it is left before acting, the more expensive it will be to change our systems to cope. This was a point made clearly by Nicholas Stern in his 2006 landmark report *The Economics of Climate Change*, and the US Council of Economic Advisers in their 2014 report on the costs of delay[10]. An example is the costs of drought to New Zealand (predicted to become more frequent with climate change) – the 2007-9 drought reduced direct and off-farm outputs by $3.6 billion. The drought in 2012-13 reduced New Zealand's GDP by between 0.3 and 0.6%. Once New Zealand is on the economic back foot from the impacts of climate change, it will become increasingly difficult over time to have the financial capacity to adapt systems to climate impacts, let alone reduce emissions.

A low-carbon future offers a huge opportunity for New Zealand. It can be epitomised via a commitment to consideration of full co-impacts and lifecycle costs and benefits in actions we take now. Benefits include retaining New Zealand's clean green market status, improved resilience, improved public health, improved air and water quality, improved biodiversity, future-proofing, opportunities for innovation and new products and services. If we retain the view that we should only be a 'follower', then we risk being left behind in what is likely to be a rapid and very belated global transition.

Of the opportunities for New Zealand to reduce its emissions, which do you think are the most likely to occur, or be most important for New Zealand?

The Society's Expert Panel feels that all of the opportunities described below are likely to occur and are of high strategic importance to New Zealand.

a. One of the most important things for New Zealand is to create competitive advantages with the global transition to a low-carbon economy. If we fall behind such a major shift in the way the world does business, we are bound to suffer economically. There is a need for New Zealand policy to be nimble and flexible, so that we can adapt as new information emerges, without stranding assets or seeing underinvestment in key areas.

   The government's current proposed long-term target of a 50% emissions reduction below 1990 levels by 2050 (not mentioned in the consultation document) is in stark contrast with the target emissions ranges proposed or formalised legally by industrialised countries such as the US, Europe and Japan, which are all aiming towards the 80% mark. Given current emissions rates, adhering to these different targets would mean that in 2050, New Zealand's per capita emissions would be about five times that of Europe, and about twice as high as that of the US. Such a growing discrepancy appears inconsistent with the government's other stated goals of contributing fairly to an effective global agreement on climate change, and of being seen as a good international citizen and maintaining our "clean and green" brand upon which much of our economic performance (through agricultural exports and tourism) rests. If this is the path the Government chooses to take post-COP21 in Paris this year, consideration should be given to including quantitative economic or social analysis of the consequences of, or justification for, being so significantly out of step with other developed countries

b. New Zealand's mix of renewable energy resource and innovation potential means that it could potentially be a leader in some aspects of mitigation – for example, reducing agricultural GHG

[10] US Council of Economic Advisers. (2014). The Cost of Delaying Action to Stem Climate Change. Retrieved from http://www.whitehouse.gov/sites/default/files/docs/the_cost_of_delaying_action_to_stem_climate_change.pdf

emissions, geothermal energy, an electricity grid running on close to 100% renewable electricity, replacing coal for wood-based industrial heat, improving biofuel production and an electric vehicle fleet which (unlike in other countries which largely rely on coal and gas-generated electricity) makes a huge amount of sense in New Zealand, both environmentally and economically. Technology developments in the areas of distributed generation, electric vehicles (including two-wheel options) and battery storage are very rapid and we are already seeing rapid uptake of Photovoltaics (PV) and interest in electric vehicles. Moreover, while the fraction of national electrity generation that comes from renewables is already high (75-80%), there are significant opportunities to move towards 100% renewable generation. To move close to 100% there are important structural issues to be tackled in the electricity system – it would require a national approach to reduce the peak:mean load ratio and adoption of non-thermal back-up capacity to cover dry years. Further development of renewable electricity (wind, geothermal, and solar PV) and biofuels would be assisted by a carbon price reflecting an updated estimate of the social and environmental cost of carbon. Addressing the structural issues would allow early closure of remaining carbon intensive coal-fired generation at Huntly[11] and eventual reduction in gas-fired plant. Other opportunities include moving from coal to gas or biofuels for industrial heat processes; and reducing emissions from heavy vehicle freight through more efficient trucking and/or modal shift to rail and coastal shipping. Unless it is very rapid, electric light vehicle uptake will only slowly reduce total transport emissions during the time period in question. Other gains may occur from a multi-faceted approach that includes encouraging more efficient driving, higher minimum efficiency standards for vehicles, and investment in public transport and active transport infrastructure.

c. New Zealand's forestry sector can temporarily sequester carbon as wood to be used later as a biofuel, effectively buying us some time to implement other measures. Permanent forests could be incentivised to store carbon on a long-term basis. Forestry also supports biodiversity, air and water quality, quality of life and national identity. The lack of a meaningful price on carbon in the New Zealand ETS and ongoing policy uncertainty about our commitment to domestic mitigation has damaged the incentives to invest in afforestation and biofuel development. We believe that more effective policy could improve the mitigation potential of our forestry sector for the benefit of all New Zealanders.

Summary

How should New Zealand take into account the future uncertanties of technologies and costs when setting its target?

New Zealand cannot let future uncertainties hold us back. The costs of unmitigated climate change have the potential to be extremely large, dwarfing the present-day costs of mitigation covered in the discussion document. Remaining within the global carbon budget discussed by the IPCC means there is a good chance (currently estimated as 67%) that warming will stay below 2°C, but it does not guarantee this outcome. Organisations such as the International Energy Agency[12], OECD,[13] and Global Commission on Economy and Climate[14] have reinforced that there are technically and economically viable mitigation

[11] Even at a low price on carbon, Huntly is likely to exit the electricity market within a few years.
[12] See https://www.iea.org/roadmaps/ and https://www.iea.org/topics/climatechange/The_Way_Forward.pdf and http://www.iea.org/publications/freepublications/publication/weo-special-report-2013-redrawing-the-energy-climate-map.html
[13] See http://www.oecd-ilibrary.org/environment/oecd-environmental-outlook-to-2050_9789264122246-en;jsessionid=34eubjgme7hup.x-oecd-live-03
[14] See http://newclimateeconomy.report/wp-content/uploads/2014/08/NCE_GlobalReport.pdf

pathways to achieve the 2-degree goal using existing and emerging technologies if we commit globally now to ambitious action. Given the slow rate of technology diffusion and the high cost of transitioning infrastructure, we should not rely on market forces as an excuse to defer action in the hope that a quick-fix technology will come to our aid in the future. Additionally, despite rapid advances in low-emissions technologies and renewable energy supplies, there remain significant uncertainties around scaling up of carbon capture and storage, so it cannot be assumed that future emissions from fossil fuels can be addressed through storage mechanisms. We also face significant technological and cost uncertainty around our ability to adapt. Hence, a precautionary approach is the best insurance for our collective future. We should therefore aim high in terms of our emissions reductions targets. Methane reductions will rely on breakthroughs occuring in ruminant research. Incentivising rapid uptake of a breakthrough when it occurs will be vital.

No investment decision in business is ever made with perfect information. Rather, businesses learn to adapt as improved information becomes available. As noted in the *Facing the Future* report, the key to the future is through locally relevant technological change 'pulled' through incentives and information sharing, rather than 'pushing' New Zealanders to 'do and be good citizens'. However, while businesses large and small will have a central role in the transition to a green economy, few will achieve the change on their own and so will need government support, including strong drivers and tight regulations and efficiency standards, especially setting out what is the minimum efficiency we as a nation will tolerate. As part of this, a strong technical analysis team, funded by Government, who provide energy and science advice to inform our policy, would prove to be valuable. This is an area of chronic under-investment by successive Governments.

By taking a target approach that enables New Zealand to optimise its global mitigation contribution through an appropriate balance between domestic and overseas investment, New Zealand can produce a buffer against the uncertainties of technological opportunities and costs in the domestic context, and therefore commit to a more ambitious contribution. We have strong reservations about indefinite reliance on purchasing credits from overseas mitigation. Rather we propose a balanced mix of investment in appropriate mitigation opportunities developed overseas and sound investment in domestic mitigation that encourages innovation and generates valuable long-term benefits and strategic advantages for New Zealand.

Other comments

Based on the scientific evidence to date, global emissions reductions of up to 40-70% below 2010 levels by 2050, and 100% (or more, via carbon capture and storage technology and increasing soil carbon) by the late 21st century, are necessary to give us a good chance of capping global warming at 2°C. As one of the globe's highest per-capita emitters of greenhouse gases, New Zealand has an opportunity to demonstrate leadership in reducing its emissions and contributing to global effort. That is why the Society strongly recommends a target for New Zealand of 40% reduction in net emissions below 1990 gross emission levels by 2030.

As noted in the latest IPCC report, "Most aspects of climate change will persist for many centuries even if emissions of CO_2 are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions of CO_2". The relatively slow response time of the climate system, compared to our ability to rapidly increase the atmospheric burden of greenhouse gases, can make the urgency of the problem hard to grasp. Uncertainty about the future should be a spur to action rather than a reason for caution. Urgent action is required now to avoid significant and very long-lasting changes to the environment that sustains us.

The climate is already changing and will continue to do so, based on emissions to date. It is not possible to avoid all the risks associated with further change. However, meeting the 40% emissions reduction target the Society proposes based on the current scientific knowledge, and seeing this goal achieved

internationally as well, would avoid the most serious impacts of human-induced climate change[15]. Across NZ there is significant interest in the potential of a low-carbon future amongst businesses, households, communities and some councils. However, New Zealand currently lacks national leadership in this space (unlike the UK, Scandinavia and the EU more generally, for example). This means that efforts are currently fragmented and less effective than they might be if there was a more coherent and linked-up approach. A clear government commitment to be a leader and not a follower, and targets for emissions reductions would assist in a more cohesive approach towards a low-carbon future across the nation. When accompanied by credible domestic policy, it would also incentivise low-carbon investments by New Zealand businesses and help to avoid locking New Zealand into an emissions-intensive development pathway that leaves it economically uncompetitive and reputationally damaged. Even if improving science suggests less stringent actions are needed, the evidence is already strong that the co-benefits of moving to advanced low-carbon energy systems justify the short term investment in any case.

A target is only as meaningful as the policy that supports it. It is not possible to hold a well-informed discussion on the merits and costs of more ambitious targets without also discussing the choice of mitigation pathways and policies for achieving those targets. The Society is pleased that the government has signalled future consultation on climate change policy. We encourage such policy consultation to be framed with a longer-term perspective in terms of how New Zealand could most effectively transition to a zero-net-emission domestic economy by mid-century, and how to build more effective collaboration across government, businesses, communities and researchers to deliver on that ambition.

This brief consultation period is not sufficient for the discussions we need to have as a country on how we want to respond to the biggest challenge of our time. Such conversations need to happen at multiple levels, on an ongoing basis, and across sectors. The Society encourages the government to take a participatory and collaborative approach to climate change policy development that is fully informed by the science and and fully leverages the world-class expertise of our national research community.

Appendix 1:

Royal Society of New Zealand Climate Expert panel

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[15] See also https://www.science.org.au/sites/default/files/user-content/post2020targetforgreenhousegasemissions.pdf

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