Low Emissions Economy Issues Paper Submission

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Introduction

Thank you for the opportunity to make a submission on the Low Emissions Economy Issue Paper.

General comments

I found the NZ Productivity Commission's Issues Paper helpful in summarising a broad range of topics for a very complex issue and look forward to more input by the Productivity Commission in this important field.

The inquiry task is framed around two broad questions (p. 1):

- What opportunities exist for the New Zealand economy to maximise the benefits and minimise the cost that a transition to a lower net-emissions economy offers, while continuing to grow incomes and wellbeing?
- How could New Zealand's regulatory, technological, financial and institutional systems, processes and practices help realise the benefits and minimise the costs and risks of a transition to a lower net emissions economy?

The sources of emissions and their make-up is presented on p. 12 with agriculture contributing 48% of emissions. Of these agricultural emissions, 76% are CH4 gases, and approximately 21% are N2O gases (MfE, 2017). Sheep and cattle are responsible for nearly all these emissions, giving a compelling reason to focus mitigation efforts in this sector.

MfE (2017) provides more detail on the agricultural sector emissions trends between 1990 and 2015:

> *The increase since 1990 is primarily due to a 2,676.2 kt CO2-e (51.1 per cent) increase in nitrous oxide (N2O) emissions from the Agricultural soils category and a 1,375.1 kt CO2-e (5.1 per cent) increase in methane (CH4) emissions from the Enteric fermentation category (see figure 5.1.2). The key drivers for this change in emissions are an increase in the application of synthetic nitrogen fertiliser of over 600 per cent since 1990, and an 88.5 per cent increase in the dairy herd population. A decrease of 49.7 per cent in the sheep population and a decrease of 22.8 per cent in the non-dairy cattle population since 1990 have partially offset these increases (p. 133).*

My submission generally answers the questions posed by the Issues Paper in the order they were presented, but I go into detail for the following topics:

- Pasture management in relation to synthetic nitrogen fertilizer
- Technological opportunities for mitigating emissions such as traffic reduction through car sharing and consequential savings in roading costs
- The 'Two Baskets' approach to climate change gas metrics

Discussion

1. Pasture Management

Question 2: Chapter 3 of this issues paper mostly looks at ways to reduce emissions directly at their source. What other approaches would help identify opportunities to effectively reduce emissions?

There are some commentators who have identified soil as a powerful means to sequester carbon and therefore combat climate change while also addressing soil degradation, farmer profitability, water quality and allocation issues, resilience and sustainability. I note that New Zealand chose not to opt for full carbon accounting in adopting the Kyoto Protocol, so the massive carbon sink in soil is excluded from eligibility for carbon credits. This may have been due to the view that the largest contributor to the loss of soil organic carbon (SOC) was soil erosion. In the North Island the greatest losses were attributed to native forest clearing over 100 years ago, which put it well outside the 1990 baseline set in the Protocol (Dymond, 2010). However, another view estimates that globally 2400 gigatonnes of carbon are stored in soil organic matter (up to a depth of 2m), and this is compared to global emissions from fossil fuels annually of 8.9 gigatonnes of carbon (Minasny et al, 2017). From this comes the calculation that a mere 0.04% increase in soil organic carbon annually can offset all fossil fuel emissions (ADEME, 2015) effectively arresting the increase in atmospheric CO_2 and it can be done without impacting primary sector profitability (in fact it is expected to lift both profitability and productivity). This initiative, called "4 per thousand", was launched at COP21 in Paris (http://newsroom.unfccc.int/media/408539/4-per-1000-initiative.pdf).

A review of New Zealand soil and their carbon content (Minasny et al, 2017, p. 62) has found that our soils already have generally good levels of soil organic carbon but there are research opportunities on

- assessing the gap between current and potential levels of carbon storage in New Zealand soils

- assessing the effect of the more frequent renovation of dairy pastures, and mixed sward compositions.
- assessing the effect of biochar additions to soils, including the economics of incentives for land managers to apply biochar to land.

The Minasny article (2017) also concludes that:

> Soil organic carbon (SOC) in New Zealand soils is naturally high. Opportunities to sequester SOC include the creation or re-establishment of wetlands, and land use change (taking into account any impacts on biomass C). Current knowledge suggests that ways to sequester SOC will include targeting specific soil classes (e.g. allophanic soils), and/or specific landscape positions (e.g. wetlands) and using appropriate management strategies.
>
> Efforts by landowners to sequester carbon into soil will need to be supported by improved ways of monitoring change, and New Zealand will need to develop a purpose-built sampling and monitoring protocol to address this challenge (2017, p. 62).

If New Zealand ever decides to negotiate a full C accounting method, then soil organic carbon could possibly qualify as a major C sink.

Co-benefits of this approach are linked to the high use of synthetic nitrogen fertiliser. There are risks that nitrogen applied to pasture beyond the assimilative capacity of the soil and plants contributes to negative environmental impacts such as NO_3 emissions and nitrogen pollution of water. Excess nitrogen in the soil harms bacterial life there and stimulates the micro-organisms present which in turn has negative consequences for SOC as these organisms consume carbon (World Economic Forum, 2012). Sait (2016) points out that every kilogram of nitrogen applied to pasture, over and above what the plant needs at that time, results in the burnout of 100 kg of soil carbon or humus. This carbon transforms to become atmospheric CO_2 and fuels the climate change problem. He recommends incentivising farmers to increase carbon in soils through rapid humus building processes using mycorrhizal fungi and humates that fast-track the carbon sequestering process. As they complete that task, they also increase farmer productivity and profitability. Sait (2013) quotes a 3-year study by the National Bank of Australia on determinants of farm profitability which found humus levels were all important: for every 0.15% increase in organic matter there was a significant increase in profitability.

There are other worthwhile benefits to increasing SOC:

- When humus levels are raised by just 1% in soil, water storage capacity increases by 170,000 L/ha without the evaporation issues, capital costs or carbon footprint implications of irrigation schemes (Sait, 2016).
- Humus improves the nutritional value of pasture and crops because it is the primary vehicle for mineral storage and delivery in the soil. It also reduces chemical contamination of food cleanses soil contaminates, prevents nitrate leaching and sponsors soil structure improvements (Sait, 2013).

Primary producers should be paid carbon credits for increases in SOC or humus. They also need to be required to introduce a carbon source in proportion to any nitrogen-based fertiliser applied to their land. This in turn raises the question of suitable carbon sources. Composting is an obvious option and the large proportion of organics and green waste going to landfill in New Zealand (up to 52% of volume) (Statistics NZ, 2008) would be an ideal waste stream to divert to composting operations, especially as this is currently a source of methane emissions. City councils and local authorities are natural candidates for running these processes as they are currently responsible for waste and rubbish collections in their jurisdictions

Combined with this is the opportunity to use our large but under-utilised lignite resources to optimise humus-building. Lignite is a rich source of humates which are indispensable humus builders in combination with mycorrhizal fungi (Sait, 2013). According to the website, 'Let's talk about coal' (Stratterra, 2016):

> Lignite is New Zealand's largest in-ground energy source. Surveys in the late 1960s and early 1970s established there are about 10 billion tonnes of recoverable lignite in Otago and Southland. That constitutes about 75,000 petajoules (PJ) of energy. For comparison, the Maui gas field, a world-class field, originally contained 4500 PJ.
>
> Low-level mining of lignite has been undertaken in New Zealand for many years. Currently there are two mines in Southland producing about 100,000 tonnes a year for use to augment other coals in some local industries such as dairy processing and drying of timber (Paragraph 4).

A compost product which incorporated humates and mycorrhizal fungi would produce a high-value product sought after by the primary sector and could be a game changer for NZ sustainable farming and prosperity. In addition, by local authorities undertaking the composting, they would be converting a service which is currently a cost centre to potentially a significant revenue generator while also improving environmental outcomes for landfills and methane emissions.

Returning to question 2 from the Issues paper which this section is answering, I would support New Zealand farmers being expected to bear some cost for their emissions as this would encourage them to find alternatives, especially related to the number of animals they are responsible for.

Question 5: What are the issues for government to consider in encouraging alternative low-emissions land uses?

- Supporting research that freely shares findings for particular solutions for land types, given that these could vary depending on local conditions, soil structure and climatic conditions etc.
- Specific data relating to the cost and quantity of inputs and the level and returns of outputs in a manner that allows comparisons to be easily made is of paramount importance.

2. Afforestation

Question 7: What policies, including adjustments to the New Zealand Emissions Trading Scheme, will encourage more sequestering of carbon in forests?

I would like to see the rules simplified and eligible plantings expanded so that riparian plantings of less than 30m width could qualify.

Increasing the price of carbon credits would also help immensely both to reinforce the changes in activity desired and mitigate costs, particularly if it was raised to around US$20/tCO2eq. In Edenhofer et al (2014) a working group for the IPCC found that:

> Among supply-side measures, the most cost-effective forestry options are afforestation, sustainable forest management and reducing deforestation, with large differences in their relative importance across regions; in agriculture, low carbon prices16 (20 USD/tCO2eq) favour cropland and grazing land management and high carbon prices (100 USD/tCO2eq) favour restoration of organic soils (medium evidence, medium agreement). When considering only studies that cover both forestry and agriculture and include agricultural soil carbon sequestration, the economic mitigation potential in the AFOLU sector is estimated to be 7.18 to 10.6 (full range of all studies: 0.49–10.6) GtCO2eq/yr in 2030 for mitigation efforts consistent with carbon prices up to 100 USD/ tCO2eq, about a third of which can be achieved at <20USD/ tCO2eq (medium evidence, medium agreement) (p.87).

As indicated in the Edenhofer et al (2014) analysis, a higher carbon price would favour restoration of organic soils which is the thrust of my earlier discussion point on pasture management.

3. Transport

3.1. Electric Vehicles

Question 9: What policies would best encourage the uptake of electric vehicles in New Zealand?

I support more encouragement of ev use. My family has purchased an ev recently (second-hand with a 200km range) and have installed solar power generation on our house with battery storage. This provides us with more reliable charging of our ev from our solar array given that the car is away from home during the week from 7-00am to 4-30pm. When assessing the impact of ev use on electricity grid demand, such as table 12 on page 24, a setup with domestic solar battery storage should be part of the mix. While switching to domestic solar generation offers some savings in electricity costs, by having a battery to store our solar power, it has probably doubled our annual savings due to being able to cut out the cost of petrol for 1.1 cars. The battery also means we don't impact on peak electricity demand to the same level because we can run down our domestic battery reserves first.

4. Buildings

Question 16: What policies and initiatives would best promote the design and use of buildings that produce low greenhouse gas emissions?

I agree with the Royal Society's recommendations on energy efficiency standards, education and training on low-emissions options for people designing, constructing, installing and using buildings.

5. Waste

Question 17: What are the main opportunities and barriers to reducing emissions in waste?

Responding to the discussion under this heading, I support the following:

- Legislation to reduce waste such as the Waste Minimisation Act 2008 should mention climate change, or GHG emissions, plus give better guidance on the role of the circular economy and other approaches to reduce emissions in waste disposal, with easy sharing of information and success stories that could be replicated across the country.
- University research or developing low-emissions technology
- Better dissemination of information on best available technology, similar to that produced the European Commission for waste incineration and treatment.

6. Cross-cutting Issues

Question 18: Policies to lower emissions from particular sources, technologies and processes can have interactions with emission sources in other parts of the economy. What are the most important interactions to consider for a transition to a low emission economy?

One of the biggest opportunities in my opinion is the emissions that could be reduced along with attendant savings possible through maximising shared rides and autonomous vehicles for local authorities and councils. This is because roading is one of the largest costs for councils, driven by rising traffic volumes and wear and tear on the existing network. Safety improvements and redesign of central business districts are also major expenses. Research on the traffic reductions possible through ride sharing or autonomous vehicles (driverless cars available for hire) suggest we could see a fall by as much as 90% in urban vehicles, given that one extra car in a car-sharing fleet can typically remove 9-13 cars from the streets (The Economist, 2015, paragraph 7). This would appear to be one of the most comprehensive and achievable means of drastically curtailing fossil fuel emissions, while improving rates affordability.

Taking Waipa District as an example (my local council), in 2017 our roading and footpath budget paid for solely from rates, so excluding NZTA subsidies and development contributions etc., was $10,946,160, representing 23% of our total rates take. If vehicle numbers reduced by 90% (and sharing services can encompass commercial and heavy vehicles) could our roading costs be reduced by a similar amount? Even if they reduced by half their current level ($5,473,080) that would represent a rates reduction of 11%. Our 2015-25 Long Term Plan has an average of $19.5 million annually for roading and footpaths so there could be the potential to save from between $9.75 million (50% reduction) to $17.6 million per year (90% reduction).

The fantastic co-benefits of embracing this technology were touched on by City of Melbourne Lord Mayor Robert Doyle at the 2017 Local Government New Zealand Conference and include:

- opening up our urban space to more parks, recreational and place-making initiatives because the width of roads can be reduced or completely pedestrianised
- space allocated to parking is no longer needed creating opportunities for redesigning our city centres for people not cars, and
- the closer interaction with others in our community builds a sense of belonging and strengthens social cohesion.

From a developer's point of view there are lots of positives too: drastically lower development contributions because connector roads and intersection treatments could be narrower and simpler to construct (so cheaper), less land is needed for roads and suburban parking so more sections could be produced adding to the developer's returns while reducing urban sprawl, and it is likely stormwater infrastructure would be simpler and therefore cheaper to design and build because of a lower area of impermeable surfaces.

There is a school of thought that suggests technologies should be left to be adopted freely as the market wills but I would make the appeal for local authorities to be enabled to promote and even seek out the establishment of this technology in their areas because of the massive benefits and savings possible from this technology. My savings analysis is centred on Waipa which is my local council, but imagine the savings possible in Auckland, Wellington, Christchurch and Dunedin.

7. Emissions Trading Scheme

Question 20: Acknowledging the current review, what changes to the New Zealand Emissions Trading Scheme are needed if it is to play an important part of New Zealand's transition to a low-emissions future?

I support changes to the ETS which would give it the capability to drive emissions reductions beyond the estimated 0.4% reduction of gross domestic emissions quoted on page 41 of the Issues paper. I have already commented on opportunities to make significant emissions reductions if SOC was included in the scheme.

8. Legislative Framework

Question 29: Does New Zealand need an independent body to oversee New Zealand's domestic and international climate change commitments? What overseas examples offer useful models for New Zealand to consider?

I support the establishment of a politically independent Climate Change Committee similar to the United Kingdom (UK)'s Climate Change Act for New Zealand. There has been a lack of central government leadership on these matters I feel and this would be an effective means to ensure targets and associated policy are put in place hopefully without delay. Increased certainty for the various players would be an important benefit arising out of such a move.

9. Designing the best combination of policies.

Question 32: What should be the mix, and relative importance of, different policy approaches (such as emissions pricing, R&D support, or direct regulation) in order to transition to a low-emissions economy?

Question 34: Who are the most important players in driving forward New Zealand's transition to a low-emissions economy?

This section of the paper considers the diversity of approaches that can be taken to achieve a low emissions economy, and asks who are the most important players for this transition we face. The role of local government must be one of the most influential given their leadership role in local communities, the size of their business and the spheres of influence they operate in, not to mention their ability to tap into non-traditional dimensions such as non-regulatory interventions around diffusing innovation and channelling investment. Therefore, I would like to see local government empowered to do all these things.

Question 32: What should be the mix, and relative importance of, different policy approaches (such as emissions pricing, R&D support, or direct regulation) in order to transition to a low-emissions economy?

Local Government is closely involved with planning of suburbs and commercial areas, public transport systems and community infrastructure. In making these decisions they are directed by central government to give consideration to costs (and impacts) covering the whole life of the asset; however they do not have access to information relating to the GHG emissions over the total life of the asset nor the relative merits of differing design approaches from an emissions standpoint. In the absence of this, no weight can be given to a low emissions option and therefore our communities may be lumbered with long-lived infrastructure and design outcomes that will tie them into inefficient systems with large embedded emissions.

Unfortunately, the current Local Government Act directs councils to apply a 'cost effective' lens and therefore puts consideration of emissions levels out of scope at present. It would be great if this legislation could be amended to allow wider considerations to be taken into account.

10. A Strategy and a Vision for New Zealand's Future

Question 36: What are the essential components of an effective emissions-mitigation strategy for New Zealand that will also be economically and politically sustainable?

I agree with the suggestions made on page 60 taken from the World Bank's publication on Decarbonizing development, concerning the three broad principles that should guide countries' low-emissions efforts:

- Planning ahead with an eye on the end goal: Implementing a mix of cheap, quick fixes that are sector-specific, as well as locking-in costlier, longer-term measures that support technology development and low-carbon infrastructure.

- Supplementing carbon pricing with other policies: Recognising that carbon pricing alone will be insufficient, so creating a policy package that triggers changes in patterns of investment, technologies and behaviours.
- Managing the political economy and smoothing the transition for those who are most affected: Ensuring that climate policy is attractive for the majority, and avoiding impacts appearing to be unfair or concentrated in a region, sector or community.

The components put forward from Motu's Low emissions future dialogue (Leining & Kerr, 2016) such as an economic (benefit-cost) case for accelerating mitigation action, long-term mitigation goals, and a list of agreed short- and medium-term mitigation policies and actions would also be worthy of inclusion in a strategy.

11. Managing impacts on vulnerable households and businesses

Question 35: What measures should exist (and at what scale and duration) to support businesses and households who have limited ability to avoid serious losses as a result of New Zealand's transition to a low-emissions economy?

I agree with trying to minimise impacts on vulnerable household and businesses and strongly support assistance for retraining where skills have become redundant due to transition upheaval for the business sector. This is similar to the Scandinavian approach of flexicurity (Wikipedia, 2017).

12. The "two baskets" approach

Question 37: Should New Zealand adopt the two baskets approach? If so, how should it influence New Zealand's emissions reductions policies and long-term vision for the future?

The Issues Paper uses Allen (2015) as a reference for raising for discussion the possibility of New Zealand adopting a "two baskets" approach to reducing emissions of both long-term climate changing gases like CO_2 and short lived climate pollutants like CH_4. There is the suggestion that focusing on long-lived CO_2 reduction is a policy position that would make sense for New Zealand to adopt given our relatively high emissions profile of CH_4.

Article 2 of the UN Framework Convention on Climate Change (2006) states:

> The ultimate objective of this Convention [is] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally

> to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner (p. 21).

Allen (2015) summarises the issue:

> While the overall aim of reducing greenhouse gas emissions to stabilise global climate remains the same, arguments are being made for very different policy priorities that appear to depend on a relatively obscure and technical issue: the choice of emission metric for comparing different climate pollutants… [however,] the 'short-lived' versus 'long-lived' discussion is not really a technical issue at all, but an expression of inter-generational priorities (p. 5).

Later in the article the author sets out in detail the relationship between Article 2 (UNFCCC, 2006) and the twin approach to reducing gas emissions:

> The first sentence [of Article 2] was, and remains, a commitment to future generations. The greatest risks of dangerous anthropogenic interference in the climate system are unlikely to manifest themselves within the lifetime of anyone who was alive when the convention was opened for signature in 1992, and very possibly not in the lifetime of anyone alive today in 2015. But the second sentence recognises more immediate concerns: allowing ecosystems to adapt and ensuring food production and economic development can continue.
>
> Reduced to its simplest form, the debate over emission metrics and Short Lived Climate Pollutants (SLCP) versus CO_2 mitigation can be conceived as addressing the two sentences of this article. It is necessary to limit cumulative emissions of CO_2 to stabilise climate and hence limit the risk of dangerous anthropogenic interference in the climate system in the long term. But reducing SLCP emissions may well be a more cost-effective way to limit the rate of climate change over the coming decades to ensure that ecosystems, food production and the economy can adapt, which also has a role in avoiding dangerous climate change.
>
> Proponents of early action on SLCP emissions frequently emphasise the 'complementary' nature of SLCP and CO_2 mitigation, but it is important to be clear what this complementarity means: they are not two ways of achieving the same goal, but address fundamentally different goals, affecting different generations (Allen, 2015, p. 23).

Other researchers have considered what emphasis is warranted for short lived climate pollutants like CH_4. Shindell et al (2012) is well-cited research and their article concluded that there were "important 'win-win' benefits of mitigating SLCPs for

near-term climate, human health, agriculture, and the cryosphere" (Shindell et al., 2012, p. 183). They calculated the value of methane emissions reductions at $700 to $5000 per metric ton, compared to the typical marginal abatement costs of less than $250 per metric ton, but admit that the benefits would not necessarily accrue to those incurring the costs (Shindell et al., 2012, p. 186). Overall, they concluded that the extent of the benefits beyond climate change considerations made early mitigation of SLCP like CH_4 a sensible move (Shindell et al., 2012, p. 188).

Based on these two views, I would not be opposed to advocating the use of two separate metrics for climate mitigation covering CO_2 and SLCPs separately but it is critical that both categories of emissions are the subject of effective efforts to curb emissions without delay.

Thank you for the opportunity to make a submission.

Clare St Pierre

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