

Climate Change: Targets, Timetables, Equity

Post-2012 Roundtable

Wellington

7 August 2008

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Categories of stabilisation levels

“Mitigation efforts and investments over the next two to three decades will have a large impact on opportunities to achieve lower stabilisation levels.”

Category	CO ₂ concentration at stabilization (2005 = 379 ppm) ^(b)	CO ₂ -equivalent concentration at stabilization including GHGs and aerosols (2005 = 375 ppm) ^(b)	Peaking year for CO ₂ emissions ^(a, c)	Change in global CO ₂ emissions in 2050 (% of 2000 emissions) ^(a, c)	Global average temperature increase above pre-industrial at equilibrium, using “best estimate” climate sensitivity ^{(d), (e)}	Global average sea level rise above pre-industrial at equilibrium from thermal expansion only ^(f)	Number of assessed scenarios
	ppm	ppm	year	percent	°C	metres	
I	350 – 400	445 – 490	2000 – 2015	-85 to -50	2.0 – 2.4	0.4 – 1.4	6
II	400 – 440	490 – 535	2000 – 2020	-60 to -30	2.4 – 2.8	0.5 – 1.7	18
III	440 – 485	535 – 590	2010 – 2030	-30 to +5	2.8 – 3.2	0.6 – 1.9	21
IV	485 – 570	590 – 710	2020 – 2060	+10 to +60	3.2 – 4.0	0.6 – 2.4	118
V	570 – 660	710 – 855	2050 – 2080	+25 to +85	4.0 – 4.9	0.8 – 2.9	9
VI	660 – 790	855 – 1130	2060 – 2090	-90 to +140	4.9 – 6.1	1.0 – 3.7	5

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IV	485 – 570	590 – 710	2020 – 2060	-10 to 5	3.2 – 4.0	0.6 – 2.4	118
V	570 – 660	710 – 855	2050 – 2080	0 to 15	3.6 – 4.9	0.8 – 2.9	9
VI	660 – 790	855 – 1130	2060 – 2090	15 to 55	4.9 – 6.1	1.0 – 3.7	5

Delay of 5 years lifts stabilisation level by 0.4°C

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Category	CO ₂ concentration at stabilization (2005 = 379 ppm) ^(b)	CO ₂ equivalent concentration at stabilization (2005 = 375 ppm) ^(g)	Peaking year emissions ^(a, c)	Change in global emissions in 2000 ^(a, c)	Global average temperature increase above pre-industrial at equilibrium, using “best estimate” climate sensitivity ^{(d), (e)}	Global average sea level rise above pre-industrial at equilibrium from thermal expansion only ^(f)	Number of assessed scenarios
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Difference is the headroom for non-CO₂ greenhouse gases

WG3 Chapter 13, page 776

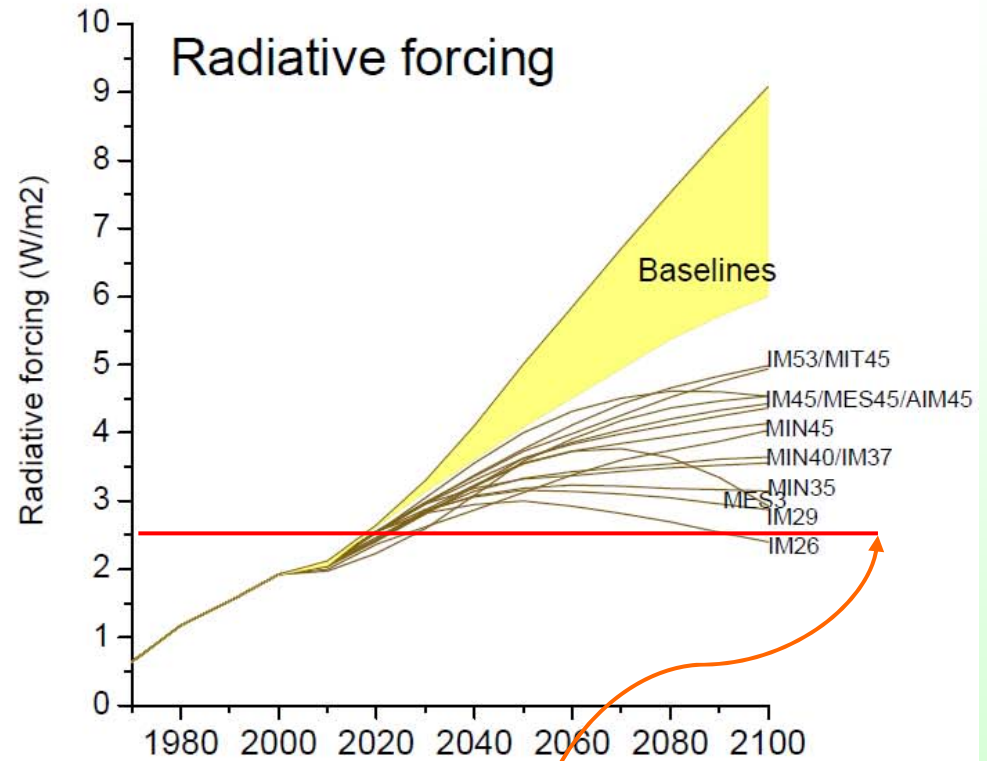
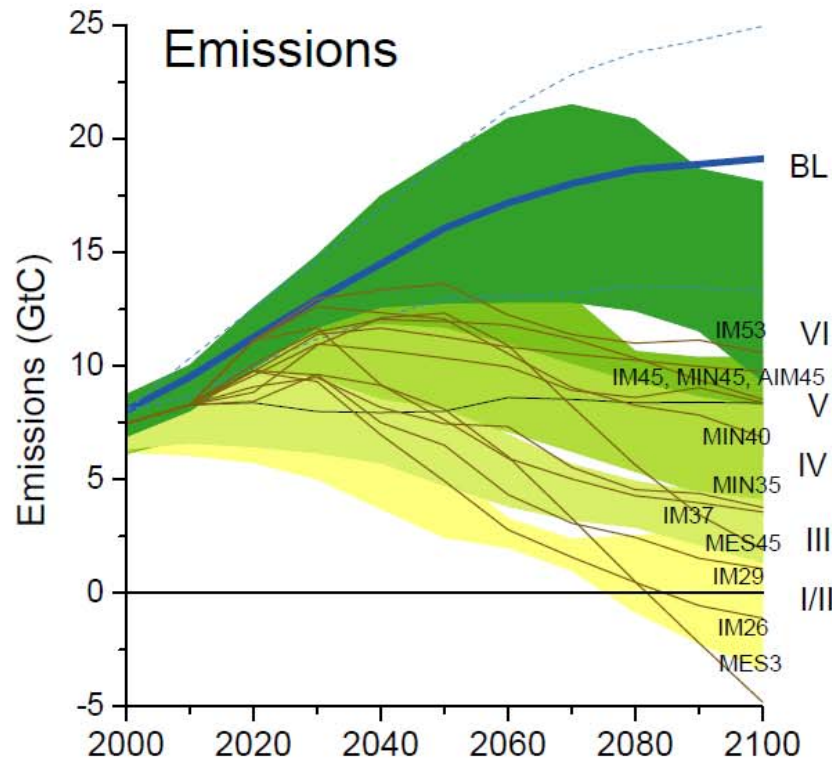
Box 13.7 The range of the difference between emissions in 1990 and emission allowances in 2020/2050 for various GHG concentration levels for Annex I and non-Annex I countries as a group^a

Scenario category	Region	2020	2050
<i>A-450 ppm CO₂-eq^b</i>	Annex I	-25% to -40%	-80% to -95%
	Non-Annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia and Centrally-Planned Asia	Substantial deviation from baseline in all regions
<i>B-550 ppm CO₂-eq</i>	Annex I	-10% to -30%	-40% to -90%
	Non-Annex I	Deviation from baseline in Latin America and Middle East, East Asia	Deviation from baseline in most regions, especially in Latin America and Middle East
<i>C-650 ppm CO₂-eq</i>	Annex I	0% to -25%	-30% to -80%
	Non-Annex I	Baseline	Deviation from baseline in Latin America and Middle East, East Asia

Notes:

- ^a The aggregate range is based on multiple approaches to apportion emissions between regions (contraction and convergence, multistage, Triptych and intensity targets, among others). Each approach makes different assumptions about the pathway, specific national efforts and other variables. Additional extreme cases – in which Annex I undertakes all reductions, or non-Annex I undertakes all reductions – are not included. The ranges presented here do not imply political feasibility, nor do the results reflect cost variances.
- ^b Only the studies aiming at stabilization at 450 ppm CO₂-eq assume a (temporary) overshoot of about 50 ppm (See Den Elzen and Meinshausen, 2006).

Recent studies of emission scenarios



Corresponds to a long term warming of 2°C for our best estimate of climate sensitivity to greenhouse gases

Targets rely on lowest of studied scenarios

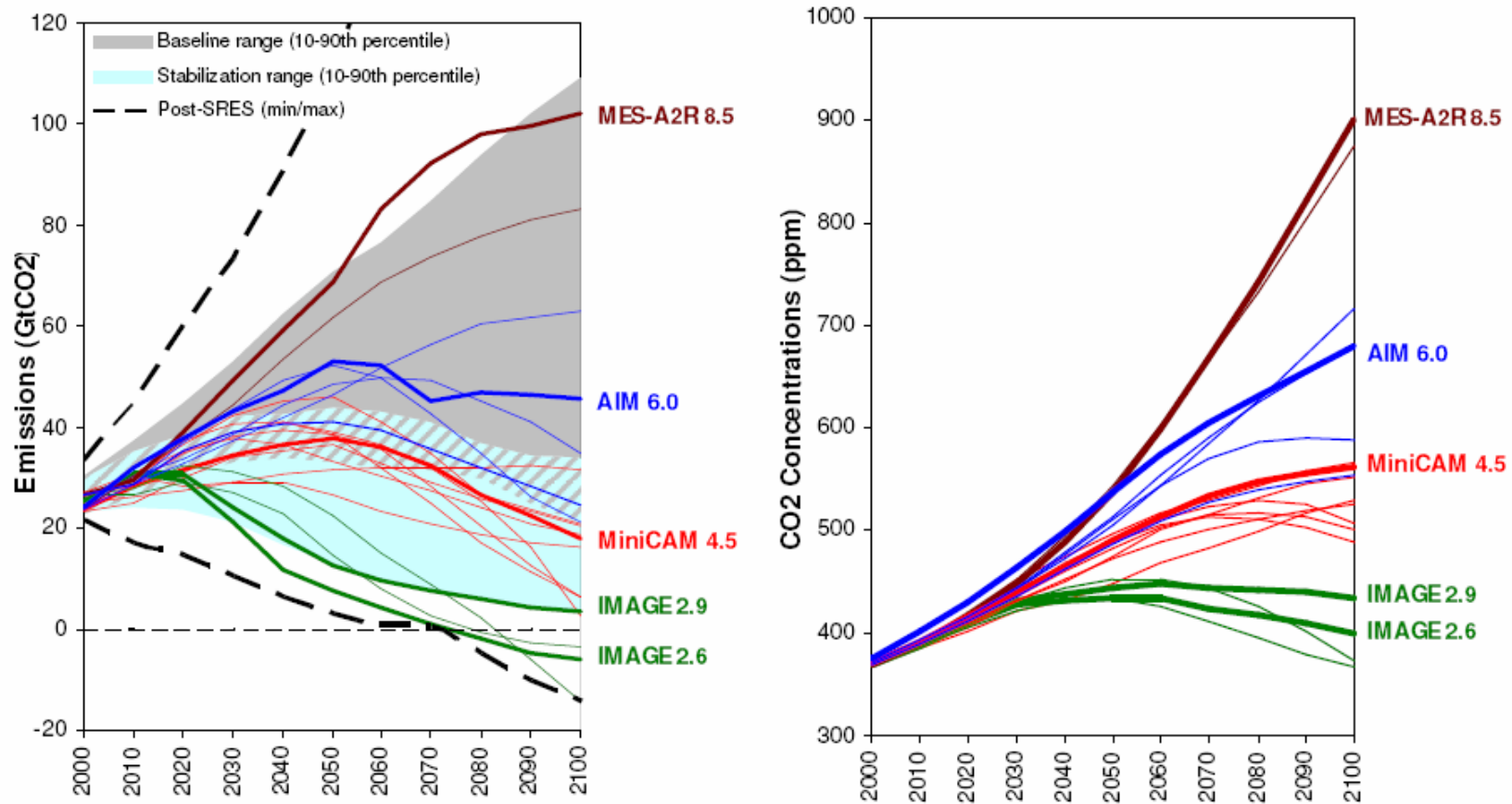


Figure III.2. Energy and industry CO₂ emissions and concentrations for RCP candidates (colored lines), and for the maximum and minimum (dashed lines) and 10th to 90th percentile (shaded area) in the post-SRES literature. Blue shaded area indicates mitigation scenarios; gray shaded area indicates baseline scenarios.³²

Selection of RCPs

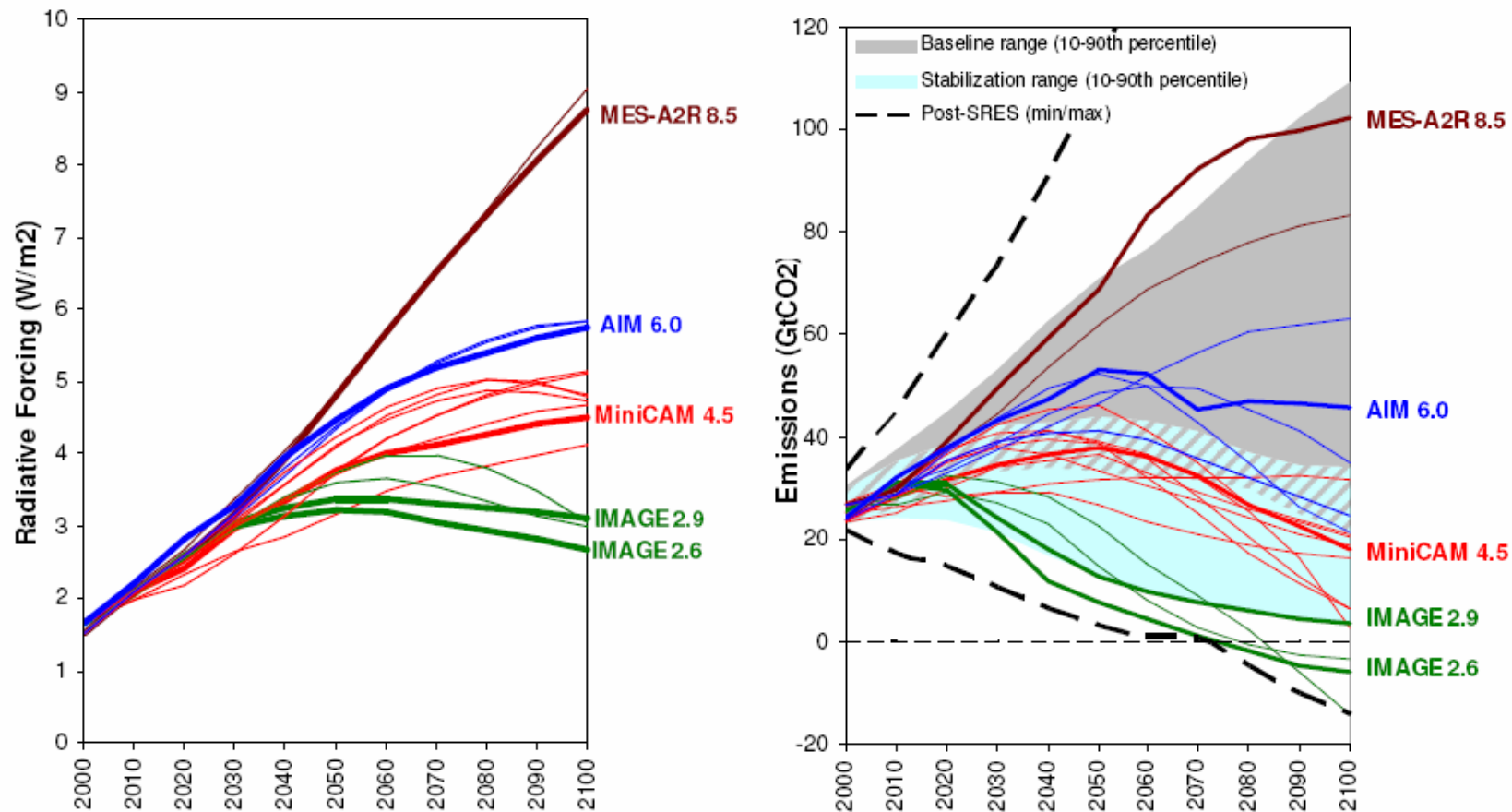
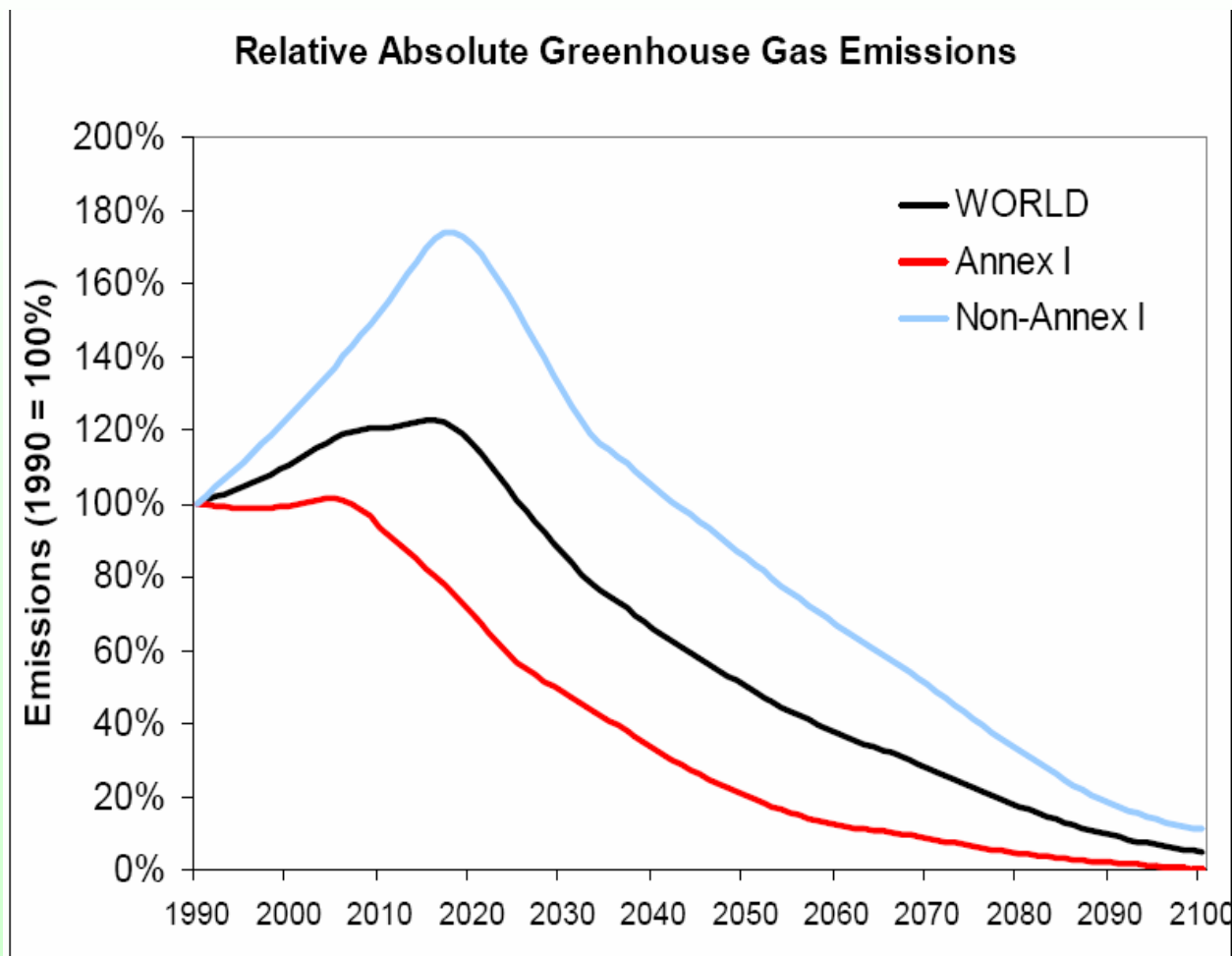


Figure 5. Radiative forcing compared to pre-industrial (left panel) and energy and industry CO₂ emissions (right panel) for the RCP candidates (colored lines), and for the maximum and minimum (dashed lines) and 10th to 90th percentile (shaded area) in the post-SRES literature. These percentiles reflect the frequency distribution of existing scenarios and should not be considered probabilities. Blue shaded area indicates mitigation scenarios; gray shaded area indicates baseline scenarios.¹⁴

Developed vs developing countries



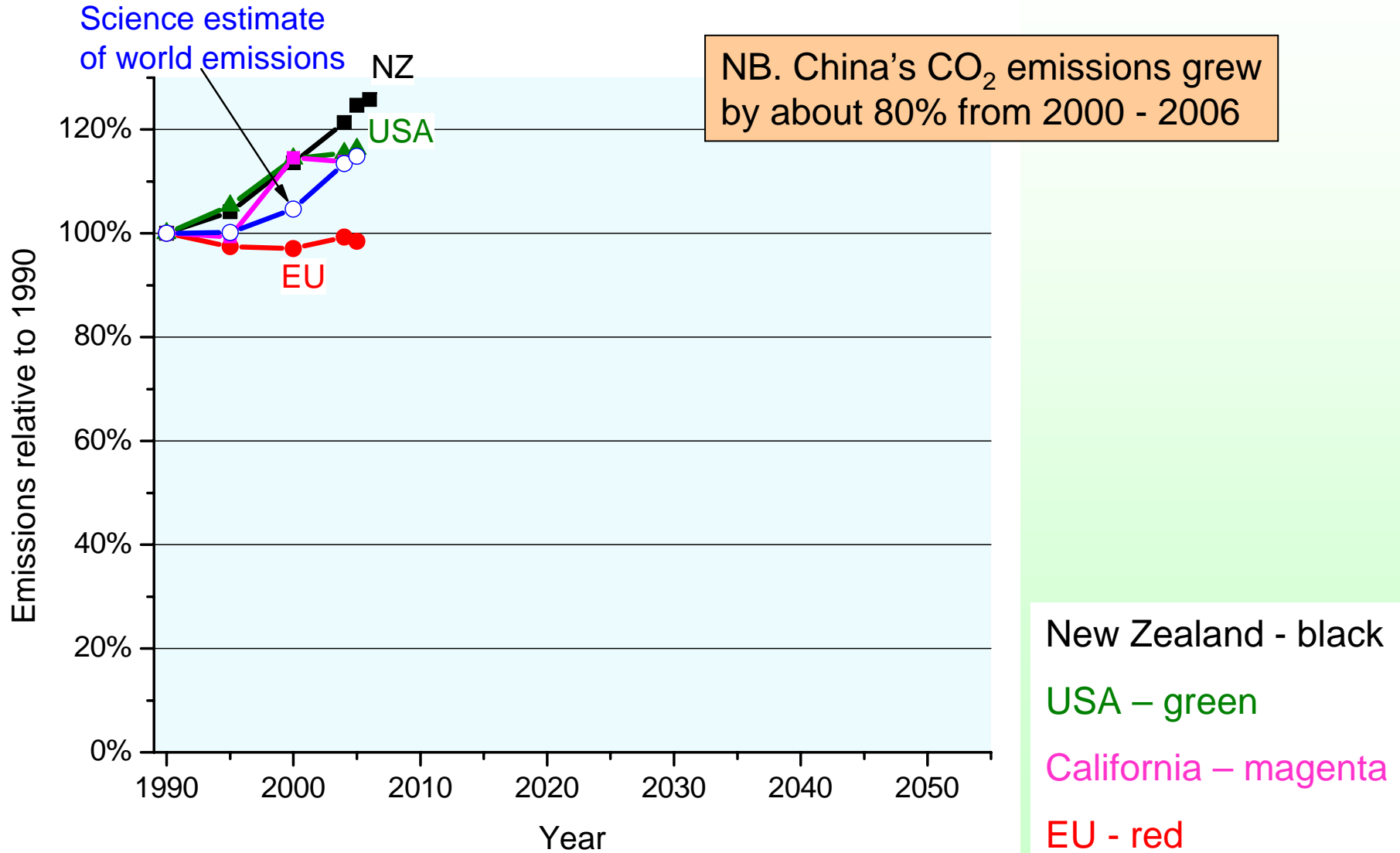
Needs to be something like:

Global emissions to be halved by 2050.

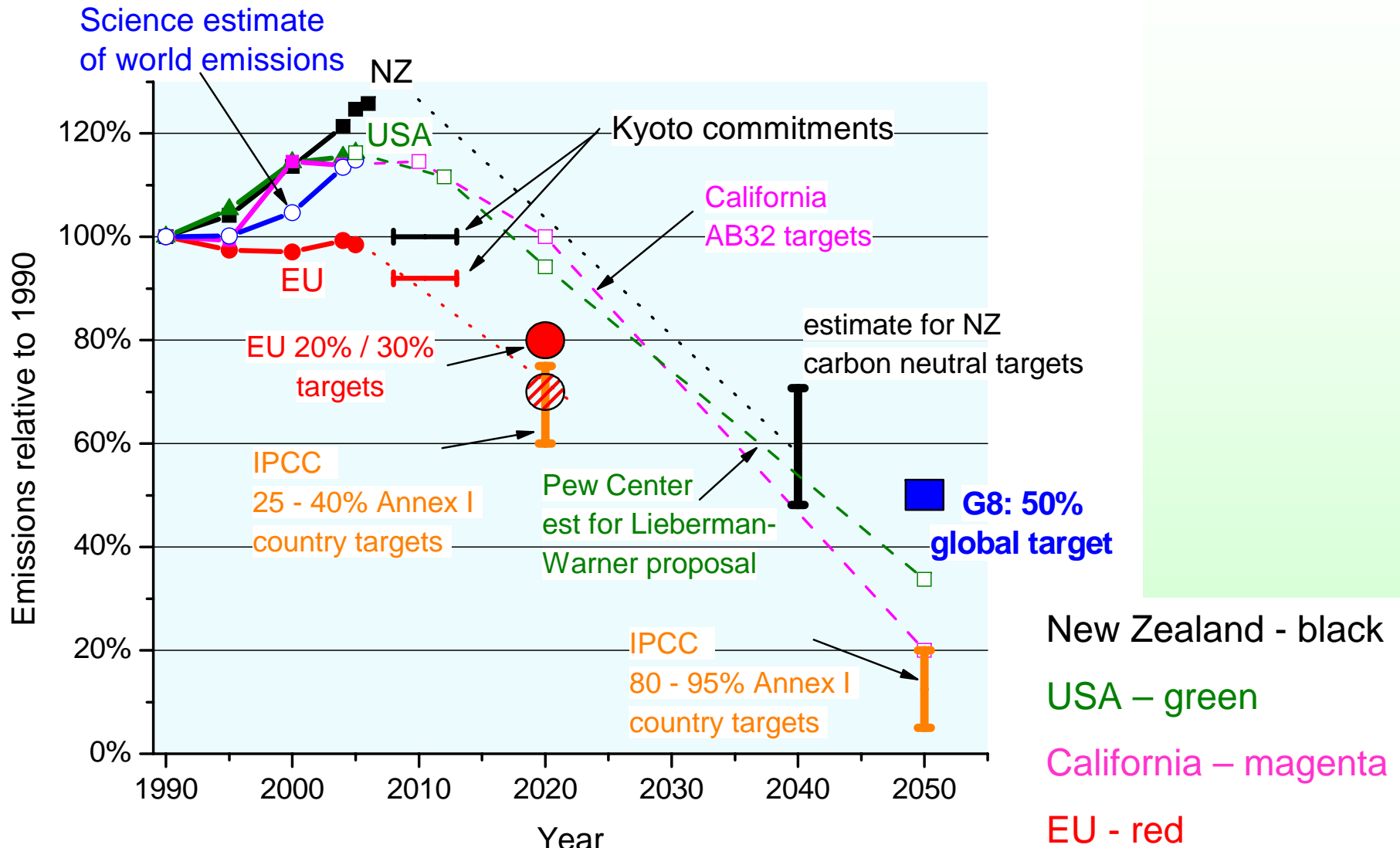
Industrialized country emissions decrease by 30% at 2020 and by 80% at 2050 relative to 1990.

Developing country emissions increase up to 2020 with following reductions determined by the necessary global emission levels.

Actual emissions since 1990

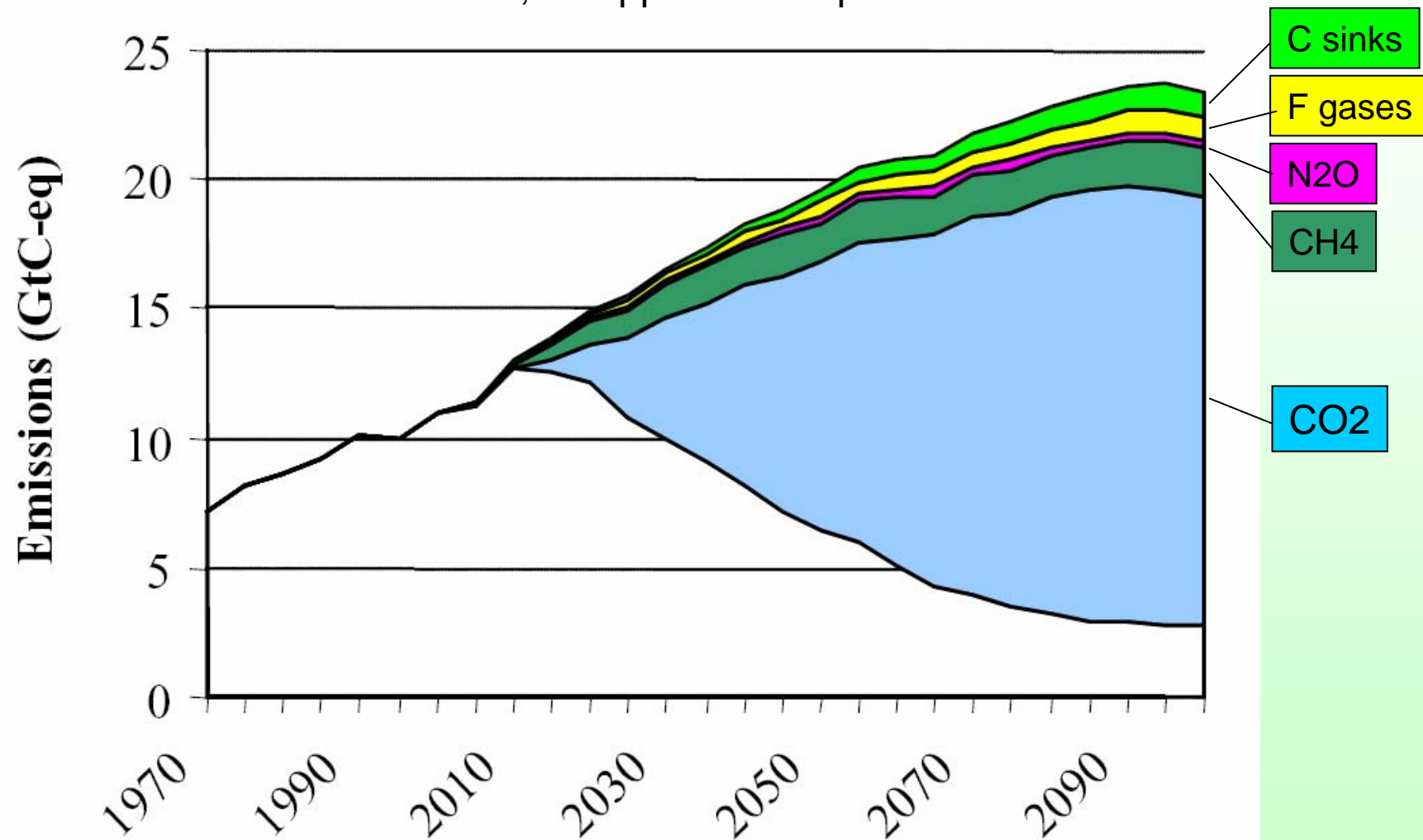


Emissions since 1990 vs Aspirations

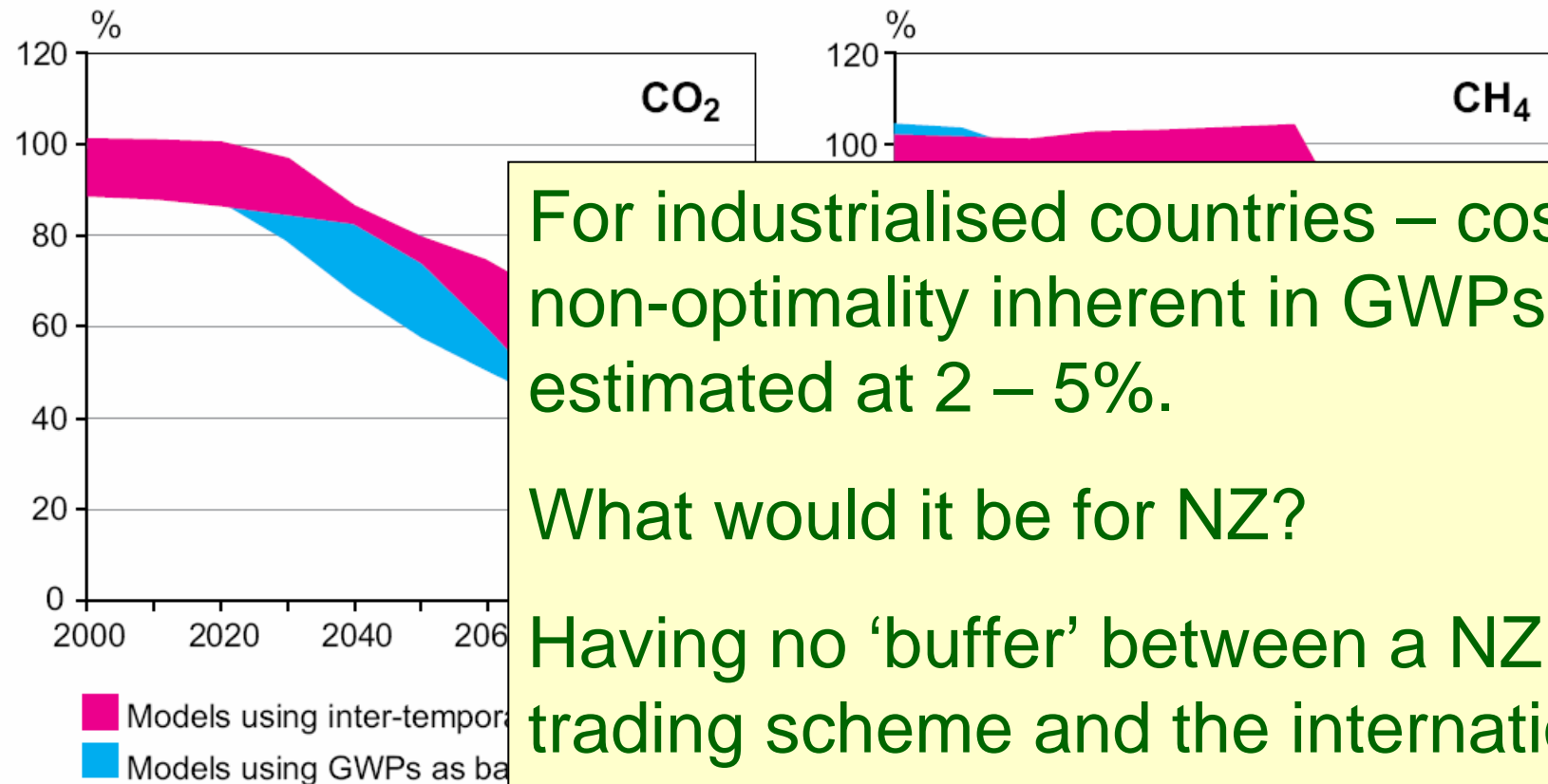


Global emission reduction by gas

IMAGE model; 450 ppm CO₂-eq scenario



GWPs vs Economic Optimality

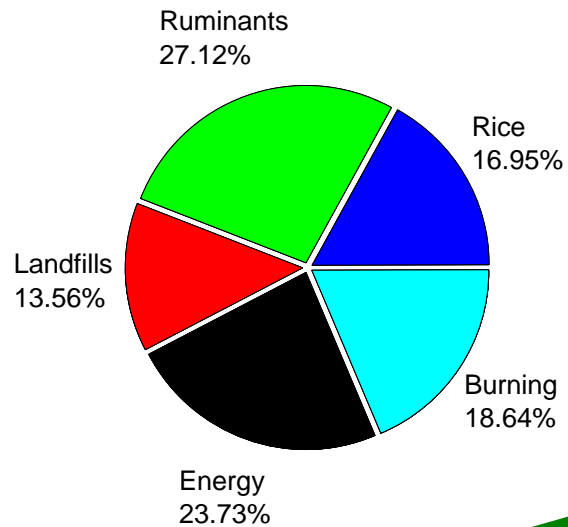


For industrialised countries – cost of non-optimality inherent in GWPs estimated at 2 – 5%.

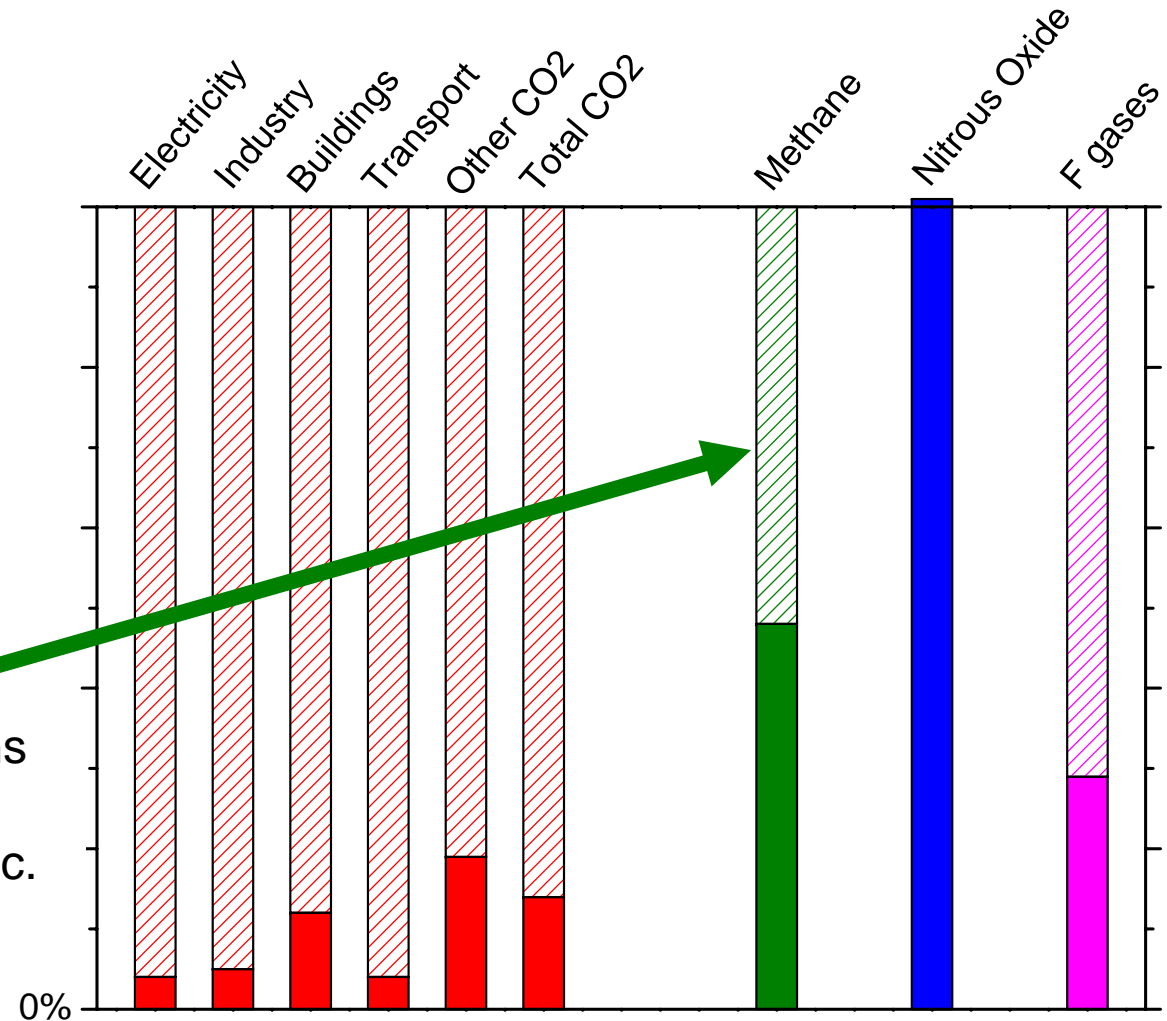
What would it be for NZ?

Having no 'buffer' between a NZ trading scheme and the international carbon market raises some unique questions for us.

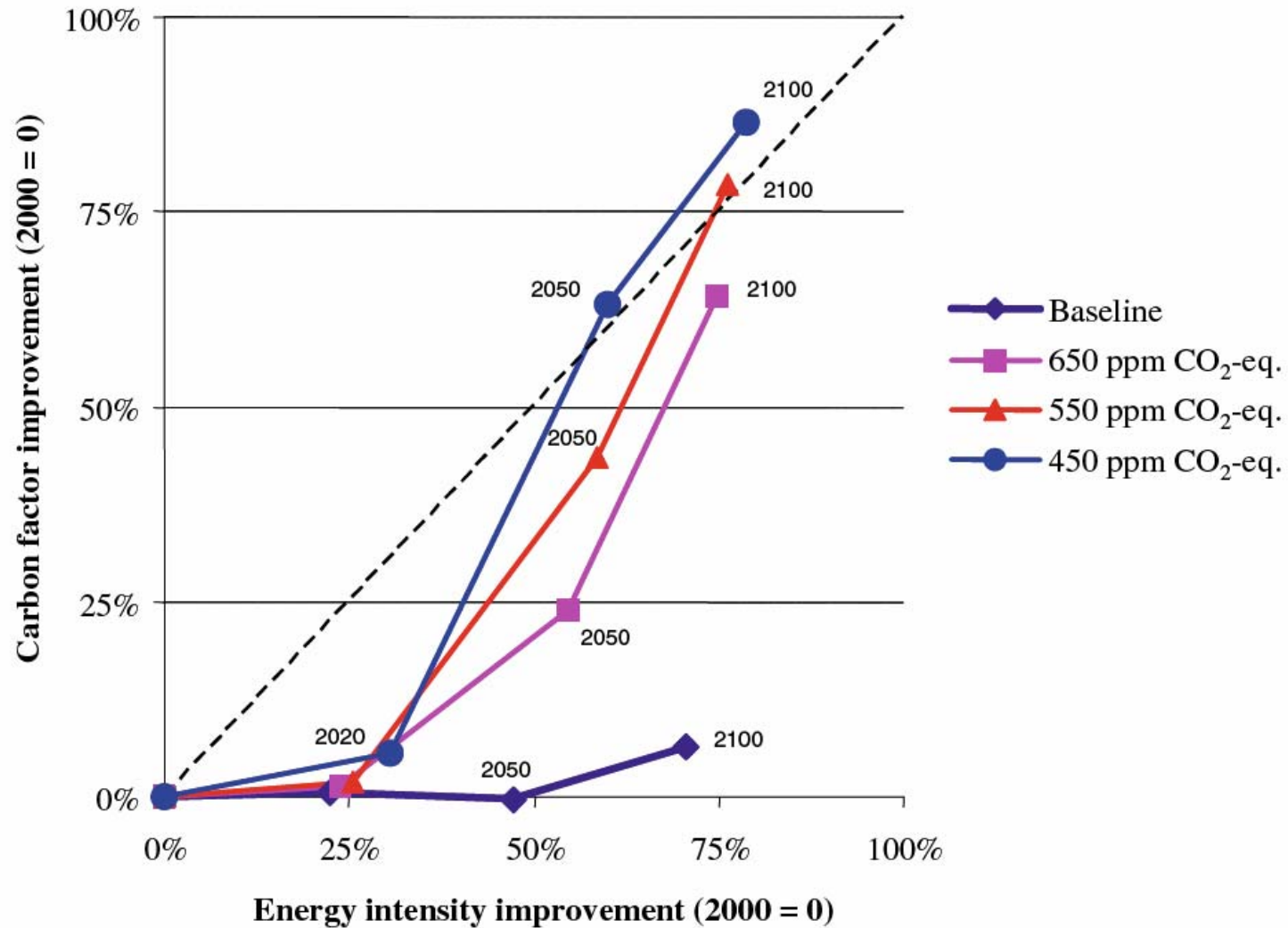
Defining the long-term target



Reduction in methane emissions comes primarily from avoiding wasteful emissions in energy etc.



Mitigation comes from decarbonising



Different effort sharing schemes

Emissions reduction in 2025 by region for different schemes, 550 ppm scenario

2025, \$550e	Average	SD	GC	CSE	AP	MS	C&C	TT	BP	EIT	GF	MCC
Canada	55.0	10.4	74.3	67.3	61.3	54.8	53.5	39.8	52.6	53.8	50.5	42.5
USA	47.5	15.0	77.9	65.3	55.0	50.9	43.3	42.1	35.0	40.5	35.1	29.7
OECD Europe	40.2	10.8	53.5	51.8	51.2	38.4	39.2	35.4	45.6	23.1	39.8	23.6
Eastern Europe	32.4	7.8	46.4	44.1	24.4	29.0	29.9	35.2	31.7	26.7	30.8	23.3
Former USSR	46.0	10.0	65.7	59.3	31.8	44.2	43.8	43.1	41.4	50.8	41.1	39.4
Oceania	45.0	13.1	73.1	62.1	44.9	46.9	43.7	36.7	37.3	33.0	38.6	33.3
Japan	44.4	9.4	55.4	55.1	55.7	42.9	43.8	41.1	45.1	31.1	44.6	28.7
Central America	33.5	8.0	22.5	24.1	37.4	34.0	29.4	27.1	40.4	41.5	47.1	31.9
South America	36.2	5.1	34.8	33.6	36.7	37.2	33.3	27.1	40.3	40.6	45.4	32.9
Northern Africa	13.0	12.1	-2.0	3.8	0.0	11.6	19.1	16.0	24.5	27.1	0.0	30.1
Western Africa	-13.1	34.1	-78.8	-69.7	0.0	0.0	-13.4	-6.2	0.0	9.2	0.0	28.0
Eastern Africa	-29.3	52.3	-130.5	-117.7	0.0	0.0	-44.1	-15.0	0.0	3.7	0.0	10.2
Southern Africa	18.2	14.3	28.1	23.3	2.7	9.1	32.5	20.1	20.3	0.3	2.7	43.3
Middle East	46.3	5.3	55.7	49.6	43.4	47.7	46.0	41.0	39.5	41.1	52.9	46.2
South Asia	-3.2	22.6	-51.7	-33.0	0.0	1.1	3.4	12.6	0.0	10.7	0.0	25.1
East Asia	31.5	2.6	28.1	31.8	27.1	30.4	32.2	34.7	30.4	31.6	35.7	32.6
South East Asia	22.7	11.1	6.2	13.9	17.4	10.2	27.0	22.5	42.2	28.5	25.2	34.0
Annex-I	44.8	10.7	66.5	59.3	47.4	45.1	42.2	40.2	39.8	38.0	38.5	30.7
non-Annex I	23.1	7.2	8.3	13.3	21.5	23.1	25.0	25.8	26.6	27.3	27.6	32.9

Take Home Messages

- Current trends are generally in the wrong direction – (except in the EU)
- 2020 targets generally above what is required for 2°C
- 2050 targets more consistent with 2°C but no detailed implementation plans
- For stabilisation targets, CO₂ is the issue - not methane
- The long-term target seems poorly defined in terms of implications for agriculture & trade in embedded carbon
- Most burden sharing frameworks impose larger near-term cuts on countries with high per capita emissions.