2021 Supporting Evidence Consultation Feedback and Updates

Part 3: How can we reach our climate goals?

Themes we heard through consultation

We heard significant feedback during consultation about our mitigations modelling work and evidence supporting our analysis of the Climate Change Response Act (CCRA) Section 5k (s5K) requests regarding the Nationally Determined Contribution (NDC) and long-term reductions in biogenic methane. These are covered by the chapters in Part 3 of our *2021 Supporting Evidence.*

Mitigation modelling across sectors

Our *Draft Evidence Report* included chapters focusing on the Current Policy Reference case, long-term scenarios to meet the 2050 targets, and possible paths for meeting the proposed emissions budgets. This section summarises the key themes we heard regarding this modelling work for each sector.

Energy

We heard during consultation that the wholesale electricity price path modelled using Energy Link's EMarket and I-Gen models was too low and did not reflect market conditions at the time of release of the *2021 Draft Advice for Consultation*. Submitters were interested in understanding the drivers of the price path and how security of supply was modelled. While some submitters disagreed on the near-term price trajectory, there was agreement on the general longer-term trend in electricity prices.

Some submissions stated that the modelled rate of cost reduction for certain technologies, particularly solar photovoltaics (PV), were not reflective of the latest market trends. Specifically, they noted that the modelled costs were too high for utility-scale solar PV installations, and that rooftop solar PV would have greater uptake. As a result, they suggested that there were greater opportunities for more PV installation and lower resulting electricity prices.

There were some questions raised over why the modelling didn't seem to explicitly consider new large-scale or small-scale hydrogeneration or enhancement and optimisation of existing hydrogeneration schemes. There was also concern over the assumed closure of two high-emissions-intensity geothermal power stations with some submitters questioning the robustness of the assumptions that drove the closures in the modelling. Some submitters noted that the assumed closure of geothermal power stations could have implications on Māori-collectives and their ongoing partnerships with developers.

Some energy system and industrial submitters were interested in seeing a sectoral breakdown of the proposed emissions budgets, in order to better understand the balance of effort across the economy and the Climate Change Commission (the Commission)'s judgements. Others wanted to see alternative paths to achieving the 2050 targets, for example, different emissions prices and different technologies.

Industry

Some submitters noted that the modelling assumptions around fossil gas use and emissions, and gas contracts didn't reflect the way the market currently works or may work in the face of new climate policies. They also highlighted that more consideration could be given to the interdependency of coal and fossil gas in the energy system.

Some submitters cautioned against the use of publicly available contracts as proxies for industrial exits and a few stakeholders provided alternatives to our assumptions on industrial closure dates and projected emissions. Namely, assumed exits for the Tiwai Point aluminium smelter, emissions from the integrated steel mill and emissions from operational changes at the refinery.

Many industry submitters thought that the modelled rate of heat plant conversion was technically feasible and economically achievable. For hard-to-abate industries, they thought that the modelling approach was sensible.

Buildings

Some submitters wanted additional analysis and modelling of the full costs of fuel-switching in buildings and industry as the modelled impacts seemed too low. They also wanted additional analysis on other transition costs such as the cost for building renovations, labour and electrical metering.

A few submitters wanted fossil gas and LPG modelled separately. We heard general support for transitioning away from the use of fossil gas, but general concern with the shape of the path in our *2021 Draft Advice for Consultation.* Some stakeholders wanted the modelling to account for low-emissions gases by 2035 and 2050 as an alternative path to meetings the emission budgets without having to phase out new fossil gas connections to buildings.

Public sector, NGO and building and construction sector submitters thought that the rate of energy efficiency improvements in our modelling could be significantly more ambitious. Submitters also suggested inclusion of embodied emissions in the modelling and development of our scenarios.

Transport

In the draft advice we presented mode shift as a national aggregate. We heard from some submitters that our public and active mode shift assumptions were not ambitious enough. More specifically, some submitters stated that the mode shift assumptions in our path were not as ambitious as those in Auckland's Climate Action Plan. In contrast, some submitters argued that our public transport assumptions were unrealistic, especially for rural areas and regional towns.

We also heard from some stakeholders that our electric vehicle (EV) uptake may be too ambitious in the short term as Aotearoa could face issues securing enough supply. This is because Aotearoa may face some difficulty securing enough EVs from Japan's second-hand market to meet the path set out in our *2021 Draft Advice for Consultation*.

We heard that our estimates for possible biofuel production in Aotearoa were too low, with several submitters pointing to evidence of larger and more diverse feedstock volumes.

Agriculture

Some stakeholders from the pastoral agriculture sector expressed concern that the reductions in biogenic methane by 2030 in our pathway were greater than the 10% below 2017 levels in the CCRA.

We heard that we had been too optimistic about the ability of farmers to reduce emissions, and that production would drop more than we estimated to reach the budgets. In particular, we heard that decreasing stocking rates would lead to a greater decline in milk production than we estimated.

Some submitters thought that we had been too conservative with the amount of land that could convert to lower-emissions land-uses like horticulture. This view was shared with a range of stakeholders who wanted to see greater overall ambition for agricultural emissions reductions.

Waste

Overall, we heard demand for more ambition in our pathway with respect to waste. Some wanted increases in the level of organic diversion and resource recovery from landfill, as well as the coverage of landfill gas capture. There were also some submitters that felt that the level of ambition in the *2021 Draft Advice for Consultation's* proposed pathway was 'achievable' and sufficient.

Forests and removals

We heard from forestry industry stakeholders that our overall projections for exotic afforestation may be too high and do not correspond to observed trends in the National Exotic Forest Description in the last decade. We also heard from some stakeholders that afforestation is happening at a faster rate than many people are aware of in certain regions.

There was generally strong support for focusing on gross emissions reductions and limiting the use of emissions removals by forests. However, some stakeholders from the agriculture sector still suggested that we were including an undesirably high amount of exotic afforestation in our modelled paths and scenarios.

The level of native afforestation in our scenarios and pathways received strong support during consultation. Nuances were added by some stakeholders who suggested that we had not factored in the difficulty and cost of establishing native forests at this scale, nor the affect this might have on agricultural production.

s5K requests: NDC and long-term reductions in biogenic methane

During consultation, we heard a lot of feedback about our analysis of the NDC in response to the s5K request. In contrast, we heard limited feedback on our analysis regarding the s5K request on long-term biogenic methane emissions reductions.

Regarding the NDC, there was widespread support for achieving it as much as possible through domestic emissions reductions. Stakeholders were generally opposed to the use of offshore mitigation.

We heard a mixture of perspectives about the ambition and level of emissions reductions in the NDC. Some thought the level of ambition should be much higher while others thought it should be much less ambitious. Several stakeholders also expressed the view that there should be complete alignment between the NDC and our emissions budgets.

On the form of the NDC, some submitters suggested the use of net-net accounting for all emissions and removals. A small number of submitters also suggested using a split-gas structure for the NDC, similar to that of our domestic 2050 targets.

Regarding biogenic methane, relatively few submissions commented on the approach taken to assessing the eventual reductions that may be necessary. Of those that did, submitters were mixed in whether the recommended reductions should be stronger or weaker. Most submissions on this issue reflected submitters' preferences for overall ambition rather than providing new evidence for the level of reductions that might be required to keep warming to 1.5°C. As a result, the approach and our findings on long-term methane emission reductions in this chapter have not changed from our draft advice.

Errors and misrepresentations

Mitigation modelling across sectors

Energy

There was some confusion during consultation about there being sufficient electricity generation and infrastructure to cope with electrification of transport and heat in our pathway. Some stakeholders had the impression that our model did not account for the need for and cost of building this infrastructure, when in fact it did. However the network cost modelling in our *2021 Draft Advice for Consultation* was fairly high-level and made key simplifying assumptions. We have modelled network costs in more detail in our final advice, *Ināia Tonu Nei*.

Some stakeholders also pointed out that our wholesale electricity price was much lower than the actual price when our *2021 Draft Advice for Consultation* was released. This was due to significantly different market conditions between September 2020 when our draft modelling was complete and February 2021. We had also presented the modelled price averaged across a range of simulated hydrological years – this representation does not convey the significant variance in modelled price for years with above or below average hydro inflows.

Agriculture

There was a common misunderstanding during consultation that our analysis called for a reduction in stock numbers of 15% on every farm in Aotearoa. This was not a recommendation in our *2021 Draft Advice for Consultation*. The 15% reduction was an average across the national herd reflected in one path that we modelled that could achieve the emissions budgets and targets. This is discussed more in *Part 3* of the *2021 Supporting Evidence.*

Another misrepresentation of our draft mitigation modelling was that we had unrealistically 'stacked' estimates of different mitigation options. However, the mitigation options in our scenarios and pathways were based on the Biological Emissions Reference Group report, in which several authors carefully assessed the 'stackability' of the different mitigation options and how they would interact with each other.

Some submitters also thought that the 13% reduction we suggested for biogenic methane in 2030 was a specific target for the agriculture sector. However, this target was for all biogenic methane, and included contributions from the waste sector.

Waste

A common misunderstanding in the waste sector was our targets around organic waste. Many stakeholders conflated the 23% organic diversion target with the target for each waste stream.

Forests

There was a common misrepresentation of *2021 Draft Advice for Consultation*, during consultation, that our forestry modelling represented a black and white world of only production radiata pine and permanent native forests, that would be established solely by planting and not harvested to any degree. The modelled forestry options (exotic forests and new native forests) were proxies for a range of different forest management practices and species (see *Chapter 9: Removing carbon from our atmosphere*).

There was another common misrepresentation that all of the native afforestation in our scenarios was assumed to be planted. This was tied to comments from some stakeholders that our native afforestation trajectories were unrealistic in terms of feasibility and cost. Our native afforestation pathways were assumed to occur through a mixture of planting and natural reversion.

s5K requests: NDC and long-term reductions in biogenic methane

There was some misunderstanding about our use of gross-net accounting for estimating emissions when comparing to the Intergovernmental Panel on Climate Change (IPCC) pathways that use a net-net approach. Some stakeholders thought this was either an error or a deliberately misleading decision. There are clear, internationally agreed guidelines for the appropriate use of gross-net and net-net accounting that we followed in this analysis. We have made this clearer in our final advice, *Ināia Tonu Nei* and *2021 Supporting Evidence*.

Some stakeholders also noted an apparent contradiction regarding compatibility with contributing to efforts to limit the increase in global average temperature to 1.5°C above pre-industrial levels (the global 1.5°C effort). Our *2021 Draft Advice for Consultation* stated that the current NDC is not compatible with contributing to the global 1.5°C effort, but that our proposed emissions budgets are. At the same time, we highlighted that domestic reductions alone are unlikely to achieve the current NDC.

We have added additional material in our final advice, *Ināia Tonu Nei*, to show how this is not a contradiction. The 2050 target in the CCRA has been set by Parliament as the country's domestic contribution to the global 1.5°C effort.

New evidence and analysis

Mitigation modelling across sectors

We incorporated a variety of new evidence and additional analysis into the chapters in *Part 3* of our *2021 Supporting Evidence*. Across all the mitigations modelling, this included incorporating the update of New Zealand's Greenhouse Gas Inventory (GHG Inventory) released in April 2021, which provides historic emissions estimates from 1990 to 2019. This section summarises this new evidence and analysis. Additional detail on the changes we made to our modelling can be found in *Chapter 7: Demonstrating emissions budgets are achievable* of our advice, *Ināia Tonu Nei*.

Agriculture

After considering consultation feedback, we revisited the evidence about reducing livestock emissions through reducing stock numbers while improving animal performance. We found that assumptions in our *2021 Draft Advice for Consultation* were overly optimistic for the emissions gains that could be made for sheep and beef without loss of production and revised our modelling accordingly.

We also revised the analysis underlying our assumed baseline productivity improvements for sheep and beef, leading to a significantly slower rate of improvement in our Current Policy Reference case. The meat production numbers in our report now refer solely to meat produced from the sheep and beef sector.

We compared our ENZ modelling of agricultural emissions against the Ministry for Primary Industries (MPI)'s model used for the GHG Inventory, which contains a more detailed representation of farm systems. This required translating our scenario assumptions into more detailed changes for specific livestock categories. We found a close match on emissions outcomes, giving us confidence the simplified modelling approach in ENZ is robust within the range of changes assumed in our scenarios.

In our *2021 Draft Advice for Consultation* we did not consider the potential for increased use of urease inhibitor in nitrogen fertiliser. We have now included this as a mitigation option in our scenarios. We also revised our modelling of historic and projected nitrogen fertiliser use, incorporating new data from Stats NZ.

Forests

We did further analysis on the costs and benefits associated with establishing native forests. These include planting (where required), pest control, fencing, carbon revenue and timber revenue (where appropriate). There is a wide range in the estimates of these factors, some of which is due to different topography, climate, soils and nearby pest populations.

We made minor refinements to our modelling of forest emissions and removals. We worked closely with MPI to improve the alignment between ENZ and the MPI forestry projections model.

Energy, industry, and buildings

We received new evidence during consultation to inform refinement of our energy modelling, particularly regarding network development and cost allocation. This helped us model a more complete representation of electricity network costs driven by peak demand and other factors. We also revised renewable energy calculations for primary and final energy consumption.

We reviewed the committed generation stack for electricity and recent announcements from developers about project build schedules. This was linked into our Energy Link modelling to improve price alignment out to 2035. Sensitivity analyses based on the continued operation of the Tiwai Point aluminium smelter and rising fossil gas prices were also conducted.

More work was done to improve the geothermal generation part of the ENZ electricity generation module. This included explicitly representing high-emissions-intensity fields and better classifying other fields.

We also conducted more analysis to support the capital replacement cost model for buildings. This included analysis on household transition costs.

Transport

We undertook additional analysis on EV uptake, in particular, testing the impact of possible supply constraints. This drew on new evidence, including from the International Energy Agency on the Global Outlook for Electric Vehicles.

We updated our assumptions on future lithium ion battery cost reductions based on the latest projections from Bloomberg New Energy Finance. We also updated our starting assumptions for current EV costs in Aotearoa. Our assumed average cost difference between an electric and petrol car in 2020 and 2021 now matches closely with the New Zealand Automobile Association's annual vehicle running cost reports.

We reviewed the ENZ model's vehicle fleet dynamics, particularly vehicle scrappage and the pattern of usage over a vehicle's life. We refined the model and incorporated data from the latest fleet statistics published by the Ministry of Transport. This has generally led to a longer 'tail' of emissions from when a vehicle enters the fleet, especially for buses, resulting in higher remaining transport emissions in 2050 in our scenarios. It has also led to higher usage in the early life for some vehicle types, particularly trucks, which has made the total cost of ownership comparison in the model more favourable towards electrification.

We considered new evidence regarding pathways for low-carbon freight in Aotearoa. This highlighted the potential for operational efficiency improvements in road freight, which we added as a new mitigation option in the ENZ model.

During consultation we also received stakeholder feedback regarding increased likelihood of some electrification of short haul air domestic air travel, which have included in our analysis.

Waste

We conducted additional analysis on the Ministry for the Environment (MfE)'s databases of municipal and non-municipal landfills. This suggested greater potential for installing landfill gas capture at non-municipal sites and for diverting organics from municipal sites without landfill gas capture. If the database information is accurate, relatively modest investments in landfill gas capture could reduce methane emissions in the waste sector substantially – which informed our decision to increase the viability and potential for landfill gas capture.

We have also received new analysis from MfE regarding Hydrofluorocarbon emissions trajectories. This incorporated better linkages to potential policies around product stewardship schemes and further importation restrictions.

s5K requests: NDC and long-term reductions in biogenic methane

Our analysis of the NDC was updated with the figures from the latest GHG Inventory.

What we have changed in Part 3 as a result of consultation:

We made a number of changes to the chapters in *Part 3* based on consultation feedback and our resulting analysis. One of the major changes was that we removed the chapter that provided supporting evidence for our demonstration path (and alternate paths) for meeting emissions budgets and targets. The significant feedback about and interest in this has led us to move all of the relevant detail into our advice, *Ināia Tonu Nei,* rather than leaving the additional details in the *2021 Supporting Evidence.*

The other chapters in Part 3 focusing on the Current Policy Reference case, our scenario analysis, and the s5K requests, remain. This section summarises the key edits to these chapters. It also summarises some general changes to the function of our ENZ model.

Chapter 11: Where are we currently heading?

- Updated the Current Policy Reference case across all sectors based on the 2021 GHG Inventory.
- Added additional clarification that the Current Policy Reference case is designed to closely align with Government projections.
- Reorganised our presentation of the reference case for energy, industry, and buildings (previously heat, industry, and power).
- Changed Tiwai Point aluminium smelter closure assumption to a hard close at end of 2024.
- Changed Methanex closure assumption to it staying open until 2040 with staged exit.
- Updated assumptions about Waitara Valley methanol plant so it is mothballed in 2021 based on reduce gas supply. This results in less of a downscale in domestic fossil gas production compared to in our *2021 Draft Advice for Consultation*.
- Updated NZ Steel emissions assumptions so that they are constant at 2018 levels rather than reducing from 2020.
- Revised our assumptions about the effect of COVID-19 on transport emissions in the Current Policy Reference case so that that transport emissions return to pre-COVID-19 trends, and that COVID-19 has limited long-term impacts on transport emissions. This aligns with the latest Ministry of Transport projections of future transport activity and emissions we received in early 2021.
- Modified our geothermal electricity generation assumptions, including emissions intensities, degassing rates, and location factors. Geothermal plants continue to run but with lower emissions than in our *2021 Draft Advice for Consultation.*
- Updated Appendix 1, which describes the representation of each sector in ENZ.
- Updated projected waste volumes based on new information from MfE.
- Added additional comparisons of the Current Policy Reference case emissions projections with Government projections for total gross emissions.
- Removed the second Appendix, which had provided some key assumptions for the Current Policy Reference case. Detailed assumptions for the reference case, our demonstration path, and all scenarios are now provided in spreadsheets that we have uploaded to the Commission's website.

Chapter 12: Long-term scenarios to meet the 2050 target

- Updated scenarios based on changes to the Current Policy Reference case that flow through to affect scenarios.
- Increased our Tailwinds/Further Behaviour Change mode shift assumptions, increasing the role of public and active transport. We added a new figure in the chapter to show the effect of this on passenger kilometres travelled.
- Updated our scenario assumptions on constraints for the supply and uptake of EVs.
- Added a box with more information on our assumptions and modelling and of the costs of EVs.
- Considered the potential for further improvements to the efficiency of internal combustion engine vehicles entering the fleet and included this in the Headwinds and Further Behaviour Change scenarios.
- Included further efficiency improvements for non-road transport in our scenarios.
- Considered the cost of native forest establishment across our scenarios, with more detail provided in *Chapter 9: Removing carbon from our atmosphere.*
- Clarified that native afforestation scenarios are based on a mixture of planting and natural reversion.
- Increased our assumptions on organic waste recovery across the scenarios, as well as the potential for landfill gas capture. We added a new subsection featuring a new table which outlines the overall resource recovery from landfill across the different scenarios.
- Added new charts that illustrate landfill gas capture and its role in emissions reductions across scenarios.

Chapter 13: Requests under s5K relating to the NDC and biogenic methane - supporting evidence

- Updated with the new GHG Inventory.
- Updating our analysis of F-gas pathways to better align with IPCC modelling.
- Added additional information about offshore mitigation and its potential use to meet emissions budgets and targets.

General updates to the ENZ model

- Updated the transport module to now model regional (Auckland, Waikato, Wellington, Canterbury and Rest of Aotearoa) differences in transport instead of averaging our results across Aotearoa.
- Added an effect of native afforestation on agricultural production, so that native afforestation now results in an effective loss in grazing land of 20% of the area afforested.
- Changed our presentation of dairy animal numbers in the Current Policy Reference case from ‘milking cows’ to ‘total dairy cattle’. This reflects the importance of support animals to the herd and emissions reduction opportunities. This flows into the Current Policy Reference Case and scenarios for meeting the 2050 target.