

12 Cooper Street  
Karori  
Wellington 6012

25 March 2021

## **Comments on Climate Change Commission draft report**

Geoff Bertram

I welcome the Commission's draft report, I support the call for more ambitious climate-change action, and I support the concept of a "just transition".

Having made those general points, I have serious concerns with parts of the draft report, and welcome this opportunity to lay those out and suggest how they might be addressed in the final report. Those concerns relate to

- (1) the Commission's acceptance and use of the gross-net accounting methodology which systematically obscures the true record of New Zealand's emissions performance and the actual lack of ambition in targets set to date;
- (2) the Commission's failure to engage with the operational detail of the very dysfunctional electricity market which stands as a roadblock to climate progress whereas it ought to be a key facilitator; and
- (3) the Commission's reluctance to engage with the nuts and bolts of the Emissions Trading Scheme, notwithstanding the lucid and compelling list of major problems in the third paragraph on page 132 of the draft report; and its failure even to canvass alternative price-based policy frameworks such as carbon taxes.

### **The Accounting Framework**

The New Zealand Government has since 1998 seized on the Kyoto Protocol's legitimisation of gross/net emissions accounting as a key device to misrepresent (massively exaggerate) the actual stringency of its emissions-reducing policy. As the Commission notes in Chapter 3 of its "Evidence", page 3, "emissions accounting for targets may differ from national greenhouse gas (GHG) inventories", and on page 4 it says "[t]he 2050 target and emissions budgets have been established through domestic law. This differs from the country's other emissions reduction targets, which are adopted under international agreements and must follow international accounting rules or guidance. This gives more flexibility to include or exclude certain elements of accounting, although broad alignment with existing approaches would have benefits for consistency, credibility and reduced administrative burden" [emphasis added]. The Commission then, unwisely in my submission, fails to align its own emissions accounting with international rules and guidance.

Under the UNFCCC reporting rules, a distinction is made in each country's GHG inventory between "total GHG emissions including net emissions or removals from LULUCF"<sup>1</sup> and "total

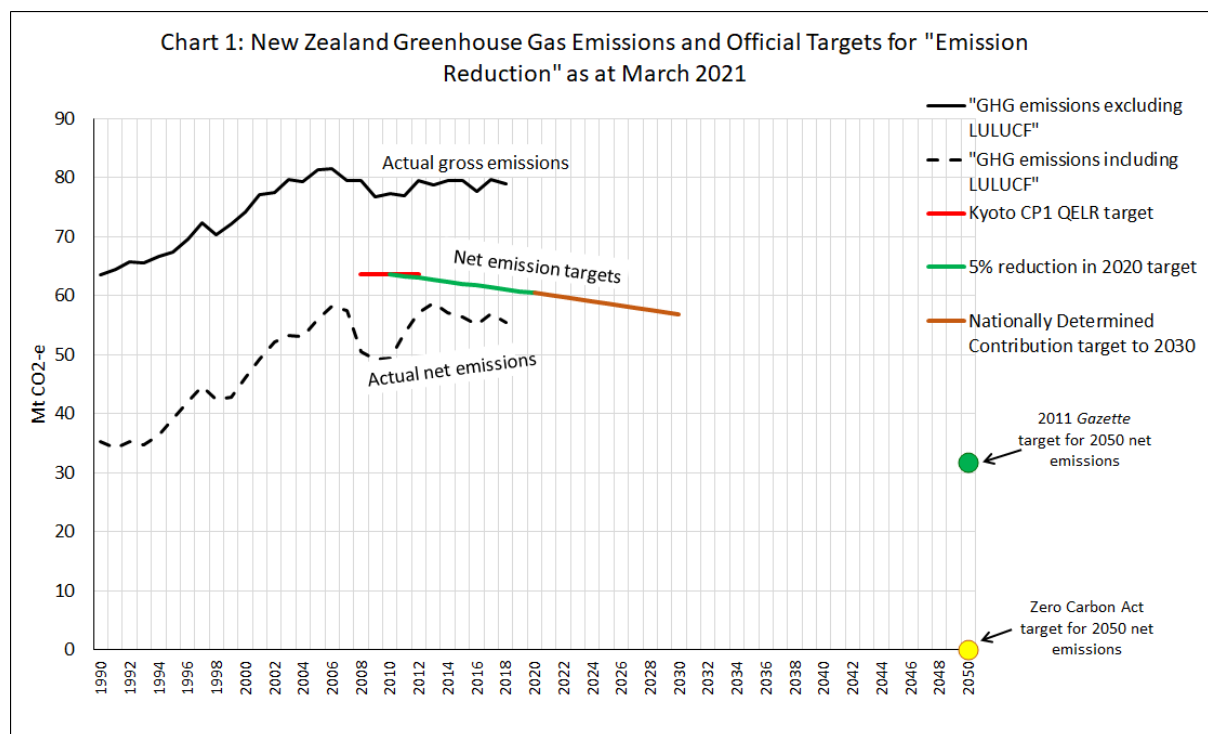
---

<sup>1</sup> LULUCF = Land Use, Land-Use Change, and Forestry. All magnitudes expressed in terms of CO<sub>2</sub> equivalents and including indirect CO<sub>2</sub> emissions - cf UNFCCC document FCCC/TRR.4/NZL, *Report on the*

GHG emissions excluding net emissions or removals from LULUCF". Because of New Zealand's large forestry sector, "net LULUCF emissions or removals" are always a negative number, which means that the reported total "including LULUCF" is consistently lower than the total "excluding LULUCF". Imperfect as the UNFCCC measures and metrics may be, they define the rules for cross-country comparisons, and are not likely to disappear any time soon.

There are therefore two UNFCCC-approved time-series showing New Zealand's emissions over the three decades since 1990. A transparent picture of the amount of mitigation achieved by this country is easily provided by plotting either or (preferably) both of these series. The series excluding LULUCF is generally referred to as "gross emissions", and the series including LULUCF is often referred to as "net emissions". With some divergences in the detail, the two series run almost parallel over the three decades for which we have audited inventory data on the UNFCCC website which is, and will continue to be, the basis on which the international community evaluates New Zealand's performance.

In the chart below I plot the latest official UNFCCC inventory numbers for New Zealand, as submitted in April 2020<sup>2</sup>. I show on the same chart the various targets for "net emissions" that the New Zealand Government has so far offered to the global community. A table of the figures used to produce this chart, with full source references for all numbers, is in Appendix 1 of this submission.



**I submit that this chart, and the underlying data, should be checked for accuracy by Commission staff, and that once this has been done, the chart should appear prominently**

<sup>2</sup> *technical review of the fourth biennial report of New Zealand*, 8 March 2021, [https://unfccc.int/sites/default/files/resource/trr4\\_NZL.pdf](https://unfccc.int/sites/default/files/resource/trr4_NZL.pdf), p.5.  
 New Zealand Common Reporting Format (CRF Table, 15 April 2020, <https://unfccc.int/documents/225160>), Table 10. The numbers are reproduced in Columns 1 and 2 of Table A.1 in the appendix to this submission.

**in section 2.1 of the revised Commission report**, accompanied by whatever explanatory material the Commission feels able to provide.

The conclusion I draw from Chart 1 is that, of the three quantified emission reduction targets or commitments applying that the New Zealand Government has made as at March 2021 for the period up to 2030, not one of them requires any reduction whatever in the actual path of this country's total net emissions as reported to the UNFCCC in New Zealand's inventory reports.

Only the 2011 *Gazette* target of a 50% gross/net reduction by 2050, and the Climate Change Response (Zero Carbon) Amendment Act 2019 s.5Q target of zero by 2050, require any such reduction, and neither of these has a committed time path over the intervening decades – both are pie-in-the-sky.

Our Government has, in other words, made no actual commitment to reduce this country's emissions at all before 2030 if one reads the official targets against the UNFCCC inventory data, as naïve readers and the general public will generally do (and should be entitled to do). New Zealand's Nationally Determined Contribution (NDC) under the Paris Accord aims for net emissions to be 56.9 MT CO<sub>2</sub>-e in 2030 which is higher than actual UNFCCC-recorded net emissions in 2018 of 55.5 MT CO<sub>2</sub>-e.

Gross-net accounting over the past two decades has been a key tool of misinformation, enabling Ministers and officials to talk airily about reductions when in fact there were none. Both the gross-net concept itself and the actual numbers have been repeatedly and opportunistically adjusted and manipulated - most egregiously in setting the NDC, when the peak year of gross emissions, 2005, was chosen as base year and "Kyoto accounting" methodology (designed for a 1990 base year) was applied to that base.

The Commission's draft report perpetuates the confusion when it should have cleared it up. In Box 8.1 on page 151 the draft report calls gross-net accounting "a legitimate internationally agreed approach" and offers the specious justification that a net/net approach might "make the country's climate action look unjustifiably good or bad depending on the point in the harvest cycle..." The Commission then abandons both gross/gross and net/net accounting and settles for the gross/net approach that consistently makes the country's action look unjustifiably good.

This flies in the face both of the Commission's claimed "high-level objective" of a "robust, transparent accounting system which tracks genuine environmental gains while balancing completeness with practicality", and of its first "principle for accounting" namely that the accounts should "seek to cover all material human caused emissions sources and sinks"<sup>3</sup>.

The key problem with gross/net accounting is the omission from the base year and subsequent years of a large chunk of "human caused emissions sources and sinks". The Commission's own definition makes this clear: "the target is expressed relative to gross emissions in a base year, but emissions and removals by forests planted or deforested since the base year are counted towards meeting the target"<sup>4</sup> [emphasis added]. On this basis the

---

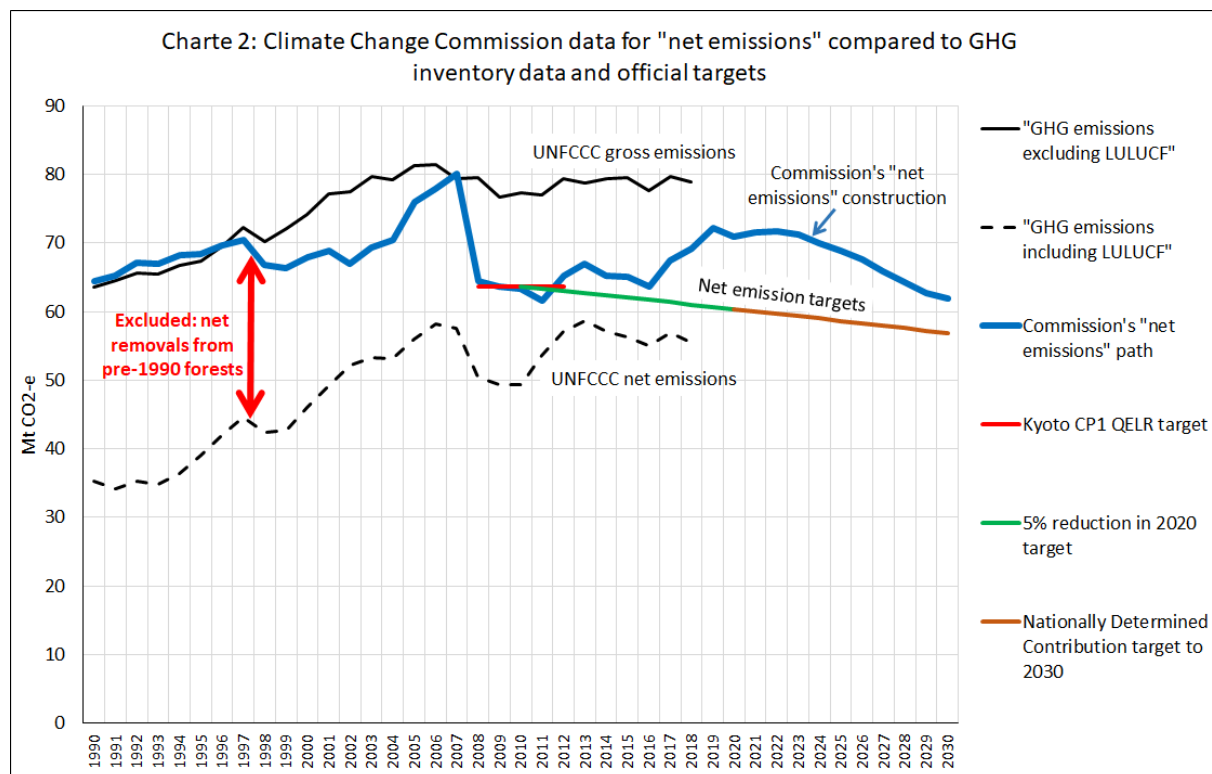
<sup>3</sup> All quotes from Climate Change Commission *Evidence Report Chapter 3: how to measure progress*, p.5

<sup>4</sup> *Evidence Report Chapter 3: how to measure progress*, p.19 Box 3.3; and main report p.151 Box 8.1.

Commission then presents a “net emissions” series that omits all emissions and removals by forests planted before the base year. That practice may represent (one interpretation of) the elaborate Kyoto accounting framework, but it completely fails to “track genuine environmental gains” and to “cover all material human caused emissions sources and sinks”.

**The planet does not care whether forests were planted before or after 1990, and nor should the Commission.**

To show the consequences of the Commission’s adoption of the gross/net accounting fiction, I offer the chart below showing New Zealand’s gross and net emissions as reported to the UNFCCC, compared with the so-called “net emissions” path from 1990 to 2018 constructed by the Commission and inserted into the database of its draft report<sup>5</sup>.



That so-called “net emissions” series, constructed by Commission staff, appears in the bottom panel of Figure 2.2 on page 35 of the draft report. As Chart 2 above makes clear, the start of this series in 1990, at around 64 MT CO<sub>2</sub>-e, is what anyone using the UNFCCC inventory data would call “gross emissions”. The presentation of that 1990 number - and the subsequent set of numbers underlying the report’s Figure 2.2 (shown in Column 10 of Table A.1 in the appendix to this submission) – as “net emissions” can be described as “legitimate” only by hiding behind the narrowest of readings of the letter (far from the spirit) of the Kyoto accounting procedures. These numbers have neither legitimacy nor integrity in terms of the Commission’s own “high-level objective” and “principles”, nor in the eyes of anyone genuinely concerned to evaluate New Zealand’s track record.

<sup>5</sup> "Current policies reference scenario" from <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Scenarios-dataset-v4.xlsx> downloaded 15 March 2021, worksheet titled "Current policy reference".

I urge the Commission to re-think its acceptance of gross/net accounting practice, and to strike out the statement in Chapter 3 of the *Evidence Report* that “gross-net accounting ... avoids the counting of gains or losses that are largely arbitrary effects due to the base year chosen”<sup>6</sup>, given that this is obviously untrue.

I note that in constructing its proposed budgets, the Commission has run into some minor difficulties associated with its use of the gross-net procedure. The total volumes of emissions for the three budget periods shown in Budget Recommendation 1 on page 31 of the draft report, and in Table ES1 on page 17, do not reconcile with the figures for “our path to 2035” as recorded in the Commission’s spreadsheets<sup>7</sup> and used to draw Figure 2.2 on page 35. The budget totals instead come from an “adjusted” series which was required because of difficulties in reconciling the Commission’s so-called “net emissions” path with MPI forestry data<sup>8</sup>.

**I submit that to avoid future confusion - and criticism from people who, like me, take the trouble to check and understand the numbers - the Commission should re-work its spreadsheets, charts and tables using the UNFCCC inventory numbers and methodology for net emissions as the basis, and re-stating the Commission’s budget proposals in UNFCCC-consistent terms. If that involves some embarrassment for the New Zealand Government and its diplomats, so be it. The alternative is that in future the Commission’s own calculations will be discredited as the New Zealand Government’s opportunistic data manipulation becomes more widely understood.**

An important effect of re-working the numbers would probably be to tighten the 2022-25 and 2025-30 budgets quite significantly. Comparison of Columns 2 and 10 of Table A.1 in the appendix to this submission shows that in 2018 New Zealand’s UNFCCC-recorded net emissions were 55.5 MtCO<sub>2</sub>-e whereas the Commission’s fictional Kyoto-style “net emissions” are shown as 69.15 MtCO<sub>2</sub>-e. The Commission’s proposed budget path for its “net emissions” does not come down to match actual UNFCCC net emissions in 2018 of 55.5 MtCO<sub>2</sub>-e until 2028.

---

<sup>6</sup> *Evidence Report Chapter 3: how to measure progress*, p.19 Box 3.3.

<sup>7</sup> 2021 Draft Advice Scenarios dataset v4 at <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Scenarios-dataset-v4.xlsx> worksheet “our path to 2035”, line 19; and 2021 Draft Advice Report charts and data v3-1 at <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Report-charts-and-data-v3.xlsx> worksheet “Chapter 2” line 46. Both datasets downloaded 15 March 2021.

<sup>8</sup> See Note 3 on worksheet “Chapter 2” in <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Report-charts-and-data-v3.xlsx>. The adjusted series used to calculate the budget totals are in line 52 of that worksheet.

## The electricity market<sup>9</sup>

The New Zealand electricity market as presently structured is designed so that the price of all wholesale electricity generated by grid-connected plant is driven to equality with the price offered by the marginal tranche of generation, which is either (i) generated from fossil fuel (given that coal and gas fuelled generation has higher operating costs than renewables such as hydro, geothermal wind and solar), or (ii) supplied from hydro or geothermal plant that has been offered for dispatch at prices that shadow the cost of fossil-fuel generation. As the price of carbon rises, whether under the NZETS or via other policy interventions, the supply price of generation is driven up accordingly, with the result that carbon-pricing policies ostensibly designed to incentivise electrification of the economy have the perverse effect of disincentivising electrification, and thereby subverting the goal of decarbonisation. The market structure means that the electricity price rises alongside the carbon price, with the resulting windfall revenues to renewable generators accruing as pure rents to the owners.

This mechanism is not a mystery. It was well recognised in the 1990s when the market was being designed<sup>10</sup>; it was the reason for inclusion in the NZETS of provision for an Electricity Allocation Factor to [over-]compensate large industrial electricity users for the effect of carbon pricing on their input costs<sup>11</sup>; and it was brought to the attention of Parliament during its consideration of NZETS reform during 2019-20<sup>12</sup>.

So long as non-renewable generation remains on the margin of the wholesale market, this perverse economy-wide disincentive to decarbonisation will persist. **I recommend that section 3.8.3, pp.61-63 of the draft report be considerably expanded to suggest a redesign of the electricity industry.** Ideally, a solution would be to break up the existing cartel of vertically-integrated gentailers, re-nationalise the large-scale hydro and geothermal

---

<sup>9</sup> For my own extensive, detailed analysis of the disastrous electricity market “reforms” since 1986 see for example Geoff Bertram, “What’s wrong with the New Zealand electricity market?” Zoom presentation to Engineers for Social Responsibility, August 19 2020 <https://youtu.be/bX0j1RvsBYk> and <http://www.geoffbertram.com/fileadmin/publications/ESR%20presentation%2019%20August%202020.pdf>; “Weak regulation, rising margins, and asset revaluations: New Zealand’s failing experiment in electricity reform”, Chapter 21 in F.P. Sioshansi (ed) *Evolution of Global Electricity Markets: New Paradigms, New Challenges, New Approaches*, Amsterdam: Elsevier Academic Press, 2013, <http://www.geoffbertram.com/fileadmin/publications/Sioshansi%202013%20book%20chapter.pdf>; “Restructuring of the New Zealand Electricity Sector, 1984-2005”, in *International experience in restructured electricity markets: What works, what does not, and why?*, edited by Sioshansi, FP and Pfaffenberger, W (Amsterdam, Elsevier, 2006), chapter 7, pp. 203-234, <http://www.geoffbertram.com/fileadmin/publications/Sioshansichapter.pdf>.

<sup>10</sup> See, e.g., Geoff Bertram, ““Non-Linear Pricing Theory: the case of wholesale electricity pricing in New Zealand”, *New Zealand Economic Papers* 30, 1 (1996) pp.87-108, concluding point on p.107.

<sup>11</sup> J. Branson, *Review of the Electricity Allocation Factor: report to the Major Electricity Users’ Group*, NZIER, July 2010; Ministry for the Environment, *The New Zealand Emissions Trading Scheme: Modelling the Electricity Allocation Factor – Issues Paper*, November 2019, <https://www.mfe.govt.nz/publications/climate-change/new-zealand-emissions-trading-scheme-modelling-electricity-allocation>, and other documents online at <https://www.mfe.govt.nz/consultations/nzets-electricity-allocation-factor-review>.

<sup>12</sup> Geoff Bertram, *Submission on Climate Change Response (Emissions Trading Reform) Amendment Bill*, submitted to Environment Select Committee of the New Zealand Parliament, January 2020, [https://www.parliament.nz/resource/en-NZ/52SCEN\\_EVI\\_92847\\_EN19999/Od552034107eedd0c18016d0909af6e3f9f0acbb](https://www.parliament.nz/resource/en-NZ/52SCEN_EVI_92847_EN19999/Od552034107eedd0c18016d0909af6e3f9f0acbb), section 5.

generation assets, price their output so as to support decarbonisation, and fully empower local network operators to promote the integration of distributed renewable generation into their networks.

Meantime the move by the electricity industry and the Government towards blocking entry of rooftop solar by imposing heavy fixed charges on residential electricity consumers should be halted in its tracks<sup>13</sup>.

### **The Emissions Trading Scheme**

The New Zealand emissions trading scheme has been dysfunctional since its establishment in 2007<sup>14</sup> and remains dysfunctional following the amendments passed by Parliament in 2020. The scheme has never imposed a cap on domestic emissions, so it is not “cap-and-trade” and should never be sold as such. Had the Commission been empowered to control the issuing of New Zealand Units according to the Commission’s recommended emissions budget, some credibility might have been added. But under the latest version of the NZETS, notional emission limits can be exceeded at any time at the whim of the Minister, and the Commission’s budgets are advisory only. Emission limits are not entrenched, and can be abandoned forthwith upon the election of a new Government.

Huge loopholes - including the “cost containment reserve” and the provision for future importation of offshore emission-mitigation credits - undermine (more accurately, eliminate) the scheme’s credibility. As it stands the scheme provides no certainty for any investor committing to a long-term mitigation or sequestration project, and is an obstacle rather than a support for serious emissions reduction effort. The governance shortcomings identified by the Commission on page 132 of the draft report are really just symptoms of the underlying lack of integrity in the basic design of the scheme.

While the changes recommended by the Commission in section 6.2.6pp.131-134 of the draft report might go some distance towards improving the NZETS, in my submission a simple carbon tax, with the proceeds recycled back – either to the population in general, or to emission-reducing activities, or both – would be a better way to proceed. The NZETS has been, and remains, wide open to gaming, manipulation and capture by large corporate interests and their consultants. It has a potentially corrupting effect on those charged with its administration. Adding in the reputation it has acquired since 2007 (in particular for selling-out forestry owners and allowing New Zealand polluters to share in the fruits of Russian and Ukrainian organised crime<sup>15</sup>), it is not fit for -purpose.

In my submission, while the Commission’s criticisms and recommendations around the NZETS are useful, it should include in section 6.2.6 at the very least a discussion of how a carbon tax

---

<sup>13</sup> For a lucid analysis of this issue see H. Viggers, “Unintended consequences of the removal of the low fixed charge regulations”, Chapter 12 in L. Grant, H. Viggers and P. Howden-Chapman (eds) *Improvising Buildings, Cutting Carbon*, Wellington: Steele Roberts, 2021.

<sup>14</sup> For an early critique see Geoff Bertram and Simon Terry, *The Carbon Challenge: New Zealand’s Emissions Trading Scheme*, Wellington: Bridget Williams Books, 2010.

<sup>15</sup> Geoff Simmons and Paul Young, *Climate Cheats: how New Zealand is cheating on our climate change commitments, and what we can do to set it right*, Morgan Foundation, April 2016, online at [http://morganfoundation.org.nz/wp-content/uploads/2016/04/ClimateCheat\\_Report8.pdf](http://morganfoundation.org.nz/wp-content/uploads/2016/04/ClimateCheat_Report8.pdf)

could quickly be substituted for the ETS<sup>16</sup>, and how such a tax could be harmonised with international carbon-market developments via border adjustments<sup>17</sup>.

---

<sup>16</sup> The International Monetary Fund has recently praised Canada for its adoption of such a simple carbon tax, starting at CAN\$40/ton and rising by 2030 to CAN\$170 per ton. See I. Parry, *Four charts on Canada's carbon pollution pricing system*, 18 March 2021, [https://www.imf.org/en/News/Articles/2021/03/17/na031821-four-charts-on-canadas-carbon-pollution-pricing-system?utm\\_medium=email&utm\\_source=govdelivery](https://www.imf.org/en/News/Articles/2021/03/17/na031821-four-charts-on-canadas-carbon-pollution-pricing-system?utm_medium=email&utm_source=govdelivery).

<sup>17</sup> Geoff Bertram, "Border Carbon Adjustments and Climate Change Policy", in J. Kelsey (ed.) *No Ordinary Deal: Unmasking the Trans-Pacific Partnership Free Trade Agreement*, Wellington and Sydney, Bridget Williams Books and Allen and Unwin, 2010.



# Appendix

**Table A.1: Data used to construct Charts 1 and 2  
in the main submission.**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	"GHG emissions excluding LULUCF" = Gross emissions, Mt CO2-e, 1990-2018 UNFCCC inventory	"GHG emissions including LULUCF" = Net emissions, Mt CO2-e, 1990-2018 UNFCCC inventory	Kyoto CP1 target = 1990 gross emissions, calculated on the basis of the 2020 inventory number for 1990	Unconditional 5% by 2020 target		NDC target for 2030 net emissions to be 30% of 2005 gross emissions		2011 <i>Gazette</i> target for 2050 net emissions to be 50% of 1990 gross emissions	Zero Carbon Act 2020 target for 2050 net emissions to be zero: end point MT CO2-e	Climate Change Commission's "net emissions" path to 2018, and business-as-usual projection to 2050	Climate Change Commission's proposed budget path in their "net" terms	Climate Change Commission's proposed budget path in their "gross" terms	Climate Change Commission's adjusted budget path in their "net" terms
	MtCO2-e	MtCO2-e	MtCO2-e	% of Kyoto CP1 target (subtracting each year's % reduction on 1990 gross emissions)	Calculated budget Mt CO2-e	Equivalent % of 1990 emissions	NDC target Mt CO2-e						
	MtCO2-e	MtCO2-e	MtCO2-e	% of 1990 gross	MtCO2-e	% of 1990 gross	MtCO2-e	MtCO2-e	MtCO2-e	MtCO2-e	MtCO2-e	MtCO2-e	MtCO2-e
1990	63.59	35.29								64.38		63.07	
1991	64.45	34.16								65.25		63.94	
1992	65.67	35.26								67.15		65.32	
1993	65.43	34.73								66.91		64.94	
1994	66.68	36.34								68.29		65.94	
1995	67.43	39.11								68.38		66.82	
1996	69.55	42.08								69.61		68.80	
1997	72.26	44.58								70.51		71.42	
1998	70.22	42.42								66.78		69.82	
1999	72.06	42.75								66.29		71.75	
2000	74.10	45.99								67.87		73.53	
2001	77.11	49.16								68.82		76.69	
2002	77.47	52.16								67.02		76.99	
2003	79.64	53.26								69.35		79.10	
2004	79.29	53.07								70.52		78.69	
2005	81.27	55.95								75.96		80.60	
2006	81.46	58.15								77.92		80.90	
2007	79.42	57.52								80.03		78.99	
2008	79.53	50.47	63.59							64.41		79.22	
2009	76.77	49.27	63.59							63.62		76.34	
2010	77.27	49.36	63.59	100.00%	63.59					63.28		76.89	
2011	76.98	53.63	63.59	99.50%	63.27					61.58		76.51	
2012	79.40	57.02	63.59	99.00%	62.96					65.30		78.79	
2013	78.80	58.69		98.50%	62.64					66.92		78.32	
2014	79.45	57.12		98.00%	62.32					65.16		78.90	
2015	79.49	56.31		97.50%	62.00					65.11		79.01	
2016	77.62	55.09		97.00%	61.68					63.71		77.22	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2017	79.64	56.93		96.50%	61.37					67.41		79.21	
2018	78.86	55.47		96.00%	61.05					69.15	69.15	78.61	
2019				95.50%	60.73					72.13	72.15	81.00	
2020				95.00%	60.41	95.00%	60.41			70.87	70.77	78.06	
2021						94.45%	60.06			71.63	71.02	77.18	
2022						93.89%	59.71			71.79	70.40	76.49	67.7
2023						93.34%	59.36			71.27	69.33	75.04	67.7
2024						92.79%	59.00			70.00	67.60	73.39	67.7
2025						92.23%	58.65			68.87	65.75	71.88	67.7
2026						91.68%	58.30			67.53	63.35	70.61	57.3
2027						91.13%	57.95			65.82	60.88	69.05	57.3
2028						90.57%	57.60			64.22	58.07	67.19	57.3
2029						90.02%	57.24			62.67	55.04	65.05	57.3
2030						89.47%	56.89			61.97	52.68	63.46	57.3
2031										61.37	50.15	61.67	44.6
2032										60.51	47.74	59.98	44.6
2033										59.81	45.55	58.31	44.6
2034										58.94	43.11	56.51	44.6
2035										57.56	40.22	54.69	44.6
2036										56.07			
2037										53.89			
2038										52.25			
2039										50.53			
2040										48.81			
2041										47.35			
2042										46.11			
2043										44.92			
2044										43.67			
2045										42.25			
2046										40.78			
2047										39.33			
2048										37.89			
2049										36.48			
2050								31.80	0	35.18			

Sources on next page.

## Sources for Table A.1.

Columns (1) and (2) from <https://unfccc.int/sites/default/files/resource/nzl-2020-crf-15apr20.zip> downloaded and extracted 15 March 2021, Table 10.

Column (3) sets net emissions 2008-2012 equal to 1990 gross emissions.

Column (4) from Ministry for the Environment, *New Zealand's Initial Report: New Zealand's Report to facilitate the calculation of its emissions budget for the period 2013 to 2020*, <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/New%20Zealand%27s%20Initial%20Report%20July%202016.pdf> , downloaded 15 March 2021, p.12 Table A.1.

Column (5) applies the percentage figures in Column (4) to 1990 gross emissions.

Column (6) applies the methodology sketched in the Commission's *Evidence Report Chapter 10: Requests under s5K relating to the Nationally Determined Contribution and biogenic methane – supporting evidence*, <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/evidence/advice-report-DRAFT-1ST-FEB/Evidence-CH-10-S5K-requests-methane-and-NDC-26-Jan-2021.pdf> downloaded 15 March 2021, p.4 Figure 10.1, setting the 2030 target at 70% of 2005 gross emissions, which converts to 89.46574% of 1990 gross emissions.

Column (7) applies the percentage figures in Column (6) to 1990 gross emissions.

Column (8) from "Climate Change Response (2050 emissions target) Notice 2011", *New Zealand Gazette* 31 March 2011, [https://www.dia.govt.nz//Pubforms.nsf/NZGZT/NZGazette41Mar11.pdf/\\$file/NZGazette41Mar11.pdf#page=28](https://www.dia.govt.nz//Pubforms.nsf/NZGZT/NZGazette41Mar11.pdf/$file/NZGazette41Mar11.pdf#page=28) (accessed 27 March 2019), p.987.

Column (9) from Climate Change Response Act 2002 (as at 15 March 2021) section 5Q.

Column (10) from <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Scenarios-dataset-v4.xlsx> , downloaded 15 March 2021, sheet "Current policy reference", line 19.

Column (11) from Climate Change Commission *2021Draft Advice Scenarios V.4* from <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Scenarios-dataset-v4.xlsx> downloaded 15 March 2021, sheet "Our path to 2035", line 19.

Column (12) from <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Scenarios-dataset-v4.xlsx> , downloaded 15 March 2021, sheet "Our path to 2035" line 20.

Column (13) from <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/2021-Draft-Advice-Report-charts-and-data-v3.xlsx> downloaded 15 March 2021, worksheet "Chapter 2" line 52.