SENSITIVE

Economic modelling of post-2020 climate change target, MfE, 21 April 2015

This note sets out an explanation of the costs presented in the draft discussion document on New Zealand's post-2020 climate change target as at 20 April. Table 1 from that document is reproduced below

Table 1 Annual economic impact of New Zealand's target out to 2030 for a global carbon price reaching $50 at 2030

	Gross National Income in 2027 (in 2012 prices)	Estimated annual economic cost to the economy
No target	$299 billion	None
5% below 1990	$295.4 billion[8]	$3.6 billion
10% below 1990	$295.4 billion	$3.6 billion
20% below 1990	$295.1 billion	$3.9 billion
30% below 1990	$294.5 billion	$4.5 billion
40% below 1990	$293.9 billion	$5.1 billion

The following questions were raised by Minister Smith with officials in relation to these figures:

1. Why is there a substantial cost even for a -5% target?
2. Why is there no apparent difference between the economic cost of a -5% and a -10% target?
3. Why is there not a consistent pattern of increasing marginal costs with the target level?

Modelling background

We have conducted economic modelling with two CGE (Computable General Equilibrium) models (Landcare and Infometrics). The results in the discussion document are from the more conservative model (Infometrics). The Infometrics results have been peer-reviewed and signed-off by NZIER. Note these results do not include the impact of forestry on emissions, due to uncertainty on what forestry rules will apply under the new agreement. All results here assume a global carbon price rising to $50 per tonne in 2030. Domestic emissions reductions costing less than $50 per tonne are taken up before the model switches to international purchasing to fulfil targets.

Response to questions

We have looked into the specific questions above with the economic consultant concerned. We are confident these issues can be explained by a combination of the following factors:

1. Rise in emissions under 'business-as-usual'
2. Choices made on rounding figures
3. Impact of global carbon pricing

1) **Rise in emissions:** New Zealand's gross emissions are currently around 21 per cent above 1990 levels and will be around 36 per cent above 1990 by 2030 under 'business as usual' projections. This means the bulk of effort required for a given target is to bring emissions back to 1990 levels. This equates to 22 Megatonnes of annual emissions reductions (Mt CO_2e) versus 26 Mt for a -10% target.

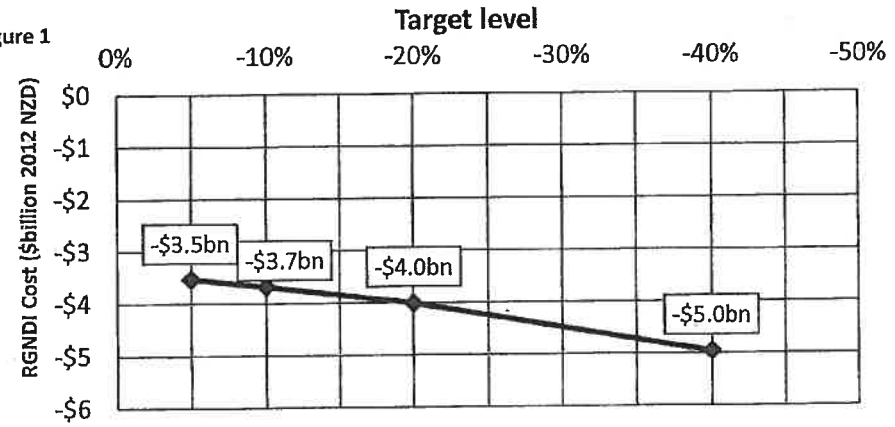
2) **Rounding:** The figures in the discussion document are rounded to reflect the accuracy available from the model. These figures were used deliberately to avoid providing 'false precision' in the discussion document. However, this is not the most suitable presentation for exploring the incremental impact of deeper targets at the level in which Ministers are interested. More precise model runs are available. These are shown in Table 2 below and plotted in the graph (Figure 1). Note that although given to a greater level of *precision*, these model results are not necessarily any more *accurate* in absolute terms.

Table 2 Revised figures with **higher-precision** model runs

1	2	3	4	5	6
	National Income in 2027	Annual economic cost, 2027, $bn	Annual emissions reductions (Mt CO_2e)	Domestic reductions (Mt CO_2e)	Int'l purchasing (Mt CO_2e)
No target	299	$0	0	0	0
-5%	295.5	$3.5	24	5	19
-10%	295.3	$3.7	26	5	21
-20%	295.0	$4.0	31	5	26
-30%	*Data not shown as this point is interpolated, not a true model output*				
-40%	294.0	$5.0	39	5	34

These more precise figures show economic costs increasing more or less consistently as targets increase from -5%. Incremental emissions reductions for targets in this range are likely to be met through international purchasing (Table 2, column 6). There is a slight increase in the marginal cost for deeper targets as shown by the slight increase in steepness of the graph. Higher marginal costs arise because extra export revenue must be generated to purchase international units, which means exporters move further down their demand curve (i.e. they accept lower prices) and at the same time have to compete for more resources domestically (i.e. land, labour and machinery). The actual rate of diminishing return may be greater as the model doesn't account for forestry land (and associated carbon absorption) displaced by other land uses, such as dairy, to generate export extra revenue.

Figure 1



3) **Impact of global carbon pricing:** As well as reducing emissions, putting a price on carbon globally will slow global economic growth and affect the demand for New Zealand's exports. These economic costs are borne regardless of New Zealand's target level. Additional costs on top of these are incurred through the marginal cost of international purchasing to meet deeper New Zealand targets. This is why the average economic cost per tonne for a -5% target appears higher than the marginal cost for deeper targets in Table 2. A similar effect was seen in previous modelling[1].

The model used also tends to overestimate the economic cost per tonne of carbon pricing, because it does not capture actions taken in anticipation of a rising carbon price. In reality, investment decisions and deployment of new practices and technologies would begin earlier, thereby reducing the average economic cost per tonne of domestic emissions reductions.

Consistency with other modelling results

A general finding of this modelling is that the economy continues to grow if New Zealand takes a target, but at a slower rate. The change in the size of the economy between 'business-as-usual' and with a target is the 'economic cost' shown above. This result is consistent with previous New Zealand and overseas modelling.[1,2]

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[1] Economic modelling of New Zealand climate change policy, NZIER & Infometrics, 2009

[2] Climate Change Mitigation Scenarios, Australian Treasury & DIICCSRTE, 2013