

Climate Goals for New Zealand in 2030:

*An Ambitious Domestic Emissions Target
within an Appropriate Share of the Global Budget*

ANNEX D

Effect of new GWPs on base emissions values and targets

Background

This Annex explores the effect which the change in the GWP metrics ('global warming potential') of all greenhouse gases, recently undertaken by the international community, has on calculations pertaining to New Zealand's emissions reporting and accountability under the UN Framework Convention on Climate Change.

The original GWPs used for purposes of reporting under the UNFCCC and its Kyoto Protocol were based on those calculated in the IPCC's 1st Assessment Report (2001). Following calculations used in the 4th IPCC Report (2007), new metrics have recently been adopted. These metrics have then been applied retroactively to the information reported by New Zealand covering its emissions from 1990 to the present.

These changes have implications for all aspects of GHG emissions accounting, both past and future. It changes the figures of New Zealand's emissions (both gross and net) for the period 1990 to 2015. For example, to cite the best-known figure, the gross emissions for New Zealand for the base-year, 1990: under the original GWPs, this was 60.6 Mt CO₂e; and under the new GWPs, this has increased to 66.7 Mt.

The changes also affect calculations of global emissions and those of all other countries, to a greater or lesser extent. And, critically, it affects the global carbon budget and the national responsibility levels of all countries.

These issues are explored in detail below.

Effect of New GWPs on New Zealand's Emissions Statistics

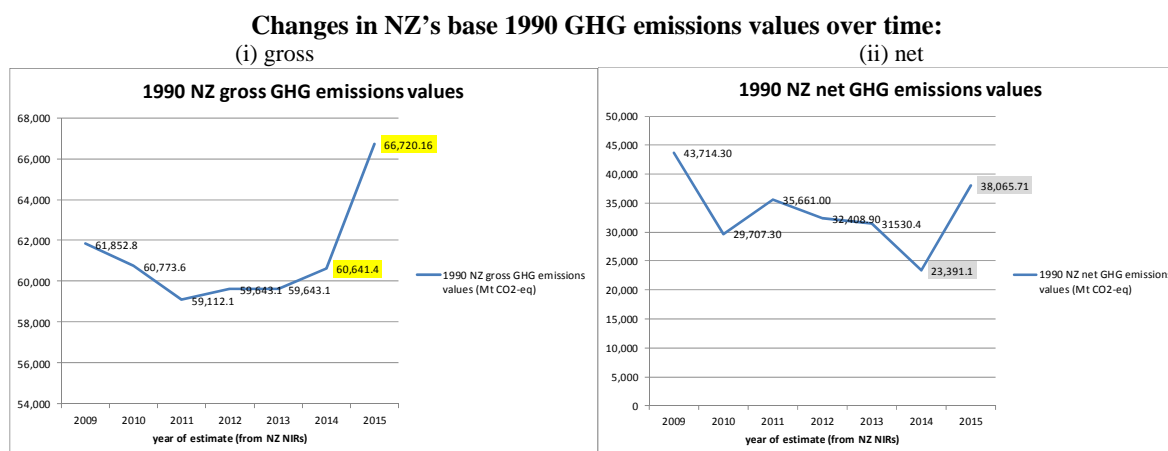
The CERP public website data (climateequityreference.org, gdrights.org), censored at 1 September 2015 and used in this analysis, reports NZ baseline gross GHG emission at 1990 as being 60.6414 Mt CO₂-e and net GHG emissions at 23.3911 Mt CO₂-e.

This is based on values provided in NZ's 2014 National Inventory Report (NIR) (MfE NZ Greenhouse Gas Inventory 1990-2012, 2014)¹ and in UNFCCC data for Annex I countries reported in WRI's CAIT 2014 baseline emissions data by country and accessed by the CERP.

However, the latest global warming potential (GWP)-adjusted all-gas GHG values for NZ (gross and net), as for other countries as required under the UNFCCC's reporting requirements for National Inventory Reports for 2015, have caused changes to NZ's baseline GHG estimates including for the base 1990 year.²

Using the new GWPs, NZ's base 1990 emissions reported in 2015 therefore rose to 66.7 Mt CO₂-e for gross GHG emissions and 38.0657 MtCO₂-e net emissions. See the datapoints highlighted in yellow (for gross emissions) and grey (for net) in the Figures 1 and 2.

Figure 1



¹ Source references provided at the end of this Annex

² GWP adjustments arose from the IPCC AR4 in 2007 – see MfE NZ Greenhouse Gas Inventory 1990-2013, April 2015 https://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/nzl-2015-nir-31jul.zip pages xiv-xvi

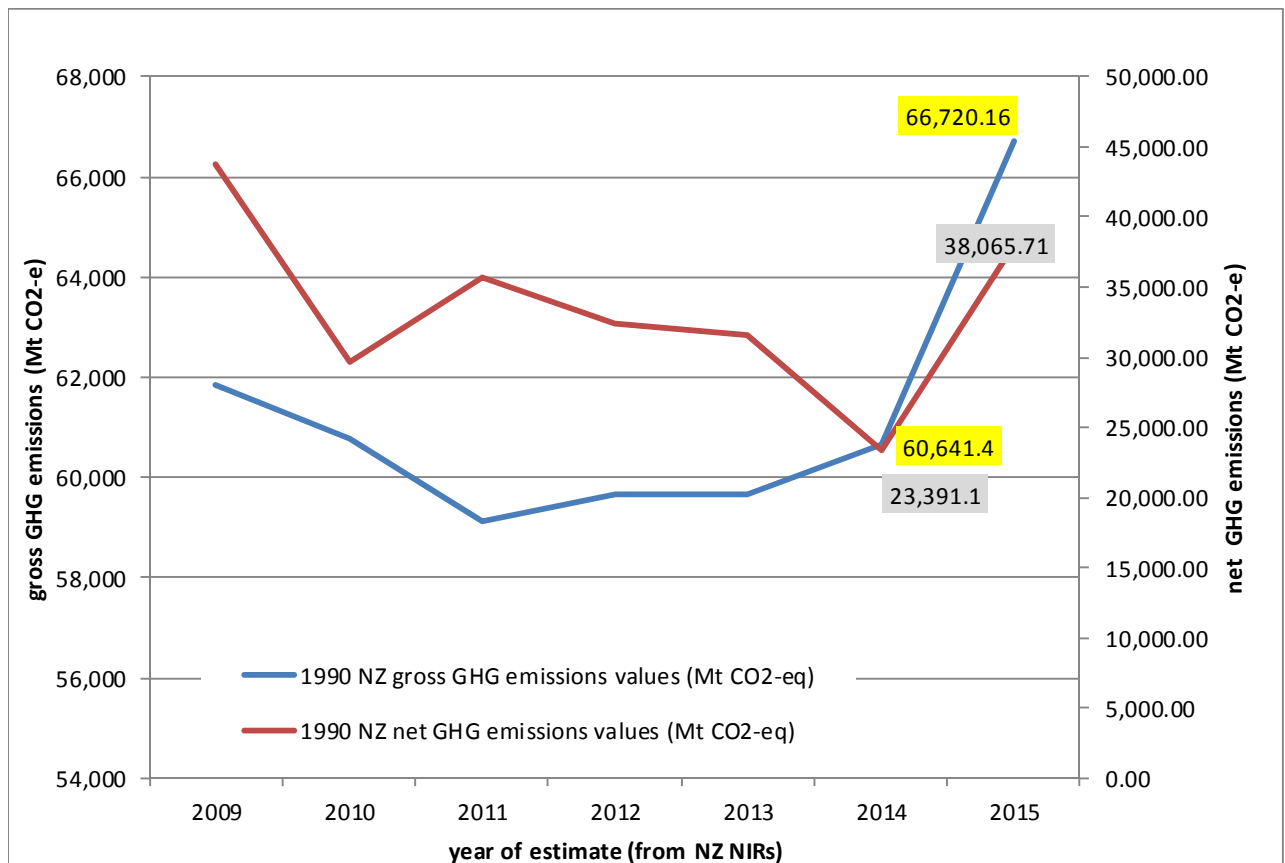
These new 1990 base values reported in the 2015 NIR were therefore rises of 10% and 63% above the 1990 base values reported in 2014 for gross and net GHG emissions respectively:

- For gross emissions, the change in the 1990 baseline in reported 2015 vs. reported in the previous year (and used by current CERP data) = 66,720.16 kt CO₂-e vs. 60,641.4 = $(66,720.16/60,641.4)-1 = +10\%$ relative change, being a 6.1 Mt absolute difference.
- For net emissions, the change in the 1990 baseline in reported 2015 vs. reported in the previous year (and used by current CERP data) = 38,065.71 kt CO₂-e vs. 23,391.1 = $(38,065.71/23,391.1)-1 = +63\%$ relative change, being a 14.7 Mt absolute difference.

Hence, the base 1990 emissions have increased with the new GWPs etc (see figure 2 below), but the changes has been even greater for net emissions than for gross.

Figure 2

1990 NZ gross and net GHG emissions values, changing with sequential NZ GG Inventory reports (NIRs)



These changes in the 1990 base mean there is volatility in estimates, as seen in figures 3 to 5; the change in base is particularly pronounced when comparing the 2015 NIR with the 2014 NIR data (the datasets relevant to this analysis).

Figure 3
Changes in NZ's 1990-early 2010s' gross GHG emissions values, over time in NIRs

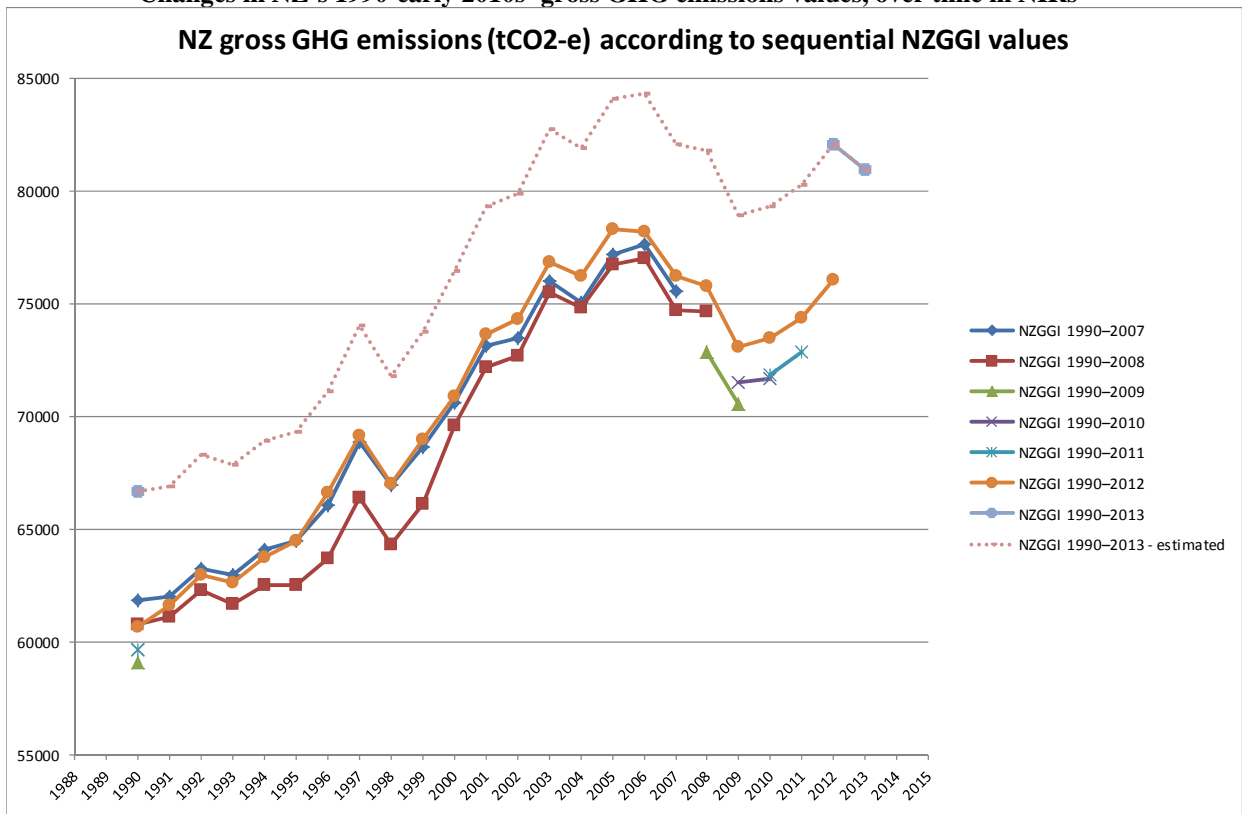
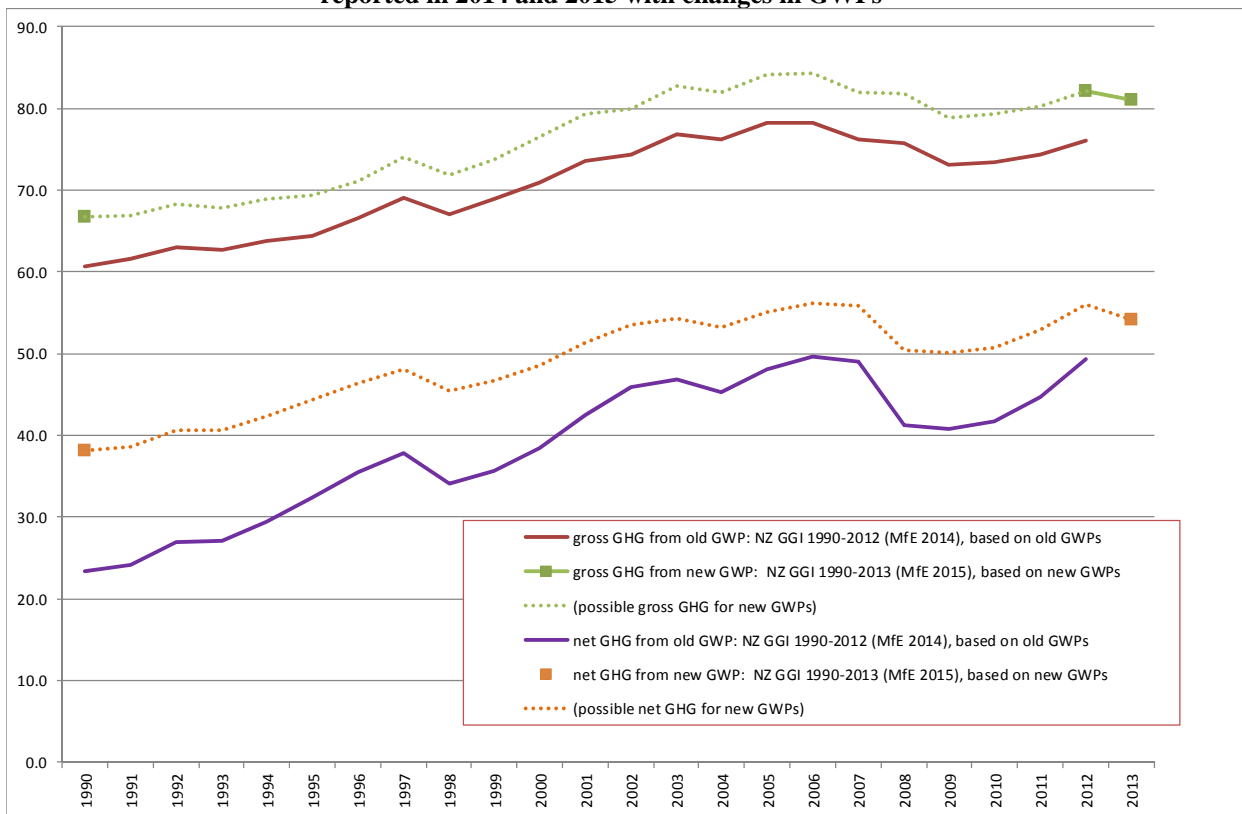


Figure 4
NZ's 1990 to 2012/13 gross and net GHG emissions values (MtCO₂-e), reported in 2014 and 2015 with changes in GWPs*



*with modelling for most of the 2015 NIR (NZ GGI 1990-2013) reporting

Figure 5

Source NZ NIR information for gross and net GHG emission trends, set side-by-side

(i) 2014 NIR (1990-2012 emissions)

(i) 2015 NIR (1990-2013 emissions)

Figure 2.1.1 New Zealand's total and net emissions (under the Climate Change Convention) from 1990 to 2012

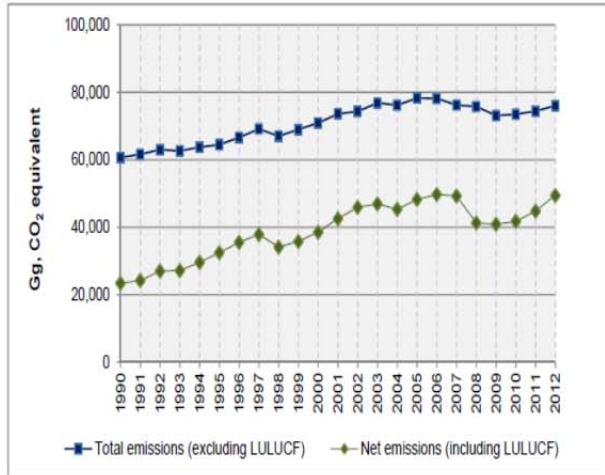
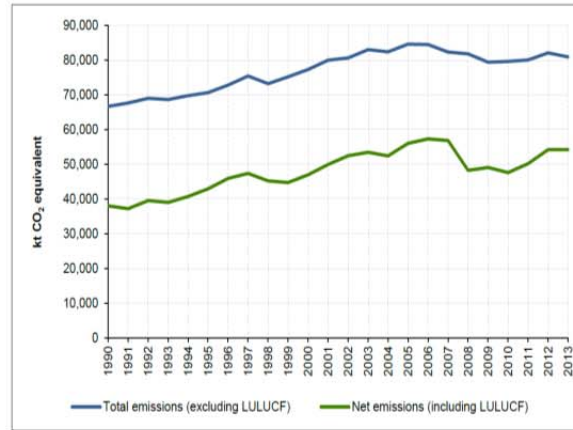


Figure 2.1.1 New Zealand's total and net emissions (under the Climate Change Convention) from 1990 to 2013



old GWPs:

<http://www.mfe.govt.nz/publications/climate-change/new-zealand-greenhouse-gas-inventory-1990-2012>
New Zealand's Greenhouse Gas Inventory 1990-2012

April 2014

In 1990, New Zealand's total greenhouse gas emissions were 60,641.4 gigagrams carbon dioxide equivalent (Gg CO₂-e). In 2012, total greenhouse gas emissions had increased by 15,406.5 Gg CO₂-e (25.4 per cent) to 76,048.0 Gg CO₂-e. Since 2011, New Zealand's total greenhouse gas emissions have increased by 1,654.5 Gg CO₂-e. In 1990, New Zealand's net greenhouse gas emissions were 23,391.1 Gg CO₂-e. In 2012, net greenhouse gas emissions had increased by 26,058.6 Gg CO₂-e (111.4 per cent) to 49,449.7 Gg CO₂-e.

new GWPs:

<http://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/national-inventory-report%20updated%2012%2012%20July%202015.pdf>
New Zealand's Greenhouse Gas Inventory 1990-2013 Snapshot

April 2015

In 1990, New Zealand's total greenhouse gas emissions were 66,720.16 kt carbon dioxide equivalent (CO₂-e). In 2013, total greenhouse gas emissions had increased by 14,241.48 kt CO₂-e (21.4 per cent above 1990 levels) to 80,961.64 kt CO₂-e. Since 2012, New Zealand's total greenhouse gas emissions have decreased by 1,116.3 kt CO₂-e (1.4 per cent). In 1990, New Zealand's net greenhouse gas emissions were 30,065.71 kt CO₂-e. In 2013, net greenhouse gas emissions had increased by 16,134.82 kt CO₂-e (42.4 per cent) to 54,200.53 kt CO₂-e. see pages xiv-xvi, 33, 39, 136, 195, 201, 318 re changes from 2014 GGI

These changes in GWP-bases therefore affect the targets in the analysis:

- The espoused e.g. current 2030 targets for gross GHG emissions of 18.1 Mt CO₂-e (CERP 2' pathway 1990 responsibility mid-equity model) or 22.2 (Contraction & Convergence model), start from the old NZ gross emissions reported in the 2014 NZ NIR, as 60.6 Mt in 1990, 76.0 in 2013, 76.9 in 2013, 79.4 estimated for 2015. So for CERP-based targets, emissions are calculated to reduce from 79.4 in 2015 down to the 18.1 Mt target for 2030 – this being a -77% reduction from 2015, -76% from 2013 or 2012, and -70% from the 60.6 base 1990 level.
- However, under the new GWPs etc in the 2015 NZ NIR, targets should be starting from the new values for gross GHG emissions as 66.7 Mt in 1990, 82.1 in 2012, and 81.0 in 2013. So that same 18.1 Mt target, if not adjusted becomes a -78% reduction from 2012 or 2013, 73% from 1990 – ie the relative change becomes more pronounced. This has commensurate effects on absolute changes, which either need to become larger to maintain the same targets, or the targets need to rise in order to maintain the same relative or absolute changes (which differ anyway).
- Similar issues would apply for net GHG emissions, but perhaps more so given the relatively larger change (+63% change, 14.7 Mt absolute increase) in the 1990 net base between the 2014 and 2015 NZ NIRs as reported.

This analysis has retained the CER targets as calculated at 1 September 2015 and has not attempted to adjust for the new GWP-based adjusted 1990 bases. Note the CER data at this time are based on WRI CAIT 2014 baseline emissions data by country, which in turn had not as yet been updated for new GWPs.

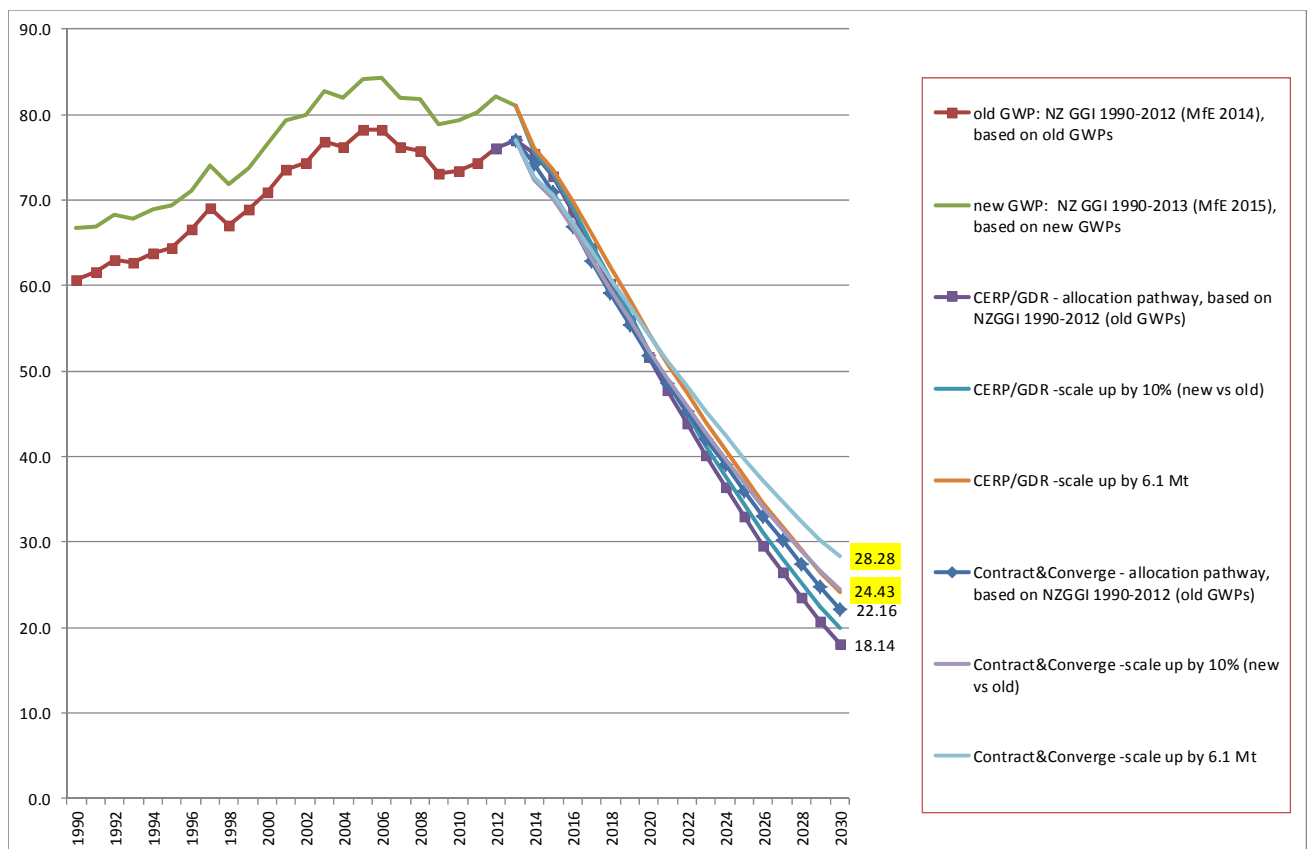
Were new new-GWP-based values used (where 1990, 2012 and 2013 are real data in the April 2015 NZGGI), then there would be various ways to calculate new targets, eg:

- inflating all targets by the ratio of new-GWP-based 1990 emissions to old-GWP-based 1990 emissions (i.e. 66.7/60.64), e.g. the 18.1 Mt 2030 target for gross GHG under the current CERP model becomes 20.0; the 22.2 target under Contraction & Convergence becomes 24.4.
- adding 6.1 Mt to all targets, i.e. the absolute difference between new-GWP-based 1990 emissions to old-GWP-based 1990 emissions (i.e. 66.7 minus 60.6), e.g. the 18.1 Mt target under the current CERP model becomes 24.2; the 22.2 target under Contraction & Convergence becomes 28.3.

These changes could mean increases of 1.9 to 6.1 Mt CO₂-e absolute increases in the CERP gross target (i.e. 10-34% relative increases on the 18.1 Mt target), and 2.2 to 6.1 Mt increases in the Contraction & Convergence target (i.e. 10-27% increase). See Figure 6.

Figure 6

Possible changes to targets for NZ for 2030 under new-GWP-based baseline gross GHG emissions*

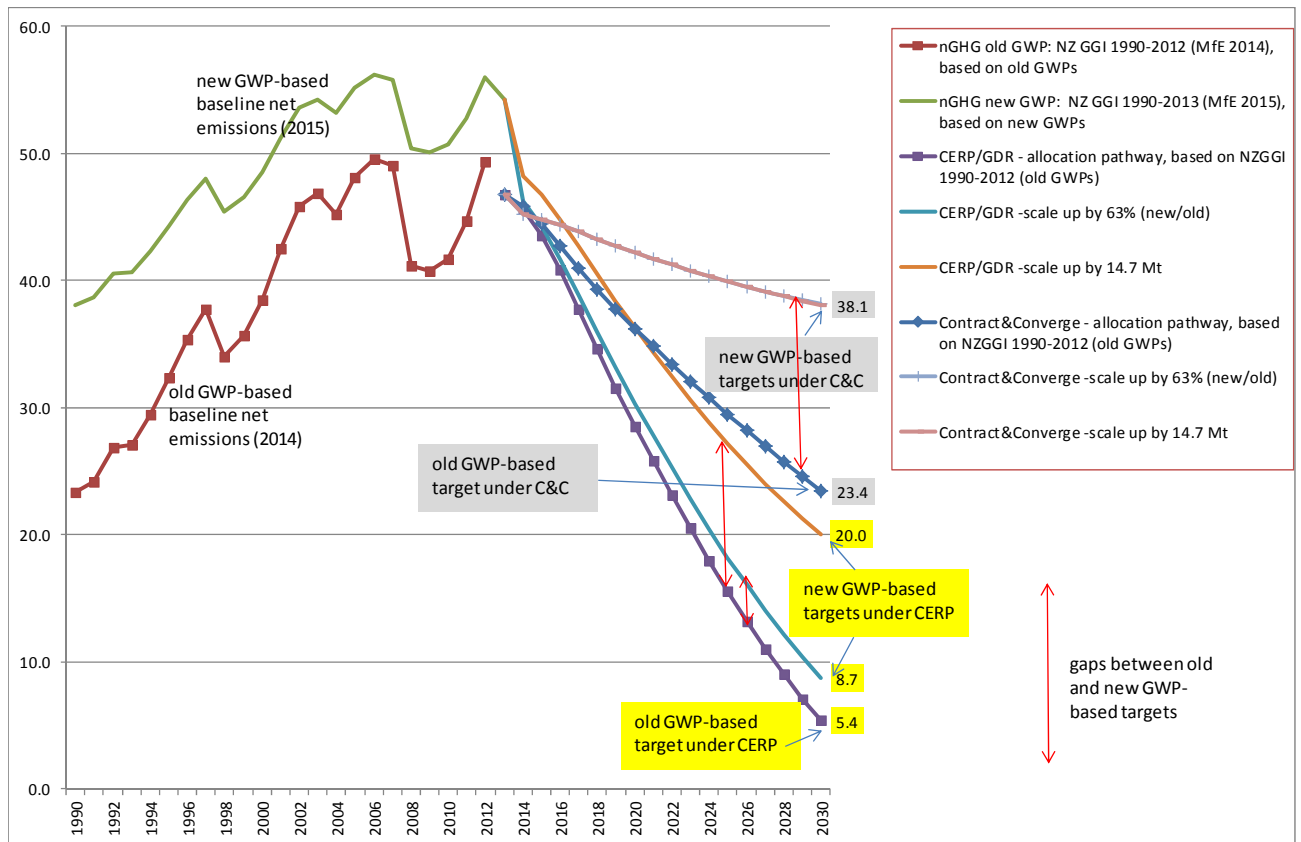


*according to different algebraic assumptions; old-GWP baseline targets 18.1 MtCO₂-e under CERP, 22.2 Mt under Contraction & Convergence

Similarly, for net GHG emissions, but more pronounced than with gross GHG, the espoused 5.4 and 23.4 Mt CO₂-e net targets (for CERP Contraction & Convergence respectively) could increase to 8.7 or 20.0 Mt for CERP and 38.1 for Contraction & Convergence. These could be 3.3 to 14.7 Mt absolute increases in the CERP net target and a 14.7 Mt increase in the Contraction & Convergence net target, see Figure 7.

Figure 7

Possible changes to targets for NZ for 2030 under new-GWP-based baseline net GHG emissions*, according to different algebraic assumptions



*where CERP 2030 target is 5.4 MtCO₂-e under old-GWP baseline, 23.4 Mt under Contraction&Convergence

Sources:

New Zealand's Greenhouse Gas Inventory 1990–2007. Ministry for the Environment, April 2009.
<http://www.mfe.govt.nz/publications/climate-change/new-zealand%E2%80%99s-greenhouse-gas-inventory-1990%E2%80%932007/chapter-2-trends>

New Zealand's Greenhouse Gas Inventory 1990–2008. Ministry for the Environment, April 2010.
<http://www.mfe.govt.nz/publications/climate-change/new-zealand%E2%80%99s-greenhouse-gas-inventory-1990%E2%80%932008>

New Zealand's Greenhouse Gas Inventory 1990–2009. Ministry for the Environment, April 2011.
<http://www.mfe.govt.nz/publications/climate-change-environmental-reporting/new-zealand%E2%80%99s-greenhouse-gas-inventory-1990%E2%80%932009>

New Zealand's Greenhouse Gas Inventory 1990–2010. Ministry for the Environment, April 2012.
<http://www.mfe.govt.nz/publications/climate-change-environmental-reporting/new-zealand%E2%80%99s-greenhouse-gas-inventory-1990%E2%80%932010>

New Zealand's Greenhouse Gas Inventory 1990–2011. Ministry for the Environment, April 2013.
<http://www.mfe.govt.nz/publications/climate-change-environmental-reporting/new-zealand%E2%80%99s-greenhouse-gas-inventory-1990%E2%80%932011>

New Zealand's Greenhouse Gas Inventory 1990–2012. Ministry for the Environment, April 2014.
<http://www.mfe.govt.nz/publications/climate-change/new-zealand%E2%80%99s-greenhouse-gas-inventory-1990%E2%80%932012>

New Zealand's Greenhouse Gas Inventory 1990–2013. Ministry for the Environment, April 2015.
<http://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/national-inventory-report%20updated%2029%20July%202015.pdf>