28th March 2021

Submission on Climate Action for Aotearoa: The Climate Change Commission's first advice report

To the Climate Change Commission,

I appreciate the effort that has gone into producing a report that covers such a wide-ranging topic in such a short space of time.

I have tried to make my submission easier for you to process by answering the questions upfront and refering to my more detailed main ideas that are contained in appendices. However I have not been able to refer to all of the points in the appendices in my answers. If someone is reading this whole submission then it may be easier to read it from the appendices first.

An important note about my submission is that I do not believe Stats NZ made a reasonable assumption in assuming that imports have the same emissions content as outputs of the same industry in New Zealand. NZ's energy sector is about 20% fossil fuels; Overseas it is about 70% fossil fuels. Electricity generation makes up the bulk of global emissions and a large contributor to electricity demand is manufacturing. If Stats NZ had factored in the difference for overseas electricity generation, the estimates could be as a rough guess 10Mt more. The statements made in this submission are based on what I believe to be the reality of the situation, where I have analysed numbers I present both the numbers as they are now, and an increase of 5Mt CO_2 as a sensitivity analysis to move the results closer to what they are in reality. I have suggested emissions budgets but these are more a demonstration of how to calculate them: for the budgets to be accurate the CCC needs to urgently request Stats NZ updates their consumption estimates to use estimated electricity mixes of countries we import from.

I also would not use the residency principle for consumption estimates. If NZ is letting tourists have the fuel to drive around in vans (or non-residents commutes to work) then we are responsible for that – it should not be considered an export.

I noticed the Commission took a different approach to how I would have gone about planning emissions budgets as you will see from the appendices. I started with the question of what is NZ's fair share of the remaining global carbon budget, and used that to set a cumulative emissions budget out to 2048. Using this approach it is clear that the Commission's proposed path would cause NZ to fail its obligations under the Paris Agreement and to future generations.

It can be difficult weighing up whether the cost of actions required to successfully limit warming to 1.5C are worse than the cost of having to adapt to global warming. However, the following is important either way:

1. Maintaining control of the ETS, so the country has the choice to be more ambitious in future.

2. Giving NZers the choice including by officials providing honest, comprehensive and quality advice, and tweaking the economy so opting for climate-friendly options doesn't negatively impact individuals relative to others.

I can understand if the Govt. feels it is too hard, and decides to make an effort on global warming but not to the level required by the Paris Agreement. But this decision should be clearly communicated to the country not hidden away by experts' technobabble. We also owe it to future generations to at least try to the best of our abilities before making a decision to give up.

The sectors where there are large emissions that we should be targeting with policy are:

- Aviation
- Switching from cars to cycing, or bus and scooter combinations
- Imported products
- Reducing industrial production probably via low ETS caps

Regards,

Wiremu Thomson

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Six Big Issues

1. The pace of change: Do you agree that the emissions budgets we have proposed would put Aotearoa on course to meet the 2050 emissions targets?

I strongly disagree. A bit of a loaded question. Do the 2050 targets matter? Do they have any scientific basis? They do not take into account cumulative emissions, so no the emissions budgets are not ambitious enough and do not meet our obligations under the Paris Agreement and to future generations. The CCC should place little emphasis on the 2050 targets because they are weak (and a distraction) and instead look at the purpose of the bill, and have regard to the international Paris Agreement NZ signed up to. I refer the Commission to Appendix C for a discussion of NZ's cumulative emissions budget and how the Commission's proposed budgets would cause NZ to fail its obligations under the Paris Agreement and to future generations.

2. Future generations: Do you agree we have struck a fair balance between requiring the current generation to take action, and leaving future generations to do more work to meet the 2050 target and beyond?

I strongly disagree. The current generation is doing basically nothing except screwing over future generations. I refer the Commission to Appendix C for a discussion of NZ's cumulative emissions budget and how the Commission's proposed budgets would cause NZ to fail its obligations under the Paris Agreement and to future generations.

3. Our contribution: Do you agree with the changes we have suggested to make the NDC compatible with the 1.5°C goal?

I strongly disagree.

Please see Appendix C for ambition required.

I think the IPCC on pg. 149 when talking about policy assumptions in emission reduction models provides a reasonable description of how I view the Commission's draft report:

Policy assumptions that lead to weak or delayed mitigation action from what would be possible in a fully cooperative world strongly influence the achievability of mitigation targets (high confidence) (Luderer et al., 2013; Rogelj et al., 2013b; OECD, 2017; Holz et al., 2018a; Strefler et al., 2018b). Such regimes also include current NDCs (Fawcett et al., 2015; Aldy et al., 2016; Rogelj et al., 2016a, 2017; Hof et al., 2017; van Soest et al., 2017), which have been reported to make achieving a 2°C pathway unattainable without CDR (Strefler et al., 2018b). Not strengthening NDCs would make it very challenging to keep 1.5°C within reach (see Section 2.3 and Cross-Chapter Box 11 in Chapter 4). One multimodel inter-comparison study (Luderer et al., 2016b, 2018) explored the effects on 1.5°C pathways assuming the implementation of current NDCs until 2030 and stringent reductions thereafter. It finds that delays in globally coordinated actions lead to various models reaching no 1.5°C pathways during the 21st century. Transnational emission reduction initiatives (TERIs) outside the UNFCCC have also been assessed and found to overlap (70–80%) with NDCs and be inadequate to bridge the gap between NDCs and a 2°C pathway (Roelfsema et al., 2018). Weak and fragmented short-term policy efforts use up a large share of the long-term carbon budget before 2030–2050 (Bertram et al., 2015a; van Vuuren

et al., 2016) and increase the need for the full portfolio of mitigation measures, including CDR (Clarke et al., 2014; Riahi et al., 2015; Xu and Ramanathan, 2017). Furthermore, fragmented policy scenarios also exhibit ‘carbon leakage’ via energy and capital markets (Arroyo-Currás et al., 2015; Kriegler et al., 2015b).

pg. 159: A world that is consistent with holding warming to 1.5°C would see greenhouse gas emissions rapidly decline in the coming decade, with strong international cooperation and a scaling up of countries’ combined ambition beyond current NDCs.

The report mentions numerous times "The scenarios that had the greatest chance of limiting warming to 1.5C, all required rapid emissions reductions of greenhouse gases between now and 2030 and then slower reductions out to the end of the century." And yet the CCC's suggested pathway is a slow reduction to 2030 and then rapid reductions due to improving technology. This is not only inconsistent with the good scenarios, but will likely have increased cumulative emissions as the slow reduction to 2030 would likely have more emissions than are made up by doing a rapid reduction post-2030.

The report does not seem to mention the estimated global CO_2 budgets at all but instead focuses on the modelled emissions pathways. For a scientific report that's meant to be evidence-based, omitting mention of the budgets that constrain these modelled pathways is bad.

The graphs in the Path to 2035 chapter, specifically figures 3.7 and 3.8, are not good advice for Parliament because they don’t include paths the IPCC report indicated were required, which is important as the CCC were trying to base the paths on the IPCC’s paths. By comparing the Commission’s path to the Commission’s own scenarios it makes the path look good when in fact more emphasis should be given to the fact the path is not good enough. You are an independent organisation: making the path look good or easy should not matter to you; all Nzers are expecting from you is honesty because then we can make informed decisions.

I think the report is too obsessed about growth and growing GDP, and though it admits that the impacts of climate change will fall disproportionately on future generations it follows it up with a statement (sometime before pg. 87) but acting too soon could see us facing a cost. Look that's the point, for us to make some sacrifices to share the burden especially as future generations don't get a choice they just get left with whatever situation the current lot leaves them with. So long as the country isn't in large debt, sells enough exports to cover the cost of imports (and foreign ownership's impact on income streams), can produce enough food to look after its dependents, impacts of climate change are kept under control, and people look after each other equitably then future generations should be fine. I don't think growth is high on their priority list.

Throughout the report you run into trade-offs between the economy and the climate and it seems almost every time you sacrifice the climate in favour of the economy. A good example of this is on pg. 155 where the CCC says the 628 MtCO2e allowed emissions over 2021-2030 under our domestic emissions budget is higher than the level of the first NDC ... If too stringent budgets are set early on, Aotearoa risks losing production in areas where a technological solution could be applied if more time was available to implement it." We don't have infinite time, otherwise we could just ignore climate change because technology would fix it eventually. Other examples where you pick the economy over the climate are whenever aviation is mentioned, where generally you say there are limited opportunities to change to low-emissions aviation for the foreseeable future, and you never propose reducing it. The report says we could use offshore mitigation, but previous reports have raised the credibility issue of whether offshore mitigation is additional. It is not an achievable plan to say we can use offshore mitigation without providing specifics of where and how this will be done.

4. Role and types of forests: Do you agree with our approach to meet the 2050 target that prioritises growing new native forests to provide a long-term store of carbon?

I agree, but if exotics improve the chances of achieving our obligations under the Paris Agreement then that is important too. With exotics though there perhaps needs to be plans regarding turning them into permanent forests if there is little demand for harvested wood, otherwise a forest might all die at the same time with minimal replacement given the trees are a monoculture with the same age.

5. Policy priorities to reduce emissions: What are the most urgent policy interventions needed to help meet our emissions budgets?

Action to address barriers, and pricing to influence investments and choices. Behaviour change is the most urgent and important policy intervention because urgent reductions are needed and technological innovations and infrastructure changes take too long. The third option the CCC proposed for this question, is more of the same technology-centric waffle that has delayed action for decades. The priority should be to adjust society to live within the means of what nature provides; if technology comes along to improve quality of life then all the better.

6. Technology and behaviour change: Do you think our proposed emissions budgets and path to 2035 are both ambitious and achievable considering the potential for future behaviour and technology changes in the next 15 years?

I strongly disagree that the proposed emissions budgets and thus the path to 2035 are ambitious. Please see Appendix C for the level of ambition required.

Consultation Questions

1. Do you support the principles we have used to guide our analysis?

- **Align with the 2050 targets.**
  I do not support. The 2050 targets are weak and not based on climate science (i.e. cumulative emissions). The CCC should "Align with the Paris Agreement" because that is what we signed up to internationally, and the CCC is required to have regard to international agreements. The Paris Agreement is more ambitious than the 2050 targets so by aligning with the Paris Agreement the CCC will achieve both international obligations and the 2050 target, but the same is not true for aligning with the 2050 targets.
- **Focus on decarbonising the economy.**
  Fully support. Better than losing too much land to trees.
- **Create options.**
  Do not support. From reading the report, the CCC's use of this principle seems to be to not take reduction actions that should be taken in the interests of leaving them as options. As such the CCC sets unambitious targets to account for options that are not taken.
- **Avoid unnecessary cost.**
  Fully support
- **Transition in an equitable and inclusive way.**
  Do not support. The word 'transition' suggests taking time to do things, but doing actions urgently is important in emergencies such as Climate Change, Covid and tsunamis. If it were changed to "Reduce emissions in an equitable and inclusive way" then I would fully support it.
- **Increase resilience to climate impacts.**
  Fully support
- **Leverage co-benefits.**
  Neutral

2. Do you support budget recommendation 1? Is there anything we should change and why?

I do not support Budget Recommendation 1 (BR1) because if you look at Appendix C (What to use for NZ's emissions budgets and NDC?), you will see BR1 would cause NZ to fail its obligations to future generations and the Paris Agreement.

I recommend setting gross consumption emissions budgets that cover international aviation and imported emissions as well using consumption-based accounting, and the stock-change approach for HWP. Under this approach I support the following CO_2 contributions to emissions budgets (1^{st}: 138 Mt, 2^{nd}: 139 Mt, 3^{rd}: 109 Mt) or (1^{st}: 94 Mt, 2^{nd}: 79 Mt, 3^{rd}: 72 Mt) depending on whether overshooting our cumulative emissions budget is scientifically allowed or not, respectively (see Appendix C for more information).

I have not taken the time to look at what the other gases would contribute, but they should also be based on consumption-accounting and be the midpoint of the IPCC estimates.

The CCC is failing the responsibility to set ambitious budgets, because they are not considering all of the available policies and so their view of what can be realistically met is limited. Therefore the budgets set are not ambitious and not in keeping with limiting warming to 1.5C.

The CCC seems to be confusing the word ‘achievable’ with ‘easy’. When submitting on the ZCB I was in favour of achievable budgets, as shown in the excerpt from my Zero Carbon Bill submission below, because I did not want to see the CCC relying on future pie in the sky technology to make it seem like everything was fine when in ten years time people would just see it as impossible to achieve. I am ok with the CCC recommending budgets that are not consistent with our fair share, so long as they acknowledge the budgets are not good enough; and the budgets are as ambitious as possible to try to achieve close to our fair share. The ETS’s cap provides significant potential to achieve ambitious budgets even if it is quite disruptive to NZ’s present norm. The CCC should try to soften the effect of the cap by recommending mitigation policies that create a more equitable outcome such as cutting the luxury of international aviation.

> “I don’t mind, but any emissions budgets that are set should include a clear plan of how the Government intends to achieve those budgets, so the people who have to achieve the budget don’t view it as pie in the sky thinking and if they want to be less ambitious then there is more information to question them on as to why they aren’t doing something mentioned in the plan.”

3. Do you support our proposed break down of emissions budgets between gross long-lived gases, biogenic methane and carbon removals from forestry? Is there anything we should change, and why?

Gross long-lived gases: Not ambitious enough
Biogenic methane: Don’t know
Forestry: Having more forestry is better for NZers in terms of chances of limiting warming, so long as it is not excessive (and thus unnecessarily costs land that could be used for other things) and the focus remains on reducing emissions.

See my answer to CQ2.

4. Do you support budget recommendation 4? Is there anything we should change, and why?

Fully, partially, neutral, do not support, don’t know

Fully support

5. Do you support enabling recommendation 1 on cross-party support for emissions budgets? Is there anything we should change and why?

Fully support

Good idea.

6. Do you support enabling recommendation 2 on coordinating efforts to address climate change across Government? Is there anything we should change and why?

Fully support.

7. Do you support enabling recommendation 3 on creating a genuine, active and enduring partnership with iwi/Māori? Is there anything we should change and why?

Don't know.

8. Do you support enabling recommendation 4 on central and local government working in partnership? Is there anything we should change and why?

Fully support.

9. Do you support enabling recommendation 5 on establishing processes for incorporating the views of all New Zealanders? Is there anything we should change and why?

Don't know.

I do not see why the CCC cannot just do surveys of public opinion (and locally targeted surveys also, e.g. at suburban malls to target suburban lifestyles) from time to time to inform their advice. A risk of randomly selecting and asking the same group of citizens each time is there will be the same bias each time, and if the members do not have the time to inform themselves on climate change then they will probably just regurgitate back the information the Govt provides them (similar to how the CCC's Pace of Change question is loaded to get a particular response).

I agree with the CCC's comment that there is a need to avoid over-consultation. I certainly do not have the time to submit on every single policy issue the Govt considers. In some ways I am hoping that the CCC will take on board all of the suggestions from this consultation and be able to represent them in future consultations.

I would add to ER5 a more inwardly looking recommendation of, the CCC should do surveys of NZers to inform their advice e.g. whether any of their policies would be likely to achieve the increased uptake in cycling and public transport they are expecting.

10. Do you support our approach to focus on decarbonising sources of long-lived gas emissions where possible? Is there anything we should change and why?

Do not support.

I support a focus on reducing long-lived gas emissions by any means whether this is by "decarbonising" (switching to a less carbon-intensive process or practice), or by reducing demand/use of that source. However I feel the CCC's approach focuses too much on fuel-switching and not enough on behaviour change or just outright placing a cap on emissions from a source.

11. Do you support our approach to focus on growing new native forests to create a long-lived source of carbon removals? Is there anything we should change and why?

Don’t know.

Native forests grow slower, so do not help as much with limiting cumulative emissions, but are more appropriate than a monoculture.

12. Do you support the overall path that we have proposed to meet the first three budgets? Is there anything we should change and why?

Looking at the overall path and weighing up the good and bad parts of it, I have to say I do not support it.

I do not support it primarily because it is not ambitious enough (see Appendix C: Cumulative Emissions Budgets for the level of ambition required), it does not make enough early reductions in land transport, it is way too soft on aviation especially international aviation, and does not look at reducing imported emissions. To a lesser extent it does not consider reducing industrial emissions in the short-term by limiting production.

The report is very weak on behaviour change. Given the urgency and scale of reductions required, behaviour change provides the best mitigation opportunities.

I am also not keen on relying on mass electric cars. They are energy-intensive to manufacture the one tonne metal boxes and then for people to take them with them everywhere they go. However I do not oppose the EV plan because it may be what is required for some people.

Though we do not have much fossil-fuel produced electricity, one of the actions that helps in decarbonising electricity is reducing electricity demand, and we can contribute to that by reducing imports from emissions-intensive electricity networks.

I like the ban on new gas connections proposal, decarbonising process heat, efforts in the waste sector, and banning petrol vehicle imports though I feel this should be much sooner.

I would prefer we focus on low energy demand options such as cycling, rail and bus/scooter combinations.

To back up my preference for low energy demand I thought this excerpt from pg. 124-125 of the IPCC 1.5C report was interesting:

> Integrated modelling aims to explore a range of developments compatible with specific climate goals and often does not include the full set of broader environmental and societal concerns beyond climate change. This has given rise to the concept of sustainable development pathways (Cross-Chapter Box 1 in Chapter 1) (van Vuuren et al., 2015), and there is an increasing body of work to extend integrated modelling to cover a broader range of sustainable development goals (Section 2.6). However, only some of the available 1.5°C-consistent pathways were developed within a larger sustainable development context (Bertram et al., 2018; Grubler et al., 2018; Rogelj et al., 2018; van Vuuren et al., 2018). As discussed in Section 2.3.4.1, those pathways are characterized by low energy and/or food demand effectively limiting fossil-fuel substitution and alleviating land competition, respectively. They

> also include regulatory policies for deepening early action and ensuring environmental protection (Bertram et al., 2018).

From the IPCC 1.5C report pg. 148 (Policy Frameworks and Enabling Conditions), just including parts to support my submission:

> "Moving from a 2°C to a 1.5°C pathway implies bold integrated policies that enable higher socio-technical transition speeds, ... and the phase-out of existing systems that may lock in emissions for decades ... This requires higher levels of transformative policy regimes in the near term, which allow deep decarbonization pathways to emerge ... and assumes more profound behavioural, economic and political transformation ... Despite inherent levels of uncertainty attached to modelling studies (e.g., related to climate and carbon cycle response), studies stress the urgency for transformative policy efforts to reduce emissions in the short term ... The available literature indicates that mitigation pathways in line with 1.5°C pathways would require stringent and integrated policy interventions (very high confidence). Higher policy ambition often takes the form of ... larger coverage of NDCs to more gases and sectors (e.g., land-use, international aviation), much lower energy and carbon intensity rates than historically seen, carbon prices much higher than the ones observed in real markets, ..."

The quote supports my submission's points that more urgent transformative effort needs to be made in the 2020s, focusing on lower energy demand rather than just fuel switching, focusing on behavioural change, including international aviation in NDCs, and higher carbon prices.

13. Do you support the package of recommendations and actions we have proposed above to ensure an equitable, inclusive and well-planned climate transition, and is there anything we should change?

I do not support these actions. Well actually I support NA1(d) (insulation and efficient heating), but I know if I am listed in the 'support some of the actions' category, then it will be used to justify things I do not support, and I would rather not have those things than have NA1(d).

I strongly disagree with Time-critical necessary action 1 because it seems like an over-engineered waste of time, that would only add overly restrictive rules for the Govt, and delay reduction actions until the report was completed (2024). It also mentions 'transition' far too much, when actions need to be done urgently and not spread out over time. The well-signalled approach is beneficial, but there is an overemphasis on it that lacks prioritising urgent emissions reductions akin to how to handle things in an emergency.

NA1 just seems to be stating the obvious in that it is what Govt and public sector should already be considering.

I'd like to point out there is an alternative to the slow, deliberately paced and planned route (as recommended by the CCC in page 5 of Chapter 16 of the evidence report). There is the route that is taken in an emergency such as Covid where the Government identifies the problem and acts quickly and responsively to address the problem and issues that occur as the result of their solutions to the problem. Applying this to Climate Change, the Government could move quicker but be ready to

support workers who have lost their jobs as was the case with Covid. If the slow transition route had been actioned in the last 30 years then it would be feasible, however none of the Governments did the work, so we are now in an emergency situation.

The CCC should support workers who lose their jobs by adding a recommendation to “Reduce skilled migration as it seems like no matter how skilled career-changers get they will likely be at the back of the queue to people who already know and have experience doing that exact job, and are as committed to the job as they are to living in NZ.” This is not to say we should not have migration, just don’t base it on skills shortages (except perhaps for doctors and nurses). If there is a skills shortage it may be because the industry has not been making the effort to train enough people or does not treat people well.

That a transition plan may be required for towns affected by reducing emissions-intensive production, perhaps suggests a lack of confidence in the social welfare system to support these people and find them gainful employment.

Towns that lose jobs could benefit from the Moving People out of Auckland policy in Appendix D as housing should be more affordable in those areas.

I am not sure whether WINZ requires job seekers to look for work themselves or just respond to their and recruitment agency requests. If it's the former then this could be a major waste of their time and productivity if there's no jobs available (not to mention the effect on their mental health and wellbeing), so probably worth looking into this if there is significant unemployment, which there may well be at least during the transition period as a lot of jobs involve selling and transporting goods from overseas. On the other hand, a jobs shortage does not seem to be a problem for NZ based on demand for fruit picking workers and the skills shortage lists.

14. Do you support the package of recommendations and actions for the transport sector? Is there anything we should change and why?

I support some of the actions, but would like to see a lot of additions.

I support NA4 except for NA4(c) which I do not support because biofuel for aviation seems like a waste of resources; aviation trips/distance should just be significantly reduced. Land and sea forms of transport are far more efficient.

NA3 seems ok.

I support TCNA2, but feel (a) should be a ban on purchasing ICE vehicles that were manufactured after 2021 (unless the purchaser receives an exemption from the Govt. because of its unique utility for work purposes). This is because with the rate of emissions reductions required it does not seem like a purchaser would be able to get full use out of the vehicle, so in their and the country’s interests it is best for them not to buy it in the first place. However vehicles built before 2022 could still be imported and used because they would only have say half of their life left, it is perhaps better to reuse an existing asset than the emissions for a new vehicle and it might maintain affordable mobility for people in the short term.

I am neutral regarding NA2, but would strongly support NA2(d) if it mentioned providing secure cycle and e-scooter storage facilities. Councils already provide a lot of car parks, but perhaps not so much secure cycle and e-scooter parking/storage.

I am concerned by the Commission's plan because most of the report's reductions in the 2020s seem to come from non-transport energy specifically heat, industry and power. The CCC is putting weight on other sectors while ignoring the most feasible options of balancing the scales in favour of other forms of transport than just driving a car or flying in an aeroplane.

Additions

Higher fuel prices
As discussed in Appendix D (the Opportunity Cost of Cycling and Public Transport section).

This promotes electric bikes as well as electric cars, and electric bikes are a better use of battery resources because they are not powering a one tonne box of metal as well.

Balancing the opportunity costs is an enabler of cycling and public transport, because it isn't just the physical or safety barriers, but also the financial and fairness barriers. I don't know about complicated cities such as Auckland and Wellington, but I'd say for the rest of NZ cities the barrier isn't safety but cost.

Maximum distance protection regulation

Bring back the maximum distance protection regulation of 1936 from the Transport Licensing Act 1931 (retrieved on 28th March 2021: https://en.wikipedia.org/wiki/Transport_Licensing_Act_1931) limiting long-distance truck freight distances, which effectively meant that long-distance freight went by rail or shipping. It worked back then to encourage rail freight, I don’t see why we cannot bring it back now given it is needed.

This would mean that trucks that were basically travelling next to railway lines would have to move the freight onto and off a train at each end, which is more GHG efficient. However trucks that were ferrying freight from a rural area to the nearest depot could travel as much as they wanted in that area (as there would not be nearby railway lines that could be used instead).

Be tougher on aviation

The CCC needs to get real on aviation, stop being so nice to a business that relies on fossil fuels, and start advising emission caps so the industry can reduce to essential travel with consumers changing modes to more easily electrified transport options. If you shift demand then quality of ground-based alternatives could improve e.g. sleeper trains. However if you just recommend investment in better quality alternatives then you may increase emissions by having empty vehicles travelling around because the demand is not there.

Secure parking for e-scooters and e-bikes

For places like Auckland or satellite towns to be able to use foldable e-scooters and public transport probably requires more provision of cheap storage facilities/lockers. Like it's fine for work where you could leave it under your desk, but if you've just gone into town for recreation then you probably don't want to have to lug a scooter around.

For example, if you were going to Sumner beach you would probably want to secure your scooter somewhere, either at the depot on the way or storage provided near the beach, and if storage was limited you would probably want to be able to book it in advance to make sure. Council-provided scooters could work but it seems like the council would need a lot of them littering peoples neighbourhoods to cope with demand and provide the same quality of service.

Taxi extension option for public transport at non-peak times

I want to include my thoughts on cycling and public transport. i.e. cycling is good as you can go direct from place to place with consistent timing similar to a private car. Public transport is only useful if you are near a bus stop that has a route that takes you near your destination (though e-scooters increase this proximity, so long as you can guarantee use of an e-scooter), as such public transport is good for popular routes or destinations such as between cities and satellite towns, however even with these routes it may only be worthwhile at popular times of day. Perhaps a useful extension to public transport would be to allow people to book their interest in a bus at a specific non-peak time, and if there is not enough demand the people could be allowed to use a taxi or borrow a car from a car share scheme near the bus stop to drive that route for the same price as a bus ticket.

General Comments

On pg. 23 of chapter 4b of the evidence report, part of a quote used said "Such planning, coupled with policies that encourage improved fuel efficiency; zero emission vehicles; and modal shifts toward walking, cycling, public transport, and shorter commute distances, is key to decarbonisation." And then the conclusion the report jumps to is "As the quotation highlights, higher density is not the only aspect of urban planning that influences emissions. Density needs to be coupled with quality infrastructure for walking, cycling, and public transport, as well as street designs that make walking and cycling safe and pleasant." The CCC’s conclusion does not **encourage** the things mentioned in the quote, all you are suggesting is **allowing** them as possibilities.

The CCC should give more consideration to the increased emissions their plan would create in other countries as the lifecycle of EVs appears to create about a quarter of the emissions of an ICE vehicle, which is still a lot of emissions (pg. 11: https://pluginbc.ca/wp/wp-content/uploads/2018/05/Environmental-Life-Cycle-Assessment-of-Electric-Vehicles-in-Canada.pdf).

The IPCC's 1.5C report indicated that pathways to reduce emissions were possible by decarbonising electricity generation, which was helped by reduced energy demand. However the report's plan involves increasing energy demand in countries that need to decarbonise.

Did the CCC's model factor in disposal costs for all the EV batteries, as this may slow uptake?

If developing nations were to copy our car-centric approach then that would be a lot of cars and batteries.

I think the electrification of aviation in the tailwinds scenario is unrealistic.

I am opposed to the idea of focusing use of liquid biofuels for aviation as suggested in pg. 58 of chapter 8 of the evidence report. Aviation can compete for it like everyone else, so that the most essential users use it rather than having it wasted on weekend holidays.

I don't support any grants or tax credits being given to the commercial aviation sector; we are meant to be ending fossil fuel subsidies. However the requirement to incorporate SAF into fuels seems sensible.

An issue with the CCC's proposed parking charges is that this may not affect commuters to work as the work or businesses may provide free parking, whereas increased fuel price would affect them.

From executive summary of chapter 2 of IPCC report:

> ... Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to as close as possible to 1.5°C. {2.2.2, 2.3.1, 2.3.5, 2.5.1, Cross-Chapter Box 9 in Chapter 4}.

I would have thought cars are considered GHG-intensive consumption goods.

I noticed the report assumed potential for NZers to reduce distance travelled or to increase walking, cycling, and public transport, but I feel the report lacks policies that would cause the potential to be realised.

There is an interesting paragraph at the end of the transport sector discussion on pg. 144 of the IPCC 1.5C report:

> "The 1.5°C pathways require an acceleration of the mitigation solutions already featured in 2°C-consistent pathways (e.g., more efficient vehicle technologies operating on lower-carbon fuels), as well as those having received lesser attention in most global transport decarbonization pathways up to now (e.g., mode-shifting and travel demand management). Current-generation, global pathways generally do not include these newer transport sector developments, whereby technological solutions are related to shifts in traveller's behaviour."

Keeping private cars out of bus lanes is probably important for consistency of timing of buses.

15. Do you support the package of recommendations and actions for the heat, industry and power sectors? Is there anything we should change and why?

Support all

I particularly like banning new gas connections. This was not entirely clear to me from the report, but should we also require new heatpumps and fridges to only be using low GHG refrigerants.

We may need a surcharge on gas to ensure gas is at least as expensive as electricity - in case electricity prices go up from increased demand - otherwise renters may opt for gas-powered houses for the cheaper energy expenses. The Government could also offer loans to replace gas infrastructure with electric options, and perhaps as encouragement to take up these loans the Government could signal that the price of gas will be significantly increased in say 8 years time. The Government could also add co-benefits by imposing a condition on the finance that the work must be done by a Govt. approved supplier, where to be Govt. approved some percentage of their staff must be first-year apprentices, or if they are a small business they must have employed a 1st-year apprentice for some percentage of the last few years. (Perhaps also require Govt. approved suppliers to purchase from Govt approved suppliers to stop shell companies outsourcing work).

Be good if you mentioned reducing production policy as an option as mentioned in Appendix D (Reduce Production).

I am unsure as to whether your model makes sense in regard to Tiwai Point closing. Your model forecasts increased EVs and more renewable generation. Aluminium may be needed for EVs, and more transmission lines may be needed to get the electricity from windy areas to consumers. The world also needs to decarbonise electricity generation for manufacturing. So given there is perhaps increased demand for low emissions aluminium in your model, I'm not sure it's likely that Tiwai Point would close.

In your model, have you factored in the emissions from the significant construction works you are proposing such as doubling renewable generation, the transmission infrastructure to support it, and associated increases in maintenance of the infrastructure.

16. Do you support the package of recommendations and actions for the agriculture sector, and is there anything we should change?

Do not know

Policies could include limiting palm kernel use given that large emissions come from deforestation to make way for palm trees.

17. Do you support the package of recommendations and actions for the forestry sector? Is there anything we should change and why?

NA12(c) if it leads to including small blocks of trees in the ETS might cause them to be cut down in anticipation, however NA12(c) is still useful.

On pg. 124 of the IPCC report, it mentions "IAMs assume bioenergy to be supplied mostly from second generation biomass feedstocks such as dedicated cellulosic crops (for example Miscanthus or poplar) as well as agricultural and forest residues." I was surprised by the mention of poplar, and wonder whether the ETS should be promoting it as well, and whether there is anything wrong with using pine for bioenergy.

18. Do you support the package of recommendations and actions for the waste sector? Is there anything we should change and why?

I am very supportive of all of the recommendations and actions because waste is an area with a lot of potential and other environmental benefits, but would like to see the following additions.

Add waste recovery/processing costs to upfront purchase cost of electric vehicles so the batteries are disposed of properly.

Require fast-food restaurants and other customer-facing businesses to recycle and provide recycling options as a condition of operating. I understand fast-food packaging generally falls into the compostable category, except for small bits of plastic which should go to landfill, yet they all end up in one rubbish bin. It doesn't exactly promote a recycling culture in NZ.

Investigate options for disposal of old, hole-ridden clothing other than just putting it in landfill.

19. Do you support the package of recommendations and actions to create a multisector strategy, and is there anything we should change?

I support NA15, NA16, NA17, TCNA6, but would add recommendations to TCNA7 to maintain control of the ETS and therefore reduce unnecessary costs for taxpayers. I feel NA19 is just proposing more investigation and so there are no actual proposals to support or oppose.

As part of NA15, they should require that all expensive projects above a threshold that are planned in future or are already underway (e.g. infrastructure and procurement), publicly publish a breakdown of project emissions (e.g. from concrete, steel, transport of construction materials, embodied emissions in imports, expected reductions in emissions). Just publishing the cost of a project is not enough for voters to understand its implications.

I would change TCNA6(b) to "Require local govt. and encourage the private sector ...", as Wellington's water problems have demonstrated local govt. often struggles with priorities, so relying on encouragement alone is not enough.

Please refer to Appendix D (Maintaining control of the ETS: Keeping prices affordable) for important recommendations regarding the ETS.

NA16 seems a bit weak, but a lot of the behaviour change policies I am suggesting are covered in specific sectors.

With ETS there may be a risk, that a forest owner could acquire units for a permanent forest and then transfer the forest to a limited liability company as it represents no value to them anymore only liability. If the forest loses carbon from fire, pests, or poor management then the cost falls on the Government and future NZers not necessarily the landowner. So it may be worth introducing a surcharge/tax on ETS units to build a buffer to cover risks of the Government having to replant (or some of the buffer could be in the form of spare forests), similar to the EQC fund.

20. Do you agree with Budget recommendation 5 on the rules for measuring progress? Is there anything we should change and why?

I do not support Budget recommendation 5. I explain my position in Appendices A, B, and C. I support consumption-based accounting, using a stock-change rather than a production approach for HWP (as described in Annex 12.A.1 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories), and setting a cumulative emissions budget to 2048 that includes expected forestry removals, such that the budget applies to gross emissions.

It does not matter how forestry is accounted for so long as it occurs as projected.

Stats NZ should have factored in electricity generation profile of other countries in their consumption estimates as that would be significantly different to NZ.

I also have the following less important comments to make:
From pg. 137 of the advice report, I get the impression the CCC is suggesting that land emissions could be allocated to industry sectors such as aviation if they paid for offsetting, which is a ridiculous way to approach it. Land emissions belong to the country making the effort to store the carbon, not industry sectors. All emissions belong to countries, the industry sectors are just an easy way of identifying where they come from.

In response to the statement on pg. 137 of the report: “Using consumption-based emissions estimates for accounting would differ from the analysis used to set the 2050 target. This could undermine the integrity of the target.” The 2050 CO_2 target is already arbitrary and lacks integrity because it is cumulative emissions that matter. The 2050 target likely came from the paragraph of the IPCC 1.5C report where they say with a global CO_2 budget using a linear decline path the world would need to reach net zero in 20 or 30 years from 2018, depending on the percentile used.

On pg. 142, it talks about Carbon Equivalent Forests. I think it is important to state that this only applies to pre-1990 exotic production forests. This is because deforesting and planting a native forest elsewhere would take a long time to reach the equivalent carbon stock and biodiversity (if ever).

International aviation emissions should be included in our budgets as mentioned in Appendix C and Appendix D (Quota on Aviation Emissions). International aviation emissions contribute to global warming as much as any other emission.

BR5(c)(iii) gives NZ a huge, unjustified windfall of removals to only count the carbon removed by wood products we harvest now and not consider emissions from decaying wood products that were harvested before 2018 (based on a 28 year harvest cycle). Better understanding of the previous statement can be gained by reading Appendix B.

Perhaps it would be good to have two targets, one production based and the other consumption based, but consumption based is the more important one as it can be set on a fair share basis.

21. Do you support our assessment of the country’s NDC? Do you support our NDC recommendation?

I do not support the recommended NDC because it is not ambitious enough.

Please see Appendix C for what our NDC should be.

22. Do you support our recommendations on the form of the NDC?

Neutral.

23. Do you support our recommendations on reporting on and meeting the NDC? Is there anything we should change, and why?

I do not support the recommendations. The CCC's plan is unrealistic at this stage as the report does not identify credible, internationally-accepted opportunities in other countries to reduce emissions. Until such time, the CCC should rely only on domestic reductions. In any case the CCC should demonstrate how to achieve the NDC using solely domestic reductions as this would allow the Govt. to weigh up the benefits of offshore mitigation compared to domestic reductions without requiring the Govt. to commission another organisation to provide them with climate advice.

24. Do you support our assessment of the possible required reductions in biogenic methane emissions?

Do not know.

Appendix A: Production vs. Consumption Based Accounting

I disagree with the Commission's draft decision on production vs. consumption based accounting.

The advantage of consumption based accounting is that you can compare the forecasted cumulative consumption emissions to a notion of a fair share of the global emissions budget. For example a fair share of the global emissions budget could be allocated based on a nation's percentage of world population in a given base year. If every nation did it this way and achieved their targets then we could be confident that with current understanding of global warming we had successfully limited warming to 1.5C (to the extent that uncertainty in climate science allows).

However with a production based target, one cannot be confident that all nations achieving their targets successfully limits warming to 1.5C in a fair and equitable way. For example, NZ could achieve massive reductions in emissions if we just stopped feeding people in other countries. This would contribute to successfully achieving our target, but it would not be fair on those countries, which would either starve or increase emissions in their countries and thus reduce the chances of them achieving their targets. It might also be in contradiction of the ensuring food production part of the Paris Agreement.

In addition the production-based target approach may prevent nations from coming to agreement on targets that when combined limit warming to 1.5C. This may be due to countries building safeguards into their targets to account for uncertainty in other countries actions, or because with production-based targets it is hard to tell what a fair target should be.

Therefore, production-based targets are weak on the 'robust science and evidence' principle as they fail to limit warming to 1.5C.

In addition, NZ production-based targets would likely account for food demand from other countries. If we had to reduce emissions in agriculture then we might take too much from other countries as above. Or we might take too little; and given other countries would be focussed on their production-based targets and not ours, there would be no incentive (signal) for them to reduce demand for emissions in our country. Though I have used agriculture as an example, the same could be said for other sectors like our demand for manufactured goods such as electric cars from other countries. So production-based targets are also weak on the 'signal for climate action' principle, whereas I would say consumption-based targets meet the principle well.

For the 'coverage of material sources and sinks' principle, you can just include the land emissions in the consumption-based accounts if it's from permanent afforestation (harvested forests may be more complicated as it requires determining end-use and where, to allocate it appropriately). With permanent afforestation you are trading away the opportunity to use land for other purposes so as to reduce emissions. So the point is consumption-based targets could meet the principle adequately (if appropriate data is gathered) and not inadequately as the report states.

Production-accounting has similar issues for land emissions as consumption-accounting as discussed in Appendix B.

Finally, some principles are more important than others, so although consumption-based accounting is uncertain and less accurate, it is more important to measure/target the right thing than to accurately measure something that is somewhat irrelevant.

Appendix B: Harvested Wood Products: Stock-Change vs. Production Approaches

Note: This section of my submission may be slightly confusing because the draft report uses 'stock change' to refer to something different. I am using 'stock-change' as used in Annex 12.A.1 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_12_Ch12_HWP.pdf).

Similar to consumption vs. production based accounting, the choice of Harvested Wood Products approach can affect NZ's ability to meet its targets.

Harvested Wood Products (HWP) is a sub-sector of LULUCF and it accounts for carbon stored in wood products such as timber framing and paper. The emissions/removals from this category are based on changes in estimated stock of wood products. If more newly harvested wood is stored in products than existing products decay, the net effect is removals and vice versa.

The IPCC defines a few approaches in their 2006 inventory reporting guidelines, but two are of interest: the stock-change approach and the production approach. The difference between the two is that the stock-change approach is based on HWP production plus imports and minus exports, whereas the production approach is simply based on HWP production of the country. In this way stock-change is similar to consumption-based accounting and production is similar to production-based accounting.

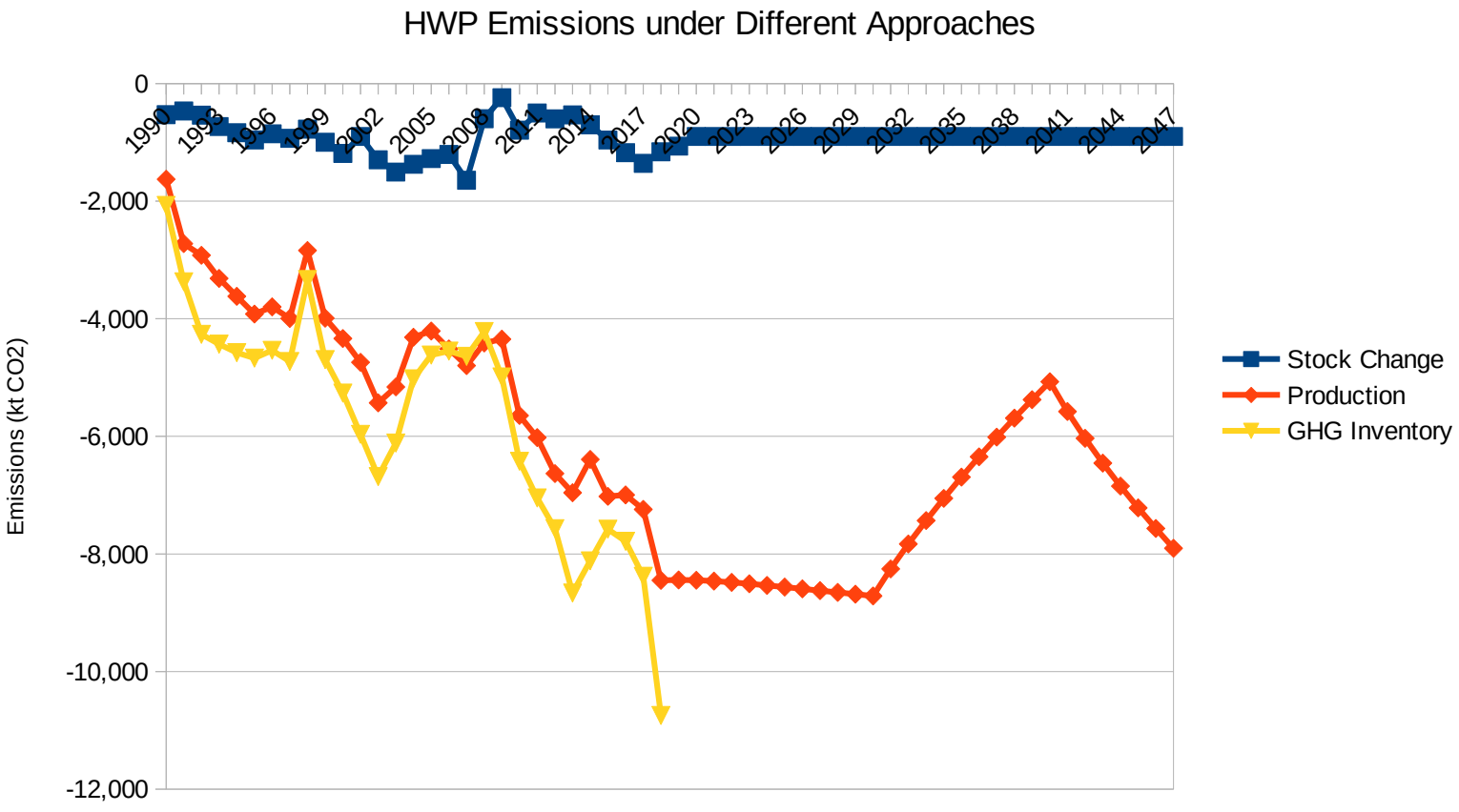
For example, NZ exported over 60% of its harvest as raw materials in 2018, along with ~45% of wood products and ~35% of paper products (for a total of 74% of 2018's harvested carbon exported). In the stock-change approach we would only account for wood products kept domestically, whereas with the production approach we would account for the 74% exported overseas as well.

NZ currently uses the production approach, however I believe we should change to using the stock-change approach. Benefits of switching to the stock-change approach are as follows:

- It's simpler and has less uncertainty. Currently for the production approach we have to research and estimate how long exported products will last in countries they are exported to. With stock-change, once a wood product is exported we do not need to know what happens to it.
- Stock-change fits better conceptually. Removals from HWP are obtained by a country finding a useful way of storing the product; the effort is made by the country having to store the product, so they should be the one that benefits from the removals. It also encourages the importing country to look after the product; with the production approach it makes no difference to the importing country whether they burn it straight away for energy, but it would impact the exporting country's emissions even though the exporter has no control over how the product is used.
- Finally, the production approach is a potential risk for NZ if exported HWP change to being used for bioenergy rather than long-term use because the decay from the existing production

stock pool would outweigh HWP being added, which would lead to high emissions. If exported HWP went to zero then over time NZ would emit the difference between its domestic consumption stock and its production approach stock, which amounts to ~127MtCO_2 in 2019 (along with another ~160MtCO_2 over the coming years). These are emissions that no future NZ Government has control over, aside from banning harvesting, and would likely destroy any chances of achieving the budgets and targets.

The following graph illustrates the difference between the two approaches calculated using the provided HWP worksheet in the 2006 guidelines along with UN FAO data (https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_12_Ch12_HWP_Worksheet.zip). However the production numbers do not exactly match those reported in NZ's inventory perhaps because a mistake was made in what wood product categories to include or perhaps because of using a tier 1 approach rather than the more accurate country-specific approach NZ uses. The graph also includes projected HWP emissions based on -0.9Mt for stock change and harvest volumes mentioned in the Draft Supporting Evidence for Consultation document chapter 7 pg. 42 (specifically 2030, 2040, and 2050 volumes divided by 2018 volume as multipliers of 2018 HWP inflows).



Appendix C: Cumulative Emissions Budget

The Importance of a Cumulative Emissions Budget

Cumulative long-lived emissions is perhaps the most important factor as to whether the world limits warming to 1.5C. There is a "... quasi-linear relationship between the total cumulative amount of CO_2 emitted into the atmosphere and global mean temperature rise ..." (IPCC 1.5C report pg. 126)

This suggests basing mitigation policy on a cumulative emissions budget. However, I note the CCC based its policy on the modelled scenarios from the IPCC 1.5C report. The CCC's approach has the following issues:

a) it hogs the upper quartile line and does not appear to be constrained by cumulative budgets that the IPCC models were, which had a budget been used would have led to some time being spent better than average to make up for the worse than average time;

b) risks grandparenting NZ's high gross emissions; and

c) the CCC has not applied the scenarios correctly as they were based on net emissions, but the CCC has used % reductions on 2010 gross emissions. The CCC may be of the view that this is acceptable because of how the Kyoto Protocol was handled, but had the IPCC 1.5C report factored in countries taking this approach then the base year 2010 emissions would be higher (by how much is not known without researching all the countries), but the target year net emissions would be the same resulting in a greater required % reduction than the CCC has used. Using our 2010 net emissions would not be appropriate as these were very low (6.8 Mt).

The bottom line is using a cumulative CO_2 emissions budget approach is probably easier and more scientific for the CO_2 aspect of emissions budgets.

A budget also improves cross-party support because if a political party wanted to be less ambitious in the short-term they would have to answer questions about their plan's impact on people in a decade or so's time.

What is NZ's Cumulative Emissions Budget?

NZ's cumulative emissions budget is made up of our fair share (based on NZ's percentage of world population in 2018; though this does not take into account historical emissions) of the global budget plus any removals we can gain from forestry. If we get to low gross emissions, such that each year our emissions are net negative then the budget could be arbitrarily big depending on how many years are included. However, warming is estimated to be increasing at 0.2C per decade with an estimate of ~1C already having occurred by 2018, so if we want to limit warming to say 1.6C (because limiting warming to 1.5C without overshoot seems impossible now), then we need to have our budget all squared up in three decades, so by 2048.

The following tables show the budgets for different warming targets, and for different current CO_2 consumption emissions due to the uncertainty of NZ's consumption estimates. The tables also

include some extra calculations to give an idea as to how difficult achieving a given budget could be.

Cumulative Emissions Budgets for Different Targets (40.5 CO_2 at present)
(All emissions values are in $MtCO_2$)

	Stock-change				Production	
	1.5C		1.6C		1.5C	
	67th percentile	50th percentile	67th percentile	50th percentile	67th percentile	50th percentile
Global Budget after 2017	420,000	580,000	570,000	770,000	420,000	580,000
NZ's share	252	348	342	462	252	348
NZ's share after 2020	163	259	253	373	192	288
Projected LULUCF removals [2021, 2047]	330?	330?	330?	330?	490	490
Projected LULUCF removals [2021, 2047] using averaging approach	187?	187?	187?	187?	347	347
NZ's budget to 2048	493	589	583	703	682.3	778.3
NZ's budget to 2048 (averaging approach)	350	446	440	560	539.3	635.3
	The following two rows are based on NZ's budgets to 2048 (without averaging)					
Gross zero year via linear decline	2045.3	2050.1	2049.8	2055.7	2054.7	2059.4
Gross reduction required by start of 2022 for no further reductions to 2048	-57.0%	-47.9%	-48.5%	-37.1%	-39.1%	-29.9%
Global Earth System Feedbacks to 2100	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000
NZ's responsibility	-60	-60	-60	-60	-60	-60
Removals to get to 67% of limiting to 1.5C budget by 2100 (averaging approach)	-203	-299	-293	-413	-203	-299
Net Removals per year from 2048-2100 (averaging approach)	-3.9	-5.8	-5.6	-7.9	-3.9	-5.8

Cumulative Emissions Budgets for Different Targets (45.5 CO_2 at present)
(All emissions values are in $MtCO_2$)

	Stock-change				Production	
	1.5C		1.6C		1.5C	
	67th percentile	50th percentile	67th percentile	50th percentile	67th percentile	50th percentile
Global Budget after 2017	420,000	580,000	570,000	770,000	420,000	580,000
NZ's share	252	348	342	462	252	348
NZ's share after 2020	148	244	238	358	177	273
Projected LULUCF removals [2021, 2047]	330?	330?	330?	330?	490	490
Projected LULUCF removals [2021, 2047] using averaging approach	187?	187?	187?	187?	347	347
NZ's budget to 2048	478	574	568	688	667.3	763.3
NZ's budget to 2048 (averaging approach)	335	431	425	545	524.3	620.3
	The following two rows are based on NZ's budgets to 2048 (without averaging)					
Gross zero year via linear decline	2042.0	2046.2	2046.0	2051.2	2050.3	2054.6
Gross reduction required by start of 2022 for no further reductions to 2048	-63.4%	-55.3%	-55.8%	-45.7%	-47.4%	-39.3%
Global Earth System Feedbacks to 2100	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000
NZ's responsibility	-60	-60	-60	-60	-60	-60
Removals to get to 67% of limiting to 1.5C budget by 2100 (averaging approach)	-188	-284	-278	-398	-203	-299
Net Removals per year from 2048-2100 (averaging approach)	-3.6	-5.5	-5.3	-7.7	-3.9	-5.8

I suggest picking a budget as the climate sees it rather than on an averaging basis because it seems like the pre-2048 period will be harder than making up for it post-2047. Then for removals post-2047, the difference in budget to the 1.5C 67% averaging approach budget is used to indicate the emissions that need to be regained taking into account that production forests are harvested.

The Production approach for HWP budgets are only included in the tables out of interest and should not be chosen because they lack fairness and have potential risks attached, as explained in Appendix B.

I did not understand from the IPCC report when the -100 Gt to make up for Earth System Feedbacks needs to occur, so I went for the optimistic choice that the removals can be left till the second half of the century.

So the question is which one to pick? I initially thought that the least ambitious choice consistent with the Paris Agreement would be the 1.6C 50% chance, but then I considered the following graph, and so had another look at Table 2.2 of the IPCC 1.5C report. I noticed that a global budget of 770 Gt (for 1.6C 50%) is similar to the 33% chance of going above 1.75C. For the Paris Agreement we

agreed to limit temperatures to well below 2C and pursue efforts to limit to 1.5C, so I would think we would be aiming for a very small chance of going above 1.75C: a one in three chance does not seem to be consistent with the agreement. Therefore the least ambitious choice consistent with the Paris Agreement would probably be the 1.6C 67% chance budget of 568 Mt CO_2.

It is worth pointing out that the gross reduction by 2022 statistic in the tables could also be seen as the average reduction over the period to 2048, so does not necessarily have to be achieved by 2022.

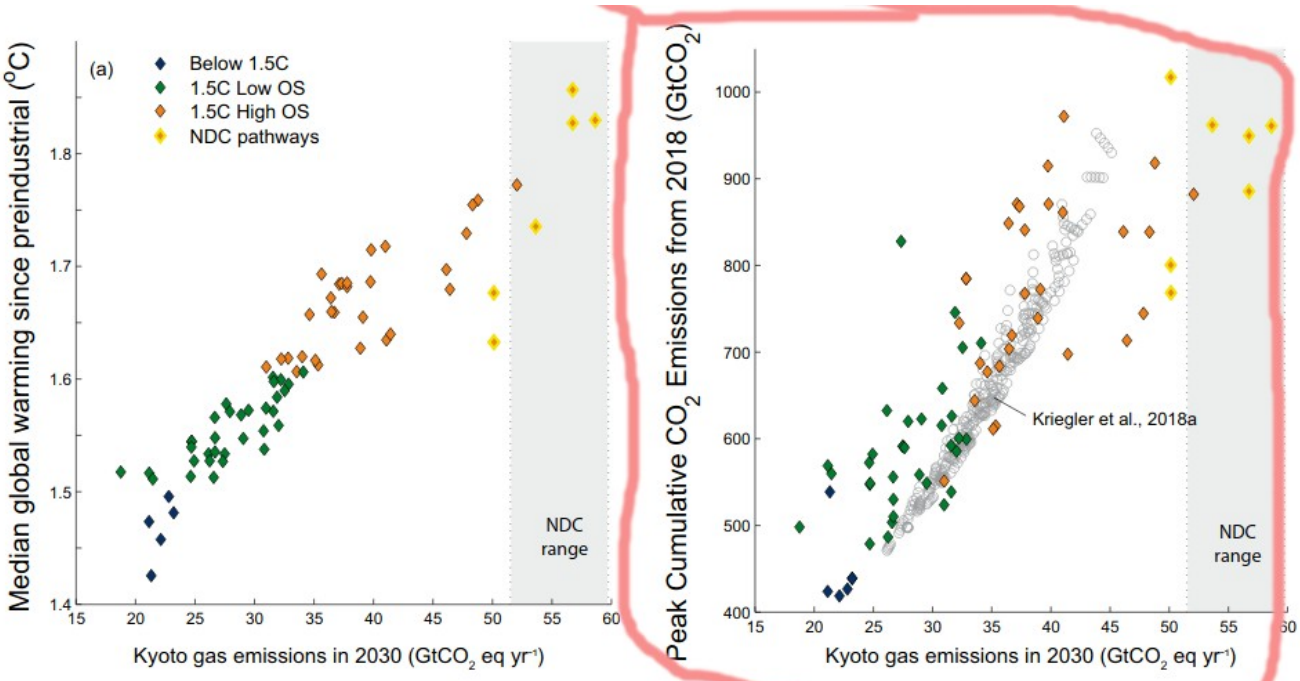


Figure 2.12 | Median global warming estimated by MAGICC (panel a) and peak cumulative CO_2 e... in the SR1.5 scenario database, as a function of CO_2-equivalent emissions (based on AR4 GWP-100) of Kyoto-GHGs in 2030. Pathways that were forced to go through

The above graph perhaps also suggests the approach of having the budgets all squared up by 2048 is not valid, and that global emissions have to not go above 570 Gt at any stage. Given the budgets to 2048 benefitted from significant removals post-2037, if we were to stay within the 570 Gt budget then cumulative gross CO_2 emissions to 2038 would need to be limited to 312 Mt (assuming 45.5 Mt consumption emissions at present), as discussed in the "What to use for NZ's emisssions budgets and NDC?" section.

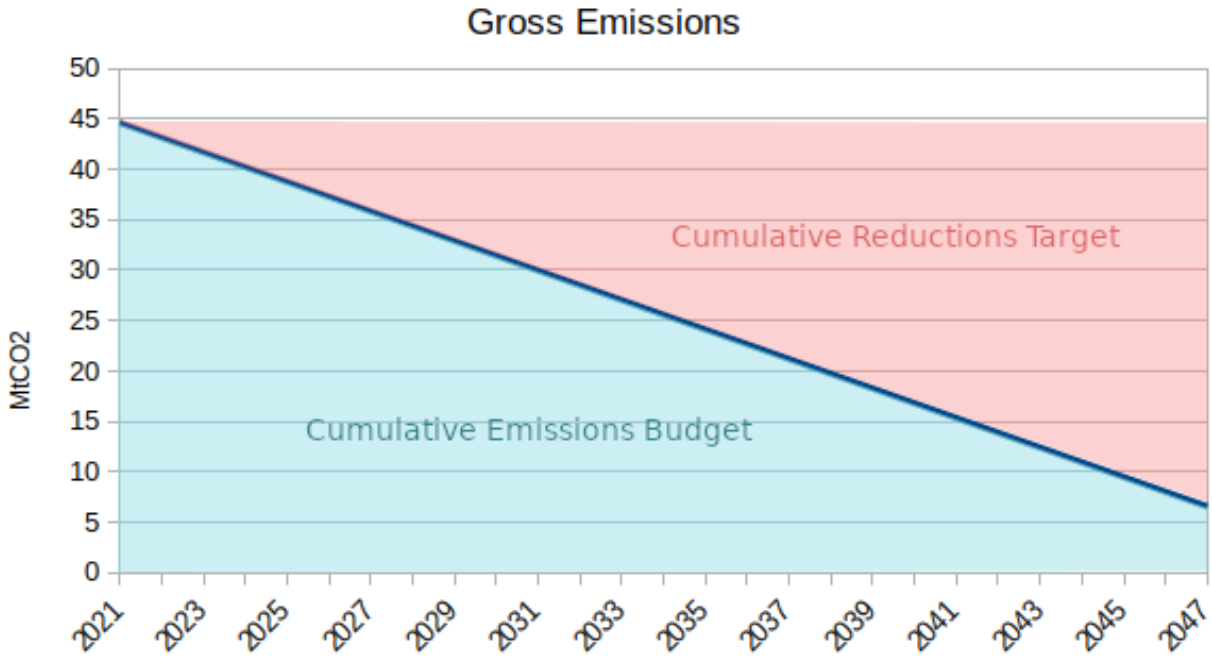
The following table provides more information on how the above tables' values were calculated.

Global Budget after 2017	From IPCC 1.5C report.
NZ's share	Based on 0.06% of world population in 2018, from my submission on the Zero Carbon Bill, which was based on http://www.worldometers.info/world-population/new-zealand-population/
NZ's share after 2020	Subtracting three years of estimated net consumption emissions (based on Stats NZ's 2017 gross CO_2 consumption estimate subtracting average historic/projected removals over the three years with a 9.746 difference for stock-change). Stock-change: 29.646 Mt/yr, Production: 19.9 Mt/yr.

Projected LULUCF removals [2021, 2047]	Based on excel file retrieved from "https://www.mfe.govt.nz/climate-change/emissions-reduction-targets/projected-emissions" on 6th March 2021. For Stock-Change I could have adjusted the projections by assuming domestic consumption of -0.9 Mt per year for HWP rather than whatever is projected, however I did not have the projected HWP data available. I did receive some HWP projections from MfE on the 5th of March, but this was not the full model and had some significant differences to NZ's inventory especially in 2007, so I decided not to use it. So for HWP I estimated it along the lines of assuming 95% of net non-HWP LULUCF removals over the last 29 years were due to plantation forestry, which will be harvested in the coming decades with 0.1 of the removals safe due to non-harvestable biomass that accrued post-1990. This was then converted into an inflow of wood and paper products using an 80:20 ratio spread over the next so many years and entered into the stock-change vs. production model discussed earlier to determine the difference in HWP between the two approaches out to 2047 (assuming -0.9 Mt/yr for stock-change). Using straight lines between the harvest volumes mentioned in the Draft Supporting Evidence for Consultation document chapter 7 pg. 42, into the HWP model of Appendix B, and assuming -0.9Mt a year for stock-change which was roughly the average over the 1990-2018 period, I got a difference of ~175Mt due to using the production approach, so the 160Mt adjustment I am using to convert projected LULUCF removals to a stock-change approach is perhaps on the optimistic side by 15Mt.
Projected LULUCF removals [2021, 2047] using averaging approach	Estimated by approximating total removals over the period [2021, 2047] from the averaging graph provided in the Commission's draft report (as I only found the data tables linked from the CCC's news section recently), and then subtracting the HWP difference calculated for the stock-change approach.
NZ's budget to 2048	Adding NZ's share after 2020 with projected LULUCF removals.
NZ's budget to 2048 (averaging approach)	Adding NZ's share after 2020 with projected LULUCF removals using the averaging approach.
Gross zero year via linear decline	Linear decline from assumed gross consumption emissions of 40.5 Mt/yr (45.5 Mt/yr) in 2020 as I am unaware of any policies that would have reduced emissions since 2017.
Gross reduction required by start of 2022 for no further reductions to 2048	NZ's budget (averaging approach) minus 40.5 Mt (45.5 Mt) for 2021, divided by 26 years of 40.5 Mt (45.5 Mt), and then minus 1.
Global Earth System Feedbacks to 2100	From IPCC 1.5C report.
NZ's responsibility	0.06% of global earth system feedbacks.
Removals to get to 67% of limiting to 1.5C budget by 2100	The difference between NZ's budget (averaging approach) for 1.5C (67%) and the budget (without averaging approach) in that column minus NZ's responsibility for ESF.
Net Removals per year from 2048-2100	Dividing Removals to get to 1.5C (67%) by the number of years in the period (52). This represents removals that are additional to any removals required to offset remaining gross emissions.

Cumulative Reductions Target and Lost Opportunities

Personally, I find it easier to plan in terms of a cumulative reductions target than a cumulative emissions budget. A cumulative reductions target can be determined by saying "well if our gross emissions are this at the moment and we continued to emit the same amount each year for the next 27 years, but our cumulative budget is this, then the difference between the two is the reductions needed over the 27 years." So with our most recent gross CO_2 consumption emissions potentially being 45.5 Mt CO_2 in 2017 and a cumulative emissions budget of 568 $MtCO_2$, our cumulative reductions target would be 27*45.5 – 568 = 661 $MtCO_2$ to 2048 (or 53.8% reduction in average gross CO_2 emissions over the period from 2021 to 2048). For the 312 Mt cumulative budget to 2038, the cumulative reductions target would be 17*45.5 – 312 = 461 $MtCO_2$ to 2038 (or 59.7% reduction over the period 2021 to 2038)



Graph is just for illustration purposes only; the numbers are not accurate.

Planning via a cumulative reductions target is to look at what should we reduce to achieve the target, whereas planning via a cumulative emissions budget is to look at what is essential and cannot be reduced.

A cumulative reductions target lets you see that there are lost opportunities. For example, NZ's international aviation was perhaps 3.7 $MtCO_2$ in 2017, if we say there is a reduction potential to cut it down to only essential transport of say 10%, then there could be 3.33 $MtCO_2$ saved each year. If NZ actioned the reduction at the start then we would save 27 times 3.33 $MtCO_2$ (89.9 Mt or 13.6% of the reductions to 2048 that are needed). If however it was implemented as a gradual transition over the 27 years then we would only save half that amount (45.0 Mt or 6.8% of the reductions needed).

Looking at the cumulative reductions target it is possible to determine the yet to be determined gross reductions required per year:

$$g = \frac{T - R}{(y+1) \times \frac{y}{2}}$$

where g is the gross reductions required per year, T is the remaining cumulative reductions target, R is planned reductions, and y is the number of years remaining to the start of 2048.

The gross emissions required at the start of 2048 can be calculated by removing planned reductions and subtracting y*g.

What to use for NZ's emissions budgets and NDC?

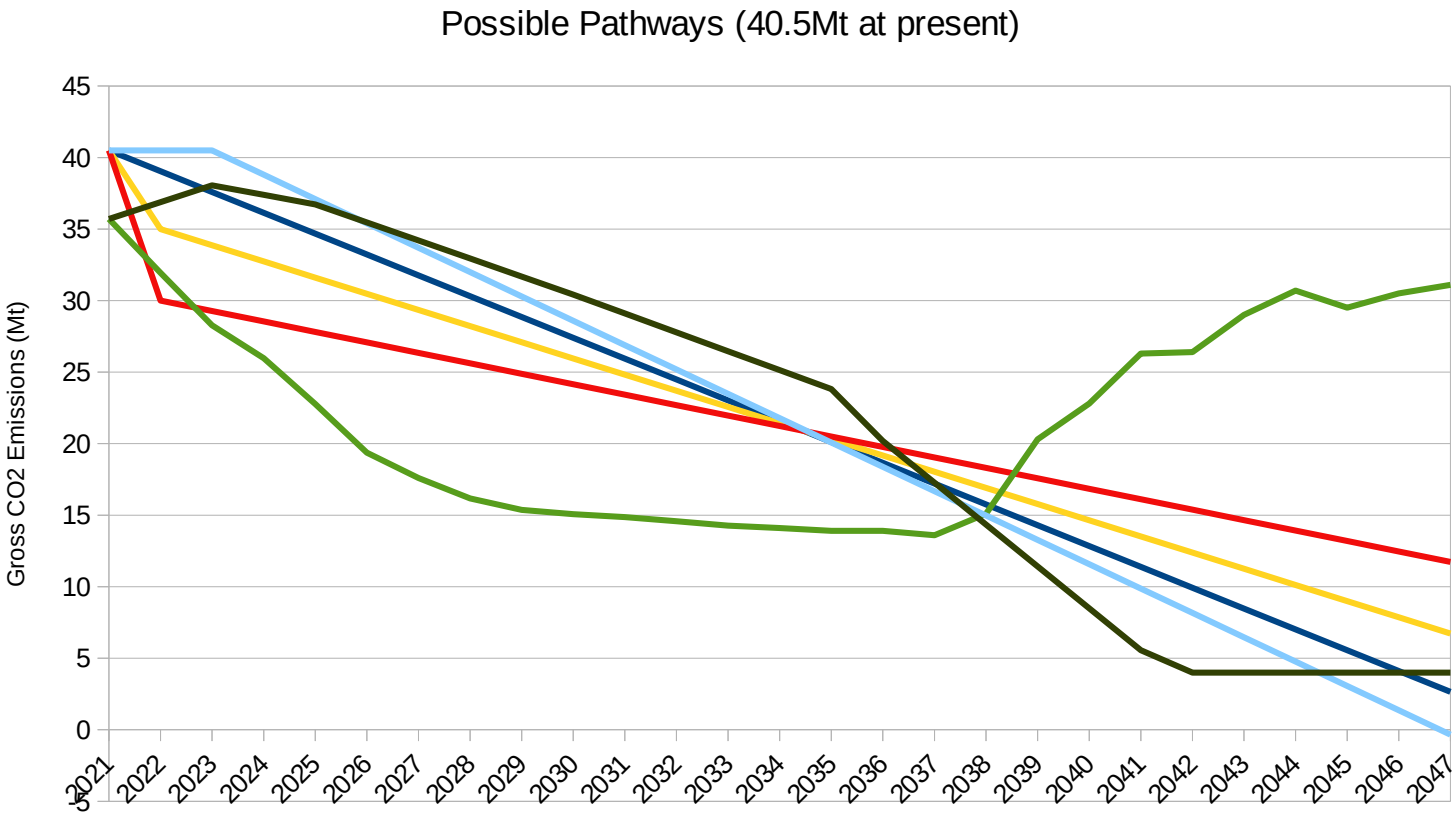
The cumulative emissions budget as calculated above covers every CO_2 emission NZers are responsible for, so it includes international aviation and embodied emissions in imports. I wanted to include the CCC's proposed path in the possible pathway graphs below (it is the black line in each graph), so that meant making the following adjustments for international aviation and imports.

- The CO_2 emissions each year were calculated based on the CCC's proposed CO_2 budgets using a starting point of 35.1 Mt (the production accounting CO_2 emissions in 2018), and then international aviation, international shipping and imports were added to each year.
- I assumed as the aviation fuel is supplied in NZ we have the ability to control these emissions, so all of the international aviation bunker (based on 2017) is added to the emissions budget (3.7 Mt per year).
- I assumed Covid meant international aviation emissions were zero until halfway through 2022 when it goes back to business as usual of 3.7 Mt/yr.
- As international aviation is not covered by NDCs or domestic targets and is hard to abate, I assumed emissions carry on at 3.7 Mt/yr until 2036 when they drop to 3 Mt/yr to account for biofuels. In reality the emissions could be more than this as they were increasing before Covid, and perhaps more than increased biofuels would offset.
- For imports I took the difference between NZ's CO_2 consumption emissions in 2017 (40.5 Mt or 45.5 Mt sensitivity analysis) subtracted NZ's CO_2 inventory emissions in 2017 (36.2 Mt), international aviation (3.7 Mt) and international shipping (0.9 Mt) to get a rough idea of imported emissions not covered by the emissions budgets (-0.3 Mt or 4.7Mt depending on the graph).
- I assumed due to other countries' decarbonisation efforts the imported emissions for the 45.5 Mt graph follow a linear decline to 10% of 4.7Mt in 2048.
- Then for post-2035 I used the remaining cumulative emissions budget to come up with a line to keep the total emissions over the 2021-2047 period within the 568 Mt budget.

For the CCC's proposed path in the 40.5 Mt at present graph, I was able to include a non-abatable essential minimum of 4 Mt CO_2, but this was not possible if current emissions are 45.5 Mt because after 2035 the budget to 2048 is only 27.7 Mt. As such the gross emissions go to -17.8 Mt in 2047 for the 45.5 Mt graph. It is possible to achieve negative gross emissions given how the calculations

were done, they just indicate removals beyond what was projected in the Current Policy Reference forecast with an ETS price of $35.

I have also included global cumulative net CO_2 emissions for each pathway, which were calculated as though every country took the same path as us.


Possible Pathways (40.5Mt at present)
Gross CO2 Emissions (Mt)
45
40
35
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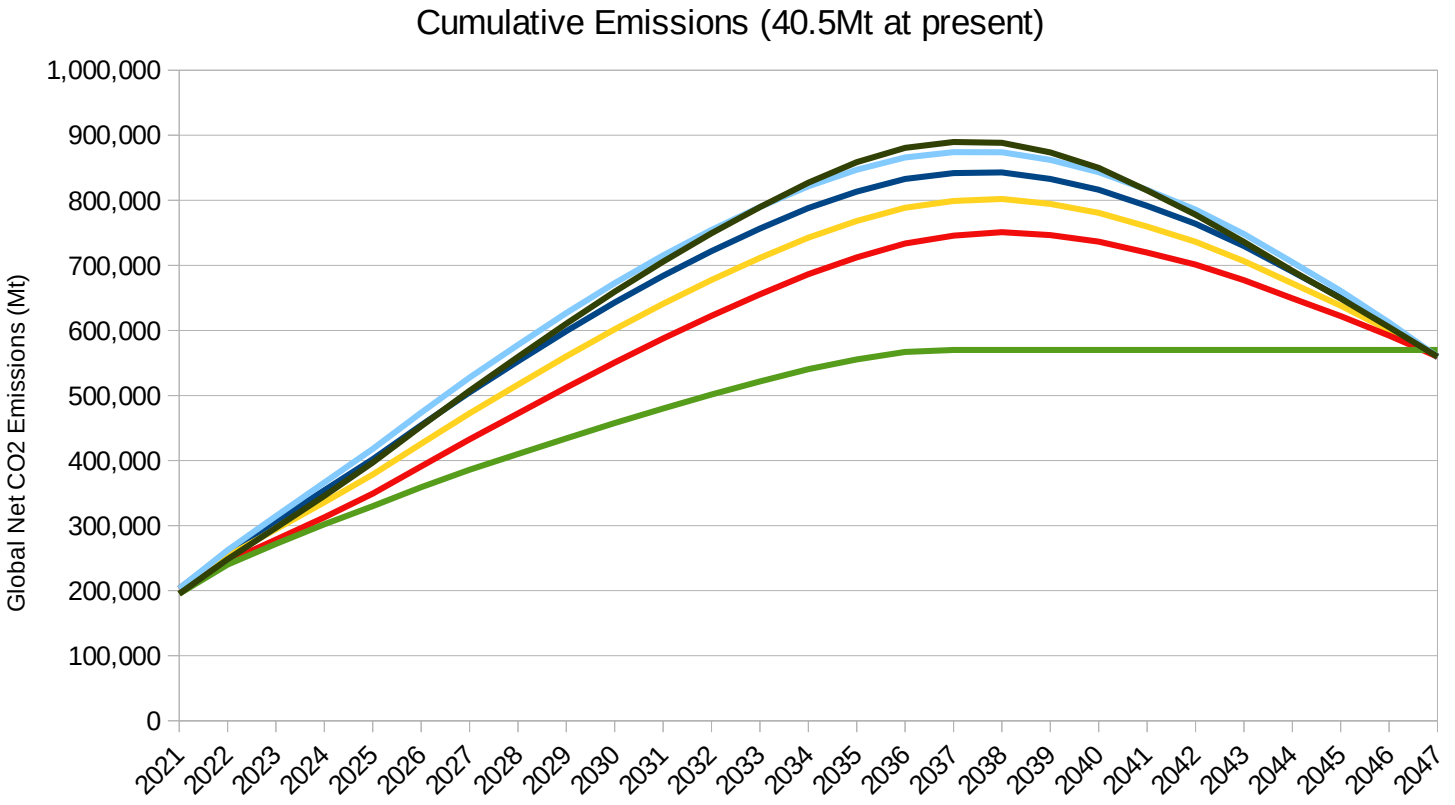
Cumulative Emissions (40.5Mt at present)
Global Net CO2 Emissions (Mt)
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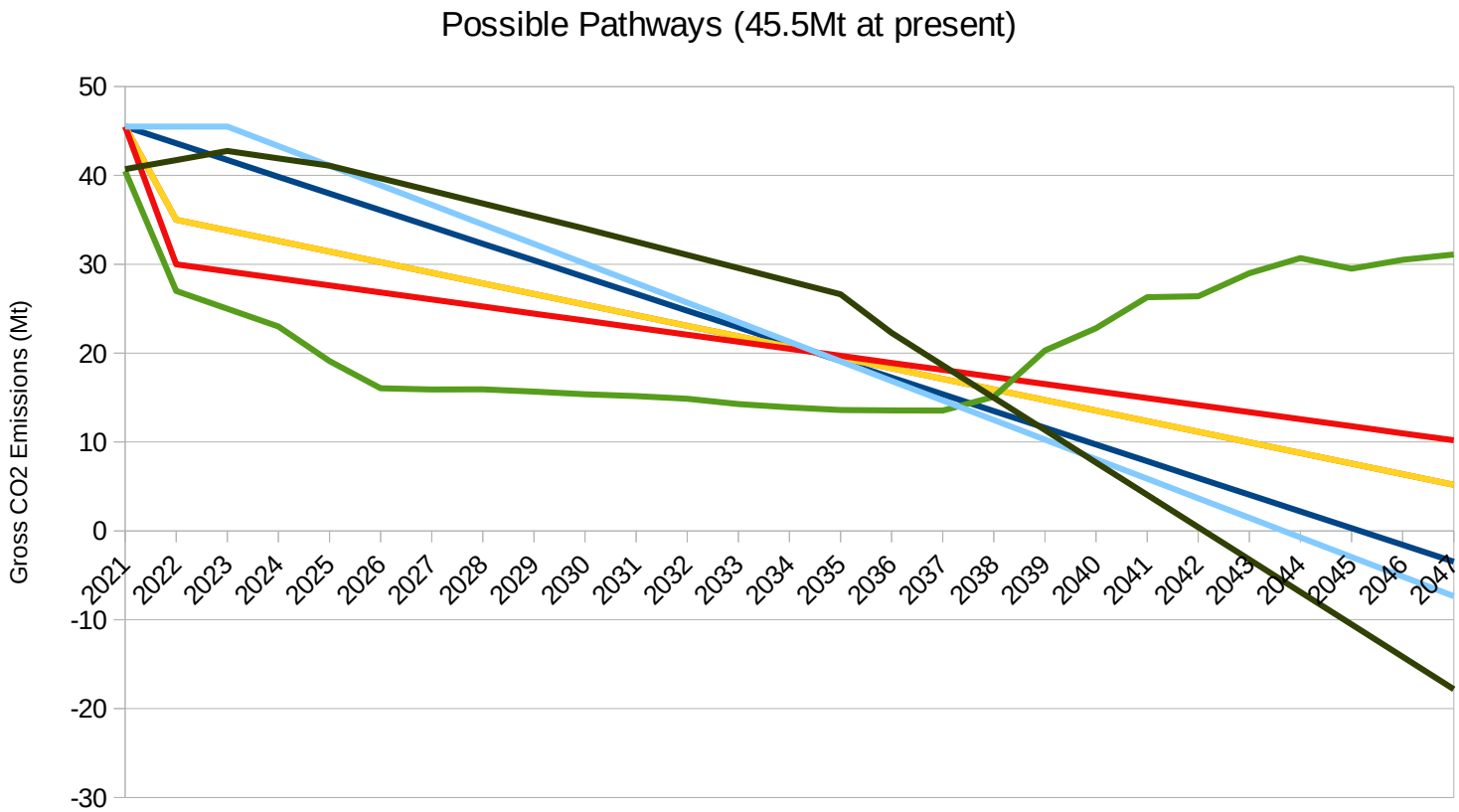
Possible Pathways (45.5Mt at present)
Gross CO2 Emissions (Mt)
50
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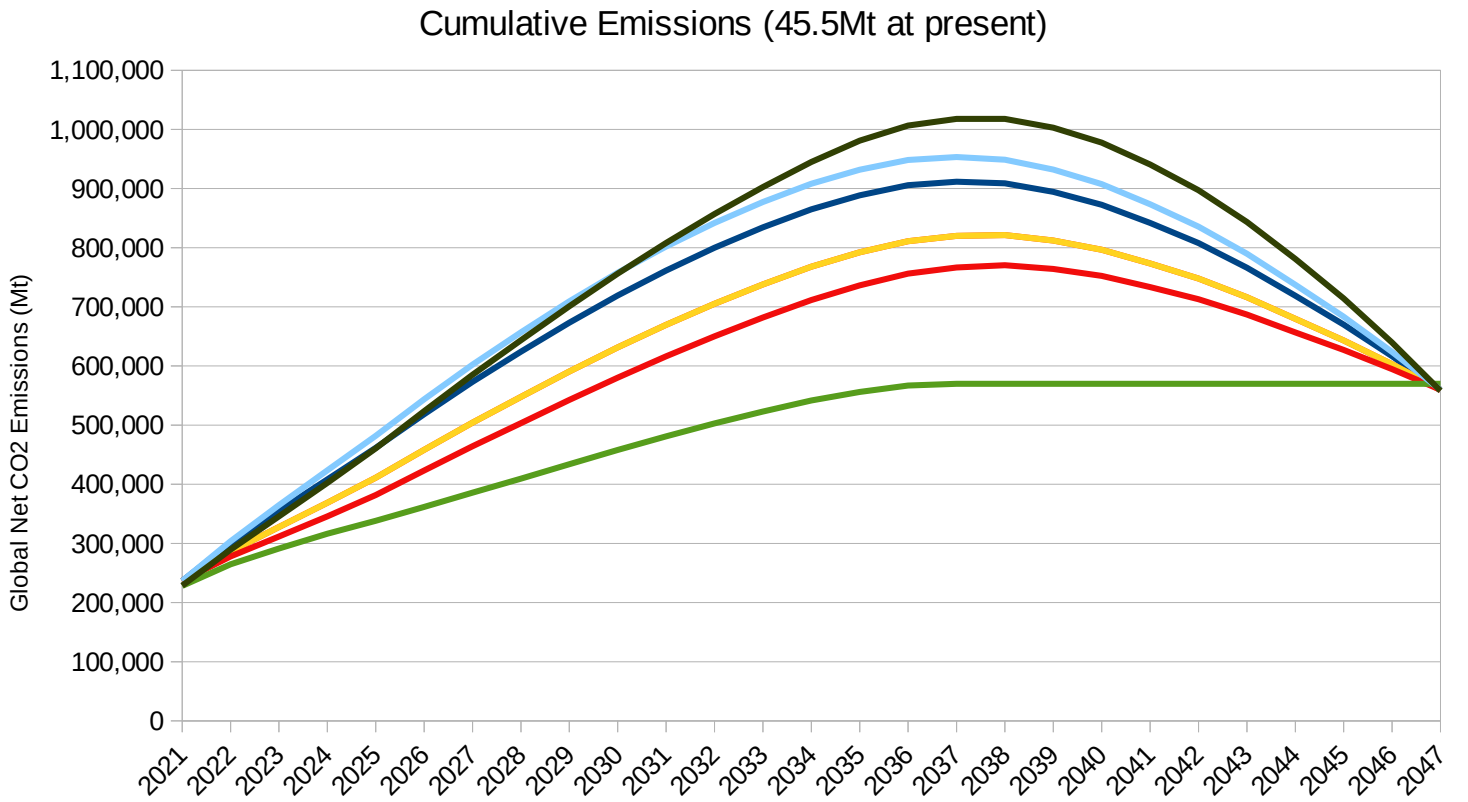
Cumulative Emissions (45.5Mt at present)
Global Net CO2 Emissions (Mt)
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1,000,000
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Earlier I made an assumption that we could overshoot the budget because temperature might lag the emissions in the atmosphere, which would give time to get the emissions back within the budget. However if this is not the case then we would have to go with a pathway similar to the green line depending on whether other countries have a similar path to us. There is spare capacity post-2037 because of increasing removals; if these could be brought forward by delaying harvesting for example then it may make things easier in the short-term. Please note for the cumulative emissions graphs: I assumed the HWP difference due to stock-change was allocated evenly across the 27 years, but from the earlier graph it seems the difference is greater earlier on, so would require even more ambitious short-term reductions.

From the graphs, it can be seen that making greater reductions in 2022 means that gross emissions can be higher in 2047, though the higher they are the more consideration would need to be given to how we would achieve the net negative emissions required post-2050.

Generally I prefer a linear pathway (if we can overshoot the budget), because while there is the potential for infrastructure changes to accelerate reductions, a lot of problems tend to have the issue of diminishing returns in that it is easy to make some large reductions but getting what remains can be challenging. A linear pathway also avoids locking in high emissions and provides the ability to change course if NZ finds it needs to be more ambitious. So if we can overshoot the budget (and I suspect we cannot from the graph included earlier: Figure 2.12 of the IPCC 1.5C report), then the yellow line (or better) is the path NZ should opt for.

It is hard to know the minimum gross emissions NZ could reduce to, but anything less than 10% of current emissions seems like it might be challenging to the point of impossible.

The CCC's path would not be good enough if current emissions are 45.5 Mt or if it is not possible to overshoot the budget. Also I think the CCC's path intended to use less forestry than was projected in the Current Policy Reference and thus in these calculations.

The CO_2 emissions budgets (for 45.5 Mt at present) are shown below. Consumption budgets include international aviation/shipping and imports. The same sort of methods that were used to adjust the CCC's path to consumption emissions, were used to adjust the yellow line's consumption budgets to production budgets. Gross 2021-2030 budgets were converted to net budgets by subtracting projected forestry removals (adjusted to a stock-change approach by not including (160 Mt/27 years) each year over 2021-2030, so total is 42.7Mt). I could not recall whether domestically consumed HWP count in NDC accounting, so I have included a row to exclude domestic consumption HWP removals.

CO_2 Contributions to Emissions Budgets (45.5 Mt at present)
(All values are in Mt CO_2)

		Green line	Yellow line	CCC's path
Gross Consumption	2022-2025	94	138	
	2026-2030	79	139	
	2031-2035	72	109	
	2021-2030	214	318	
	2021-2037	312		
Gross Production	2022-2025	Consumption is challenging enough already	104	133.7
	2026-2030		98	143.2
	2031-2035		72	110.8
	2021-2030		237	312
Net Consumption	2021-2030	171	275	
Net Production	2021-2030		194	269
Net Consumption excl. HWP	2021-2030	180	284	
Net Production excl. HWP	2021-2030		203	278

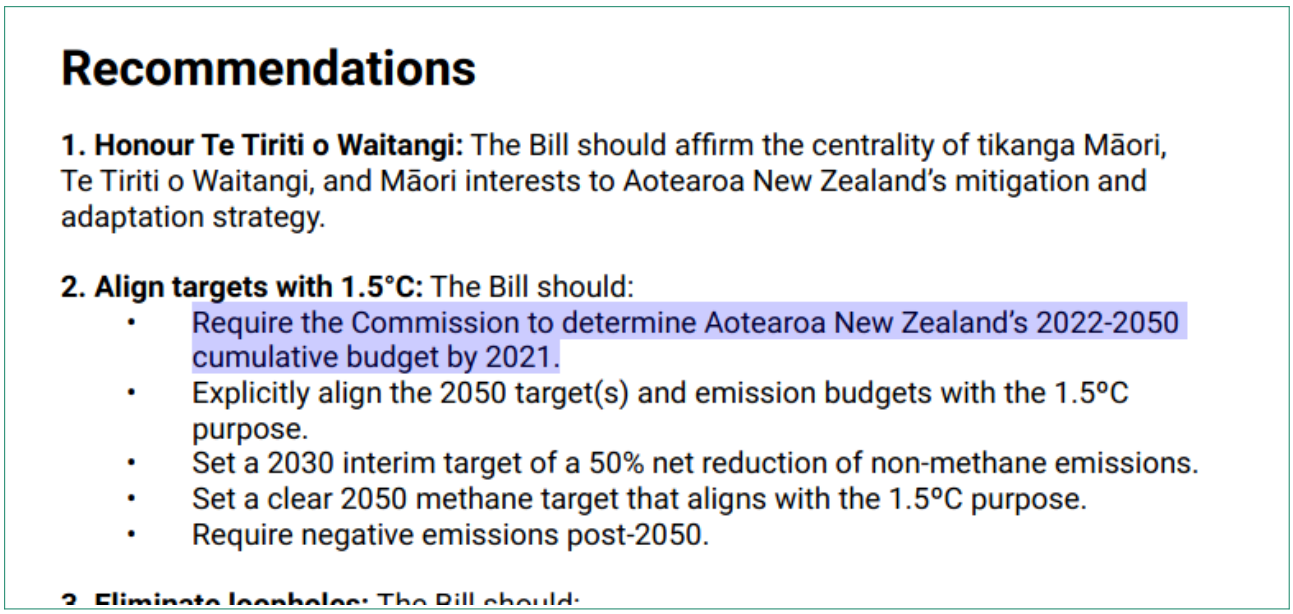
Given the yellow line is better than the CCC's proposed path, the table shows the CCC's proposed CO_2 emissions budgets are too high. It also shows that if the green line is required because overshooting the budget is not allowed, then even more ambitious budgets are required.

At a guess the yellow and green paths (depending on whether overshooting is allowed or not) may mean global warming would overshoot 1.5C for a few decades, but hopefully not go above 1.6C over that time.

Using consumption budgets is better in my opinion because (a) they are larger, which is better for the economy; (b) they cover international aviation and imports which are probably some of the easier things to reduce; and (c) they are fairer because they include increased imported emissions e.g. increased EV imports.

Lack of Discussion of Cumulative Emissions

Oddly given the importance of cumulative emissions, the report from the Environment Select Committee on the Zero Carbon Amendment Bill and MfE's summary of submissions on the Zero Carbon Bill do not mention cumulative emissions. This is despite my submissions on both bills describing the importance of a cumulative emissions target, as well as many of the Generation Zero submissions on the amendment bill. The relevant parts of mine and Generation Zero's submissions are below.



Recommendations

1. Honour Te Tiriti o Waitangi: The Bill should affirm the centrality of tikanga Māori, Te Tiriti o Waitangi, and Māori interests to Aotearoa New Zealand's mitigation and adaptation strategy.

2. Align targets with 1.5°C: The Bill should:

- Require the Commission to determine Aotearoa New Zealand's 2022-2050 cumulative budget by 2021.
- Explicitly align the 2050 target(s) and emission budgets with the 1.5ºC purpose.
- Set a 2030 interim target of a 50% net reduction of non-methane emissions.
- Set a clear 2050 methane target that aligns with the 1.5ºC purpose.
- Require negative emissions post-2050.

3. Eliminate loopholes: The Bill should:

Generation Zero's submission on Zero Carbon Amendment Bill pg. 5

Cumulative Emissions Target (5O)

The Bill does not have a cumulative emissions target and without one, the whole world could do really well by setting and achieving ambitious targets of net zero in 2035 and yet still fail to limit warming to 1.5°C. How could this happen? Well if you looked at the actions of each country it could be that they did a whole heap of emissions-intensive projects in the years leading up to 2035, so they could have those things and still achieve their target; never mind that the projects were enough to blow the budget before they got to 2035.

I suppose this is covered by the Bill in an indirect way though. Countries will think they can do emissions-intensive projects and still achieve the target. A couple of years later the science will show emissions are not dropping fast enough and countries need to be more ambitious, so they will adjust their targets, panic about how to achieve them and perhaps because of the indirect approach not even realise they were responsible for their own problems. So ultimately they both work to limit cumulative emissions; just without an explicit cumulative emissions target you might get more of a headless chicken approach.

My submission on the Zero Carbon Amendment Bill pg. 1

Sadly, searching for the word 'cumulative' in the amendment bill's hansard only comes up with one result, which was when Todd Muller was advocating to make an addition to the bill along the lines of being in step with other developed countries. Similar searches for the words 'overall', 'total', and 'budget' have just as disappointing results. It seems MPs (and even the CCC's draft report) simply view the emissions budgets as stepping stones to the 2050 target, rather than as important constraints in themselves. The lack of discussion of cumulative emissions perhaps suggests that MPs do not understand the science of climate change, so the CCC giving good advice on cumulative emissions seems rather important.

Appendix D: Policies

ETS vs. Carbon Tax

I noted the draft report's discussions on a high emissions price said that it was not exactly helpful because it would just lead to more trees rather than reductions. This is where a carbon tax and giving the revenue back to people via a universal dividend (perhaps in practice as an IRD refund) is helpful. I have written this previously on my website, so I have just copied it into my submission, with minor alterations.

Ideal Climate Tax Policy

The ideal climate tax policy would be to have both a Carbon Tax and an Emissions Trading Scheme. There are three actions that can be taken regarding emissions:

1. Emissions can be reduced in the first place.
2. Emissions can be offset by planting permanent forests. However, this is trading carbon stored safely underground for millennia for carbon stored on the surface.
3. Emissions can be accepted so long as they do not go over the allowable emissions for a temperature limit.

Using a Carbon Tax and Refund Scheme, set at the cost of cycling discussed below, addresses the first action because it makes the costs of climate pollution explicit. A cost is being added to the emissions that is equivalent to the cost required to not emit that amount in the first place.

An ETS adds to the first action but primarily addresses the second action. A government can budget for how many emissions they will accept, and how many they will offset by planting trees. This is the supply of ETS units. The market demand then determines the price of the limited supply.

Finally, some countries make an effort, and some countries do not. The added carbon price could cause the cost of goods produced by countries making an effort to be higher than those not making an effort. This perversely encourages countries to do nothing. To prevent this, the carbon prices should only apply to the country's domestic market, with anything leaving being exempt and anything coming in being charged.

Opportunity Cost of Cycling and Public Transport

Driving is generally faster than cycling or public transport. The time saved by driving can be put towards working more hours and thus earning more income. Therefore there is an opportunity cost in choosing to cycle. This cost is partly offset by the cost of fuel, but in general it is currently better to drive than to cycle. This is a barrier to increasing uptake of cycling and thus reducing emissions. To remove this barrier and improve fairness/equity for people who care about the climate, the price of fuel should be set to make up for the opportunity cost of cycling, as calculated below.

$$cost\ per\ litre = \frac{income\ per\ hour \times hours\ saved\ by\ driving}{litres\ per\ km \times distance}$$

This can also be written as,

$$cost\ per\ litre = \frac{income\ per\ hour \times \left(\frac{1}{cycling\ speed} - \frac{1}{driving\ speed}\right)}{litres\ per\ km}$$

The median hourly income for the June 2020 quarter was $27.00 (Stats NZ: https://www.stats.govt.nz/information-releases/labour-market-statistics-income-june-2020-quarter).
The average grams of CO_2/km for cars and SUVS was 161 (https://www.beehive.govt.nz/sites/default/files/2021-01/Clean%20Car%20Import%20Standard%20Explainer_0.pdf).
The kg CO_2/litre of fuel is 2.29 (https://www.mfe.govt.nz/publications/climate-change/guidance-voluntary-corporate-greenhouse-gas-reporting-data-and-methods-7).
The tax rate for income over $14,000 and up to $48,000 is 17.5%, and this is basically the same as the effective tax rate a median income earner would be paying.

So targeting an average person the cost per litre should be

$$cost\ per\ litre = 316.8 \times \left(\frac{1}{cycling\ speed} - \frac{1}{driving\ speed}\right)$$

For a bicycle and a car: assuming 22-25km/hr and 50km/hr respectively, the cost per litre to make cycling fair would be in the range of $6.34 to $8.06 per litre.

E-bikes can range in speeds in NZ with some going up to 32km/hr and others up to 45km/hr. Overseas it seems they regulate e-bikes to a maximum speed of 32km/hr perhaps for safety reasons. E-scooters from looking online seem to be able to get to maybe 25-30km/hr.

So using a safe e-bike speed of 32km/hr, the cost per litre should be $3.56. The current price of 91 petrol is ~$2, so the Govt. would need to increase the price by $1.56. This could be added on to fuel tax or as a separate carbon tax (and as mentioned in the section above, revenue should be given back to people via a universal dividend to avoid taking money out of the economy). This is just to make using an e-bike fair; to encourage mode shift it should be set higher. However the Govt. may not want to increase it by that much, but any increase would improve fairness. The higher it is the

better for low income people unless they live in a rural area. This is because they have a lower price point where switching is better, and so any further increase benefits them as they should have switched away from fuel (except from goods/services), but would get an increased universal dividend return.

This addresses suburban commuting in 50km/hr zones, but toll charges may be needed on city motorways due to their higher speed limits. For intercity motorways connecting satellite towns it perhaps does not matter as much because people could take public transport and then switch to their foldable e-scooter in the city.

If fuel-intensive work is important then the business can just pass the cost on as ultimately no money has left the economy, so the consumer should still have the ability and willingness to pay the higher price.

This is an area the public sector, with regard to climate change, is consistently weak on: Why should people who care about their wellbeing make changes that will cost them time and money relative to their peers? If a few people do it, they have just wasted their time for little reason (but if it does not cost them anything then they are free to make environmentally-conscious choices).

Limits of Market or Cost-Based Approaches; and the Advantages of Picking Winners/Losers and Tradeable Emissions Quotas

With a market-based approach, people with money are perhaps more willing to spend on luxury things such as air travel even though this may mean people in poverty go with even less. Therefore policies that pick winners (and losers) may be appropriate to ensure basic human rights. Tradeable Emissions Quotas (where people are rationed units and pay for things with both money and units) perhaps have an advantage here. Although they are basically the same as money, there is perhaps a minimum where no matter how high the price gets they would not sell because a basic standard of living is worth more than money can buy. If however it was a basic price mechanism then it could be they are not able to make this choice.

Quota on Aviation Emissions

International aviation was possibly the fifth largest source of NZ’s consumption emissions in 2017 (source is my website: climatedash.nz/opinion.php) and had an upward trend before Covid.

Though these emissions are yet to be technically counted as NZ’s responsibility, they count towards global warming as much as any other emission and NZ can control these emissions because NZ permits the flights and supplies the aviation fuel.

Aviation is a luxury we can be reasonably confident NZers, serious about mitigating climate change, will not share in for the next few decades as much as we have, so if we are talking about fairness and equity with future NZers then we should be doing our bit and cutting aviation now.

For aviation we could cap the flights or fuel supplies (keeping some reserves for Govt. uses such as medicine). If the Govt. wanted more control over things coming into the country then they could

run a travel permit system similar to the MIQ quarantine booking system (or slighly less control by just using the existing visa system).

Capping is a more effective system than higher prices because if we just do higher prices then the costs could be passed on to the poor with little decrease in emissions, but at least with capping there will actually be reduced emissions. International flights and accommodation are already expensive so increasing the price does not seem like it would have that much effect.

The CCC's advice is far too soft on aviation. In general the CCC's draft advice states there is little opportunity in the foreseeable future to reduce emissions from aviation and leaves it at that. The CCC needs to recommend that as the emissions cannot be reduced and it is non-essential (generally no ones life depends on the flight; probably just a week's holiday somewhere that will suffer hardship due to the flight) then flights should be reduced. People can still travel to and from NZ, via cruise ships for example, but boats are less emissions-intensive and the increased time and cost should reduce demand.

The CCC's statement on pg. 49 of the report is slightly incorrect: "As required by the legislation, we will review whether these should be included in the 2050 target in 2024." The CCC is able to review including international aviation and shipping now, it is just the final deadline for the review is in 2024. Not including them just makes things harder for NZ.

Aviation is also an industry where investors should not be angry about the cuts because Air NZ and a lot of airports are partially Government-owned and private investors know that investing in an industry powered by fossil fuels has significant risk.

The effect of Covid on aviation has also given the Govt. the opportunity to cut aviation without necessarily being the bad guys for causing lots of job losses. I do not see the point in scaling up aviation after Covid just to scale it down again for climate change; take the opportunity now, save disrupting peoples lives and just leave it down.

Population Decline

Reducing population would reduce emissions and place less strain on natural resources. It may be better for a child if there is less population, so this policy is about informing parents that it may be better for their child if they only give birth to one.

For this policy probably just do a 2-3 months advertising campaign every five years so as to ensure people are informed without them getting sick of being bombarded by it. Even if decision-makers intend to have more than one child, they should not censor an effective climate mitigation and adaptation policy. Not everyone will follow the advice and that is ok, but some will and every little bit helps.

Assuming 80 year life expectancy, two children per mother at the moment, births not increasing in other countries due to emigration to NZ and children having a similar footprint to adults (it's perhaps an unreasonable assumption), the policy could reduce emissions on average by 5% in 17 years, or 8% over 27 years, with further reductions achieved the next generation. The reductions could be higher than this as construction of new infrastructure for increased population involves

more emissions than use of existing infrastructure. The benefits are probably higher in the adaptation area because it reduces strain on natural resources that will be more at risk due to climate change.

I think the reductions are unlikely so I would not count them towards budgets, but it is still worth advertising.

Maintaining control of the ETS: Keeping prices affordable

Government should only sell the percentage it has

There is a risk to future NZers of much higher ETS prices than current NZers pay if the Government exhausts its supply of NZUs such that the only budget left is provided by private sector forest owners (who may not want to sell so they can cover harvesting emissions, or for land/unit banking reasons). Therefore, once an emissions budget has been set, the Government should only contribute its percentage of the remaining budget to the emissions budget (i.e. (NZ's remaining share of global budget + projected and unsold afforestation on Govt. land) divided by (projected and unsold afforestation on private land + NZU stockpile + NZ's remaining share of global budget + projected and unsold afforestation on Govt. Land)).

This would mean NZ would not be relying on removals it had not guaranteed, e.g. if a forest owner decided to clear the land for a different use in future. It also means there may be higher ETS prices in the short-term than anticipated, due to limited supply, unless the country comes up with a believable plan for reducing emissions to the level agreed to in the Paris Agreement. If the reduction plan is believable then forest owners would be more inclined to sell ETS units because they would see that demand won't outstrip supply in the future. So making sacrifices in the short-term may be a lot better for the economy and emitting sectors than the CCC's supposedly soft transition draft plan.

Government could look to secure future NZUs now

If overshooting the budget is possible then we will be reliant on increased forestry and low gross emissions to bring us back under budget. There is a risk the Govt. will have to pay for the forestry at quite a high cost as they will have no alternative as there are no emissions to reduce. So the Govt should look to secure future ETS units or ownership of land for forestry now (while there is the alternative of more rapid emission reductions instead of forestry) to reduce the risk of high costs later. Given the Govt. should just be releasing its percentage towards the emissions budget each year, if the Govt. can secure land for forestry now then its share would increase and it could provide more units.

There should be an expiry date on auctioned NZUs

If the Govt. finds NZUs are being surrendered more on CO_2 than anticipated then they may want to split NZUs to cover different gases in future, so they have more control over the cap of each specific gas. Having an expiry date on NZUs gives the Govt. more abiliity to make this change because they can auction new specific gas NZUs while existing wildcard NZUs will expire.

Expiry dates are also useful because they increase risk to investors who may only be trying to use the ETS market to make a profit. This works because investors could be left holding units that are worth nothing. With less investors in the scheme there should be reduced unnecessary costs for consumers. Generally it seems perishable markets tend to work better for consumers than the skyrocketing prices seen in a constrained supply market like housing. It also means that if NZers overachieve on emissions reductions such that there are spare emissions in a period, the Govt. could buy back NZUs cheap, so the value of those units (e.g. on the international market) can be shared among all NZers rather than NZers efforts profiting private investors.

Compensation/Settlement Buyback Process

The Govt. could look to do a compensation/settlement buyback process for the NZU stockpile, looking into how NZU holders acquired their units because NZUs bought for $1 not too long ago, potentially being worth a lot more, not because of productive or risk-taking reasons, but because the Govt was asleep at the wheel does not bode well for reducing inequality.

The current NZU stockpile could be as high as 24% of the Govt. controlled budget to 2038, under the not overshooting the budget scenario.

EITE Industries Free Allocation should change to Border Adjustments

The free industrial allocation to EITE industries could represent a significant loss to the Govt. budget, so it would be better to exempt emissions from exported products and require surrendering of NZUs for imported products.

Better Waste Management

Without more detail as to where significant emissions from waste are coming from, the following suggestions are just guessing at improvements.

We banned single-use plastic bags from supermarkets. Could we also require that customer-facing businesses e.g. fast food restaurants have to recycle and provide recycling options as a condition of operating?

Do worn-out clothes with holes in them have to go to landfill or can something be set up to deal with clothing waste?

Reduce Production

On pg. 155 of the draft report it states “If too stringent budgets are set early on, Aotearoa risks losing production in areas where a technological solution could be applied if more time was available to implement it ... If time is not allowed for these solutions to be implemented, some businesses will simply have to shut down.”

I would like the CCC to mention it is still possible to reduce emissions in these businesses by reducing their production by some percentage e.g. retiring some machines, but not the whole factory.

The ETS cap if set appropriately could be the major driver of these reductions.

Reduce Imported Emissions

Imported manufactured products often provide a positive impact on people's wellbeing, and we cannot directly affect these emissions by building renewable generation ourselves. However, policies we could use are:

- shift to suppliers that have a lower carbon footprint (e.g. higher renewable energy percentage, or less GHG-intensive production processes).
- reduce consumption, e.g. import limits.

As other countries are looking to reduce emissions, these emissions may reduce by themselves without us having to enact policies, but should progress be slower than expected then these policies could be used to ensure we are still meeting our budgets. This may be against the free-trade dogma, in which case the CCC must remember its job is to provide independent, comprehensive advice so that NZers are informed in their choices. It is up to voters to make the political choices as to whether they care more about the climate or free-trade.

The CCC is using the achievable aspect of emissions budgets as way too much of an excuse to set non-ambitious budgets. Ultimately so long as the budgets are not too crippling we can always cover uncertainties or not making enough of an effort by reducing quality of life things such as imports of manufactured products, e.g. people may struggle to buy the limited imports of the latest Playstation, or Xbox (iPhone, whiteware, furniture). This sort of action would also promote more use of existing assets and more of a circular economy.

Moving People out of Auckland

Moving public sector jobs and encouraging private sector jobs to shift from Auckland to further south to places with more affordable housing would have positive benefits. This is because creating breathing room in Auckland might allow enough housing flexibility for Aucklanders to live closer to their jobs or PT routes that efficiently connect to their work. It also improves energy efficiency due to less transmission losses from the distance between renewable generators and consumers in Auckland. On the other hand there may be higher energy use due to the colder climate the further south people go. There would also be adaptation benefits in the form of lower drought risk for Aucklanders.

Better Urban Planning

In terms of urban planning I think it could be improved by making sure increased housing density is spread around the different parts of a city. I feel like some suburbs in Christchurch with good accessibility to jobs are missing out on increased density. This can lead to people living further

away and being more car-dependent. To mitigate the effect on privacy and light, decreasing height planes could be used around a higher-density area.

Financing Conversion from Gas

Discussed in answer to CQ15.

Delay Harvesting

Rather than paying for offshore mitigation, it might be possible to pay forest owners to delay harvest. This would allow borrowing of capacity from post-2038 when things may be easier due to significant projected forestry removals. Alternatively, offshore mitigation could be used where we trade our future removals with another country’s current removals (provided they have set an equally fair target for limiting warming).

Application for low interest loan due to hardship

A higher fuel price may cause significant hardship in some situations e.g. first-time home owners who have bought a lifestyle block with the intent of commuting to work. Though frustrating, some support should be extended to situations like this. Perhaps the Government could introduce an 'application for low interest loan due to hardship' scheme to handle situations like this where a loan to allow purchase of an electric car or cover increased fuel costs would help. The conditions on the loan could be that the applicants did not have the wealth or income to finance it themselves (e.g. they only have one heavily mortgaged home and no other savings), other methods to reduce hardship such as use of public transport were not possible, and they purchased their property before the Government signalled intent to raise fuel prices.