

New Zealand's Nationally Determined Contribution (NDC) and Emissions Budgets Need Urgent Review

From: Engineers for Social Responsibility Inc. (ESR)

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Summary

Our current Nationally Determined Contribution (NDC), made under the Paris Agreement, is extremely weak. While not clearly stated, the undertaking to reduce our emissions by 30% over the 2005-2030 period is based on a comparison of gross emissions in the base year with net emissions in the target year. On a consistent net-net basis it is actually an undertaking to *increase* our net emissions by approximately 1% over this period.

There is therefore a very strong case for New Zealand to submit a revised version of our NDC. We also need to move to an NDC that is expressed in consistent terms, and not in terms that are confusing and misleading.

Scientists and others are telling us that it is critically important that the world achieves major emissions reductions over the coming decade. For example, the Intergovernmental Panel on Climate Change (IPCC) says global net CO₂ emissions need to fall by around 45% over the 2010-2030 period, the UN Environment Programme (UNEP) says that global greenhouse gas emissions need to fall by 45% over the 2020-2030 period, and Climate Action Tracker (a partnership between Climate Analytics, The New Climate Institute and the Potsdam Institute for Climate Impact Research) says that by 2030 New Zealand needs to reduce its overall *gross* emissions to at least 44% below the 2005 level, and preferably up towards the 70% level.

As a developed country with the necessary skills and resources, there is a strong argument for us to be aiming higher than what the above figures indicate.

While not expressed in a manner that makes comparison clear, based on the available information, the budget figures for emissions reductions given in the Climate Commission's final report, July 2021, are well below what the international bodies noted above say is required by 2030. ESR therefore very strongly recommends that the Commission's current proposed budget figures not be accepted by the government, or used as a guide for what we should be aiming for in our revised NDC.

Based on a review of the available information, ESR recommends that we follow the advice of Climate Action Tracker, and set a target to reduce our gross emissions by at least 44%, and preferably up towards 70%, over the 2005-2030 period. Our NDC can then be revised to reflect this undertaking. We could also work on a net basis, but letting our high Land Use, Land-Use Change and Forestry (LULUCF) offsets side-track us from taking rapid action to reduce our use of fossil fuels would not be a good way of proceeding.

The emissions reductions proposed here are considered to be attainable if the government, businesses and New Zealand society take the necessary steps and work collectively to achieve them. Several further recommendations are made in this document.

Details

Our current NDC

Our NDC, made in 2016 under the Paris Agreement, is extremely weak. It says that by 2030 we are undertaking to reduce emissions over all sectors of our economy, including agriculture, to 30% below 2005 levels. But what is not clearly stated is that the reduction is based on a comparison of *gross* emissions in 2005 with *net* emissions in 2030. In terms of consistent net-net measurements, based on figures from the NZ Greenhouse Gas Inventory 1990-2019, it is an undertaking to increase our net emissions by approximately 1% over this period.

Scientists and others are telling us that it is critically important that the world achieves major emissions reductions over the coming decade. For New Zealand to signal that it plans to make an appropriate contribution to this, we need a far stronger NDC. Also, only a very few countries have apparently submitted NDCs based on this confusing gross-net accounting. When the government submits a revised version of the NDC, we very strongly recommend that it uses consistent measurement methods, including net measurements determined in the standard way, rather than the 'modified activity based' measurement the Climate Commission has used, so that what it is proposing is completely clear. Using confusing accounting methods just misleads people.

Countries have been encouraged to "ratchet up" their NDCs every 5 years, or more frequently. Our NDC was updated in April 2020, but the 2030 emissions targets remained unchanged. Instead, it was amended to include several matters arising as a result of the passing of the Climate Change Response (Zero Carbon) Amendment Act 2019. In particular, it noted that a new domestic target had been set to reduce net greenhouse gas emissions (other than biogenic methane) to zero by 2050; and to reduce net emissions of biogenic methane to 10% below 2017 levels by 2030, and to 24 to 47% below 2017 levels by 2050.

The updated NDC also noted that an independent Climate Commission had been established in 2019 to advise the government. In its first final report, July 2021, the Commission made some useful suggestions, but the emissions reduction targets it proposed for 2030 appear to be much weaker than what the IPCC 2018 Special Report on Global Warming of 1.5 °C says is needed. Also, the data in the Commission's report is presented in a way that obfuscates comparison with international scientific recommendations, such as the IPCC figures. These are the two reasons why Lawyers for Climate Action are taking legal action against the Climate Commission.

From the graph given in Figure 9.4 of the Commission's 2021 final report (p 193) it is estimated that under the proposed budgets, net CO₂ emissions would fall by around 27% over the 2010-2030 period. This is far lower than the 45% reduction the IPCC says is required. Also, from the graph for long-lived gases in Figure 5.3 (p 81) it is estimated that the emissions of these gases would fall by around 21% over the 2010-2030 period – also far less than is needed. It is therefore critically important that the Commission's budget figures are not used as a guide as to what we should be aiming for in our revised NDC.

Much stronger response needed

A recent report from the World Resources Institute and Climate Analytics (Closing the Gap: The impact of G20 climate commitments on limiting global temperature rise to 1.5°C, September 2021)

shows that, based on available data, current NDCs and legally binding net-zero targets put the world on a trajectory to 2.4°C of warming by the end of the century. It is imperative that this outcome is avoided.

Information from several sources makes it clear that, just to meet global average requirements for emissions reductions, New Zealand's contribution to reducing its emissions needs to be far stronger than what the present version of our NDC calls for. Also, as a developed country with the necessary skills and resources, and very high emissions rates per capita, we should be aiming considerably higher than this.

The IPCC in their 2018 report concluded that, to have a 50-66% chance of limiting warming to 1.5°C above pre-industrial levels by the end of the century, net anthropogenic CO₂ emissions need to decline by around 45% (40 to 58% interquartile range) from 2010 levels by 2030, with emissions specifically from coal burning reducing by around 65% over this period. Other quoted interquartile figures from the IPCC report are for emissions of agricultural methane to fall by 11-30% and emissions of agricultural nitrous oxide by around 0 to 21% over the 2010 to 2030 period. Because global emissions have continued to increase since the report was issued, these reductions are now likely to be too low.

Since the IPCC report was released, a report from the UNEP (Emissions Gap Report 2020, December 2020) warned that, to meet the 1.5°C warming goal, global greenhouse gas emissions need to fall 7.6% per year between 2020 and 2030. On a compounded basis, that gives a total reduction in emissions over this period of 45%. In New Zealand's case, working on a net basis, since our net emissions fell by approximately 4% over the 2005-2019 period (2020 data not yet available), to meet this target we would need to reduce our net emission by at least 47%, if assessed on a 2005-2030 basis, as is currently used in our NDC.

In 2021, Climate Action Tracker rated New Zealand's contribution to controlling climate change as "highly insufficient". It said that to be consistent with limiting global warming to 1.5°C, New Zealand needs to set a 2030 target to reduce *gross* emissions to at least 44% below 2005 levels. Further, to be considered a "role model", it should aim for at least a 70% reduction in gross emissions over this period.

The Climate Commission was asked by the government for advice on strengthening the present NDC and recommended "a reduction to net emissions of much more than 36% below 2005 gross levels by 2030" (final report, July 2021, p 358). There are three problems with this advice. First, the Commission is providing information on the assumption that the revised NDC will continue to be defined in the unclear and misleading gross-net basis. Second, a reduction of net emissions to 36% below 2005 gross levels by 2030, is equivalent to an approximately 8% reduction over this period on a consistent net-net basis, which is only a tiny fraction of what is needed. And third, there is no specific 2030 target suggested.

Based on the information above, it is very clear that for New Zealand to play its part in limiting global warming, we need to set far stronger targets and take far stronger action than our NDC currently states and the Climate Commission is currently proposing. In keeping with that, when the government submits a revised version of the NDC, it very clearly needs to come up with a much stronger and more realistic target for emissions reductions by 2030. And it needs to change to using consistent net-net or gross-gross measurement methods so that what it is proposing is completely clear.

Beyond that, the undertaking in our current NDC to achieve net zero emissions by 2050 also needs to be reviewed. Quite a number of other countries have committed to faster reductions than this. Currently these include Bhutan (achieved), Suriname (achieved), Uruguay (2030), Finland (2035), Austria (2040), Iceland (2040), Germany (2045) and Sweden (2045).

How to proceed from here

About 48% of New Zealand's emissions currently come from agriculture. This is a very high percentage compared to most other countries, because farming is such a major activity for us. But it also needs to be noted that around 95% of our dairy products and 80% of our meat industry products are exported, so a large percentage of these emissions relate to producing food for others in the world.

We could split out all agricultural emissions from our other emissions, and treat them separately, but to keep things relatively simple, ESR's recommendation is that we just split out biogenic methane, as we are currently doing.

Compared to a lot of other countries, New Zealand's LULUCF offsets against emissions are very large. For example, in the 2019 year in the UK, LULUCF emissions were positive, giving a net emissions figure that was approx. 1.3% *higher* than the gross figure, while in New Zealand our LULUCF emissions were negative, giving a net figure that was 33.3% *lower* than the gross figure. Letting our high LULUCF offsets side-track us from taking rapid action to reduce our use of fossil fuels would not be a good way of proceeding.

Based on the above information, ESR's recommendation is that we follow what Climate Action Tracker says New Zealand needs to do to contribute to holding global warming to 1.5°C, and in response revise our objectives and budgets with the aim of reducing our gross emissions for all gases other than biogenic methane by a minimum of 44% over the 2005 to 2030 period, and preferably further up towards the 70% reduction figure. ESR further recommends that our NDC be revised to reflect these new targets.

In terms of CO₂ reductions, for a specific percentage reduction, working on a gross-gross basis will normally give a somewhat different reduction than working on a net-net basis, which the IPCC figures relate to. For example, for the Commission's recommended budgets, approximate figures working from Figure 9.4 (final report 2021, p 193) give a 2010 to 2030 reduction of 21% working on a gross-gross basis and 27% working on a net-net basis. This means that gross emissions reductions of 44% or more over the 2005 to 2030 period are likely to come close to, or exceed the IPCC requirement of reducing net CO₂ emissions by 45% over this period.

Regarding biogenic methane emissions, the amended version of our NDC includes reducing biogenic methane levels to 10% below 2017 levels by 2030. Because methane levels in 2010 were only very fractionally higher than in 2017, this target is equivalent to reducing methane emissions by approximately 10.1% over the 2010 to 2030 period.

The IPCC in its 2018 report gives an interquartile range for reduction of methane emissions of 11-30% below 2010 levels by 2030. There is therefore a case for New Zealand to be aiming higher than the 10.1% figure given above. Methane emissions rose approximately 5.6% between 1990 and 2019, largely as a result of increased dairy cattle numbers.

It could be that in the future we ease back to working based on net emissions when setting our targets. There is a particularly strong argument for this in relation to our agricultural emissions. But because of the current very urgent need for global emissions to be reduced, ESR recommends that, for the time being, we work on a gross basis for all our emissions, as Climate Action Tracker stated.

Reductions required to meet these targets are achievable

The emissions reductions proposed here to be achieved by 2030 will require significant changes in many parts of our economy, but based on the information available, will be attainable if the government, businesses and New Zealand society work collectively to achieve them. Some key examples of how this can happen are given below.

Transport

Road transport emissions have risen by around 96% since 1990 and accounted for around 43% of all CO₂ emissions in 2019. An all-sector approach is required to reduce unnecessary travel, shift travel to more shared or active modes (for example, mass transit, and walking and cycling respectively) and transition essential travel to reduced emission fleets.

A key way to reduce vehicle emissions is to take the necessary steps to move more quickly to electrically powered vehicles. Norway gives an example of what is possible, although differences in socio economic factors need to be taken into account when setting New Zealand policy. Following steps taken starting from 1990, in 2020, 54% of all new vehicles sold in Norway were battery powered electric. Norway has now set a goal that by 2025 all new cars sold should be zero-emissions, apart from their embodied energy.

The Climate Change Commission recommended that all light vehicles entering the country must be low emissions by 2035 – ten years slower than the Norwegian goal. By taking the right steps we should be able to move much faster than this.

While petrol- and diesel-powered vehicles still remain an option, their emissions also require attention. The average light vehicle in New Zealand produces around 171 g/km of CO₂ emissions. In January 2021 the Government announced its intention to reduce this down to an average of 105 g/km by 2025 for vehicles entering the country – a standard Japan set in 2014 and the EU in 2020. We can and must proceed faster than this. The 105 g/km level could be brought into effect from 2022, which would reduce the emissions of these types of vehicles entering the country by about 38%.

To reduce emissions, as well as improved walking and cycling options, we also need much-improved public transport systems that can provide a lot of people with fast, safe and reliable ways of travelling, both within and between cities, that are typically less costly and produce less emissions than private motor vehicle-based travel.

Electricity generation

Electricity generation has recently been our largest coal user. If we took the simple step of giving renewably generated electricity priority access to the grid, the use of fossil fuels for this purpose

would start to rapidly fall, and the development of renewably powered generating facilities would rapidly increase, which we will need as we move away from fossil fuels. This does not seem to be covered in the Climate Commission's report.

Related to the above, the way the electricity market works also needs to be changed so that retail electricity prices are reduced to reflect generating costs, giving more incentive for businesses and other customers to move away from fossil fuels to electricity, when this is an appropriate option.

Also related to the above, the market needs to allow people or businesses with solar panels, or other systems for renewably generating electricity, including local electricity networks, to feed into the grid at a fair price. Currently they are sometimes not able to do this, and if they can, often receive rather low prices. This needs to change because these sources can potentially make a significant contribution to our total power needs.

Low- and medium-temperature process heat

Large amounts of coal and natural gas are used for process heat in New Zealand. For example, the dairy industry is one of New Zealand's largest coal users. Moving away from fossil fuels for these applications is straightforward. We already know how to do it by using biofuels, such as wood chips, or by moving to the use of electricity. The Climate Commission's final report mentions eliminating coal use for food processing by 2040, but by taking the right moves, we could be largely, or completely out of fossil fuel use for these low and medium temperature applications well before 2030.

High temperature processes

Regarding high temperature process heat, the Climate Change Commission report says that "while there is potential to further decarbonise a range of industrial processes through emerging technologies, we assume these are not available for use before 2035". However, moving beyond what the Commission says, the need to reduce fossil fuel use is rapidly driving changes in technology and the development of new options.

Steel manufacture and processing in New Zealand currently accounts for a major part of our coal use. As an example of recent developments in this area, in July 2021 a Swedish company, HYBRIT, produced its first steel using fossil-free hydrogen instead of coal and coke. It plans to bring fossil-free steel to the market by 2026. Eliminating coal use in these industries by 2030 may well therefore be possible.

Cement manufacture is also currently a major coal user, but other fuels such as wood, agricultural waste, or even car tyres, can be used for this purpose. Emerging technology includes using hydrogen-based fuels or electric heaters.

Agriculture

About 48% of New Zealand's emissions currently come from agriculture. These emissions have increased by around 17% since 1990, largely as a result of the expansion of the dairy sector. Around 71% of these emissions come from methane produced by ruminant animals – mainly cows and sheep, and around 20% from nitrous oxide, a long-lived gas. By 2019, the methane emissions had risen by around 8% and the nitrous oxide emissions by around 54% above 1990 levels.

The increase in nitrous oxide emissions is primarily the result of increased use of synthetic nitrogen fertilisers. This has also led to serious nitrogen pollution of many of New Zealand's waterways. The use of these fertilisers can be greatly reduced by moving to alternatives such as inter-cropping with clover or other legumes that can provide nitrogen captured from the atmosphere, and by moving to regenerative farming approaches that can completely eliminate the need for fertilisers, as well as sequestering carbon into the soil. Reducing cattle numbers to levels that are sustainable in the longer term would also assist.

Reducing biogenic methane emissions is more of a challenge. Reducing cattle numbers is the obvious way to achieve this, including moving to other ways of using the land. However, our understanding is that research is taking place to explore whether cattle that produce lower emissions can be bred, and into types of supplementary feed stocks for cattle that can reduce the emissions they produce.

Assisting steps

There are many steps that can be taken to assist with meeting the required reductions. A few key ones are listed here.

Higher carbon charges

Our charges under our ETS are way below the cost of the damage the emissions are causing, often referred to as the social cost of carbon (SCC). An IPCC group concluded in 2018 that the SCC was above US\$100 (above approx. NZ\$140) / tonne CO₂, and another group (Katharine Ricke et al, Nature Climate Change 2018) came up with an often-quoted figure of US\$417 (approx. NZ\$585) / tonne CO₂. This means we are subsidising the damage the emissions are causing, and effectively passing this cost on to our children, grandchildren and future generations.

The current ETS charges are also far too low to drive the emissions reductions that are needed, which is evident from our ever-increasing emissions since the ETS came into effect over most sectors of our economy in 2010. The charges are also a long way below the figure of US\$177 (approx. NZ\$250) that the IPCC in 2018 concluded would be needed by 2030, but which may well now be an under-estimate.

Higher emissions charges are workable. For example, Sweden already has emissions charges equivalent to around NZ\$190 over part of its economy, which has remained strong. By 2018, its net emissions had dropped by around 27% below 1990 levels, while ours rose by around 31%. Several other European countries also now have emissions charges equivalent to more than NZ\$100 over parts of their economies.

ESR therefore recommends that the government takes the necessary steps to ramp up emissions charges under the ETS far more rapidly. To make this workable, ESR further recommends that a large part of the resulting revenue from these charges be recycled back to the public, for example via a citizen's dividend, so that the public is not seriously adversely affected by the effect the emissions charges have on the prices of goods and services

Further, to make higher emissions charges work properly and effectively, ESR recommends that units purchased from the government for a specific price can only be used during the period when

their cost relates to the actual emissions charges being made, and after that if unused can be sold back to the government for their purchase price. This will remove the ability for businesses to purchase units while prices are lower, “bank” them, and use them later when emissions charges have increased. The use of banked units, which is currently allowed, reduces the incentive for users to lower their emissions, and reduces the revenue the government receives.

Cessation of oil, gas and coal development

The International Energy Agency (IEA), recently released a report (Net Zero by 2050, May 2021) saying that there should be no new oil, gas or coal development if the world is to reach net zero emissions by 2050. ESR recommends that our government adopts this policy.

Targets for phase-out of fossil fuel use

Some developed countries are setting targets for the phase-out of fossil fuel use for various purposes, but New Zealand has not done this yet. ESR therefore recommends that the government introduces targets for the phase-out of coal for electricity production by 2025 and for low- and medium-temperature process heat applications, such as the dairy industry, by 2027.

Changes to how the electricity market operates

As covered above, ESR recommends that the government rapidly introduces legislation, similar to what was proposed in 2013, giving renewably generated electricity priority access to the electricity market, and setting the price paid to producers based on their generating costs, and not on the price paid to the highest priced electricity generator supplying the market at that time.

Also, as covered above, ESR recommends that the way the electricity market operates be further changed so as to give people or businesses with systems for renewably generating electricity, or local grids powered by renewable sources, the right to feed into the grid and to be paid a fair price.

Assistance to businesses

Offering assistance to businesses that are facing major costs in moving away from fossil fuel use may sometimes make sense, if it speeds up their transition and helps protect their future. For example, besides making advice available, some of the revenue from carbon charges could be returned to specific businesses in the short term, in order to assist them in funding their transition. The arguments for introducing this will vary from industry to industry. ESR recommends that the government considers this option on an industry-by-industry basis.

Conclusion

New Zealand needs to take rapid action to play an appropriate role in holding global warming within internationally agreed limits. Neither the current NDC nor the Climate Commission’s currently proposed emissions reduction budgets are nearly strong enough to achieve this.

ESR recommends that we follow what Climate Action Tracker has determined is necessary for New Zealand to do – reduce our gross emissions, other than for biogenic methane, to 44% below 2005 levels by 2030, and preferably up towards a 70% reduction figure.

Reducing biogenic methane emissions, is more of a challenge, but for the time being ESR recommends that we aim somewhat higher than the government's current target to reduce these emissions to 10% below 2017 levels by 2030.

ESR further recommends that we update our NDC to reflect the newly adopted 2030 emissions targets, and that we express our NDC on a net-net, or possibly a gross-gross, basis, but not on an unclear and confusing gross-net basis.

Several other recommendations are made by ESR in this document.

Data

The New Zealand-related data used here is primarily taken from the NZ Greenhouse Gas Inventory 1990-2019, and from the final report of the Climate Commission, released in July 2021.

Monetary values were converted using US\$1 = NZ\$1.40, the approximate conversion rate at the time this material was prepared.

Engineers for Social Responsibility Inc. (ESR) is an independent group of engineers who consider that being knowledgeable in the field of technology means that they also have a special obligation to the public at large in matters that relate to engineering, or that can be addressed using engineering approaches. Given the urgency of the issue, for some time now the organisation has been particularly focused on how to respond to the climate crisis by reducing emissions and concentrations of greenhouse gases in the atmosphere.

The key authors of this report are members of ESR with strong experience and qualifications in engineering, and a broad knowledge in relation to climate change, what is causing it and how it can be addressed.

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