



Ministry for the  
**Environment**  
Manatū Mō Te Taiao

## Towards New Zealand's 2020 Emissions Reduction Target: Update on Analytical Work

<b>Date:</b>	9 March 2009	<b>MfE Priority:</b>	Urgent
<b>Security Level:</b>		<b>Number of Attachments:</b>	Nil
		<b>MfE Ref No:</b>	09-B-00576

### Action Sought

	<b>Action Sought</b>	<b>Deadline</b>
Minister for Climate Change Issues Hon Dr Nick Smith	<b>None.</b> This briefing responds to your request for a summary of work being undertaken on emissions projections and reductions (and results to date), to help inform decisions on a mid-term (2020) target for New Zealand in the context of the international climate change negotiations.	15 March
Associate Minister for Climate Change Issues (International Negotiations) Hon Tim Groser	<b>Note</b> this briefing is for your information in advance of the Cabinet paper titled Climate change: international negotiations: update and New Zealand position which will be presented to CBC at its meeting on 16 March.	15 March

### Ministry for the Environment Contacts

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		<b>(cell)</b>	<b>(work)</b>	
<b>[Withheld]</b>	Analyst, Climate Change and Energy Policy		<b>[Withheld]</b>	✓

## Executive Summary

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As requested, this briefing note summarises:

- the analytical work being undertaken and results to date that will help inform government decisions around a medium-term emission reduction target in the context of the international climate change negotiations
- analysis that has been done on what a 2020 target would look like for New Zealand if we assume a constant rate of change from 2008 emissions to 50% of 1990 emissions by 2050.

### **Medium-term (2020) targets applying a constant rate of change**

Officials have undertaken some preliminary modelling of the trajectories to reach targets using constant rates of change. Applying a constant rate of change to achieve a 50% reduction by 2050 results in the following possible 2020 targets:

- 35% above 1990 levels assuming a starting point of *actual* 2008 emissions
- 10% above 1990 levels assuming a starting point of our Kyoto target in 2008
- 1% below 1990 levels assuming a starting point of 2012, reflecting net emissions to 1990 levels over the Kyoto target period 2008-2012.

### **Work to inform a New Zealand target for 2020**

Officials have an ongoing work programme to analyse both the domestic and international implications of medium-term targets. To date, the domestic work has focused on domestic mitigation potential at different emissions price scenarios and what the costs of achieving a number of hypothetical targets would be. More recent international work (still in development) is starting to assess whether New Zealand and other countries' future emissions reduction targets are 'fair' in the context of the international climate change negotiations.

#### *New Zealand's emissions reduction targets and associated economic costs – domestic focus*

Officials have been developing and modelling a number of scenarios for potential emissions mitigation under a range of assumptions and carbon prices. Using current baseline emissions projections (which exclude the effects of drought and the recent global economic downturn), it is estimated that total net emissions will be about:

- 42% above 1990 levels in 2020, assuming no new mitigation activities
- 26% above 1990 levels in 2020, assuming a \$25 price on all emissions and planned non-price measures
- 16% above 1990 levels in 2020, assuming a \$50 price on all emissions and planned non-price measures.

These are qualified estimates and need further work and data to increase their robustness and keep them up to date. They are likely to be adjusted somewhat as a result.

#### *Assessing what would constitute a fair target for New Zealand – international focus*

In order to gain an understanding of what constitutes a fair target for New Zealand (relative to those of other countries), officials are developing a framework for assessing comparable effort. The framework is intended to provide a coherent and transparent approach in the international climate change negotiations.

The framework takes into account the national circumstances of individual countries, including sectoral mitigation potential, and is based primarily on the premise that the targets of individual countries should reflect the costs that each country faces in meeting their target in terms of a percentage impact on their GDP.

Recommended Action

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**We recommend that you:**

- (a) **Note** this briefing responds to your request for a summary of work being undertaken on emissions projections and reductions (and results to date), to help inform decisions on a mid-term (2020) target for New Zealand in the context of the international climate change negotiations.

Prue Densem **Date**  
**Central Government Policy Group**

Referred to Ministry Communications Staff: No

Hon Dr Nick Smith **Date**  
**Minister for Climate Change Issues**

Hon Tim Groser **Date**  
**Associate Minister for Climate Change Issues (International Negotiations)**

## Purpose of Report

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1. You have requested a report summarising the analytical work being undertaken and results to date that will help inform government decisions around a medium-term emission reduction target in the context of the international climate change negotiations.
2. You have also requested some analysis be done on what a 2020 target would look like for New Zealand if we assume a constant rate of change from 2008 emissions to 50% of 1990 emissions by 2050.

## Background

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3. A Cabinet paper titled *Climate change: international negotiations: update and New Zealand position* is scheduled to go to the Cabinet Business Committee on 16 March 2009. This will update Cabinet's mandate to guide New Zealand's position in the future international climate change negotiations throughout 2009.
4. An essential part of New Zealand's international climate change policy during the coming months is a position on a medium-term emission reduction target (out to 2020) for New Zealand.
5. This briefing note reports on the work being undertaken to inform decisions on a medium-term target, based on analysis of the international and domestic implications of medium-term and long-term emission reduction targets.

## Medium-term (2020) and long-term (2050) targets applying a constant rate of change

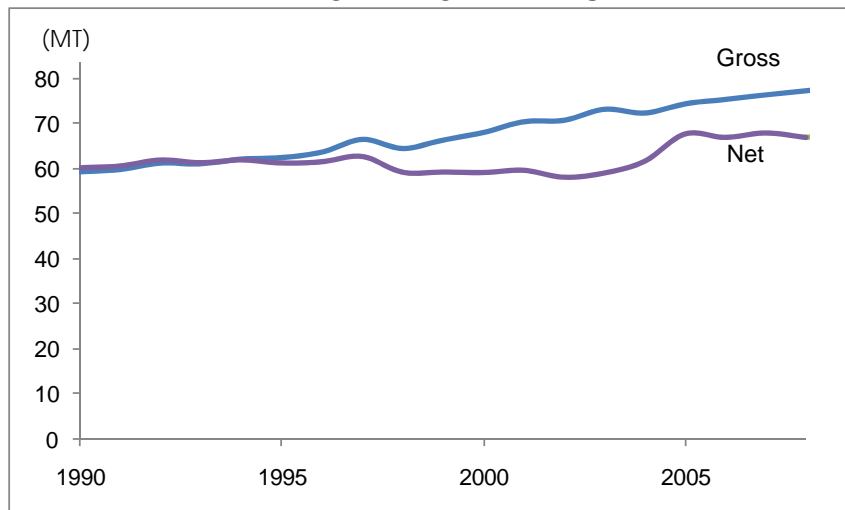
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6. The government has a goal of a 50% reduction in net emissions below 1990 levels by 2050<sup>1</sup>. You have requested analysis be done on the implications for a 2020 target of meeting this goal with a constant rate of change in emissions from 2008. You also requested that officials consider:
  - the implications of using gross or net emissions for defining the target (assuming that the baseline is expressed in gross emissions only)
  - starting from actual estimated emissions in 2008 or our Kyoto target of 1990 levels in the first commitment period.
7. The following graph illustrates the difference between the growth in New Zealand's gross and net emissions relative to gross emissions in 1990. In accordance with Kyoto accounting rules, the sequestration component of net emissions applies only to forests planted since 1990. While using net emissions over this short time period (1990 to present) will only *slightly* distort the underlying growth in actual emissions, it is significant enough that officials think using a constant rate of change on gross emissions would be more appropriate<sup>2</sup>.

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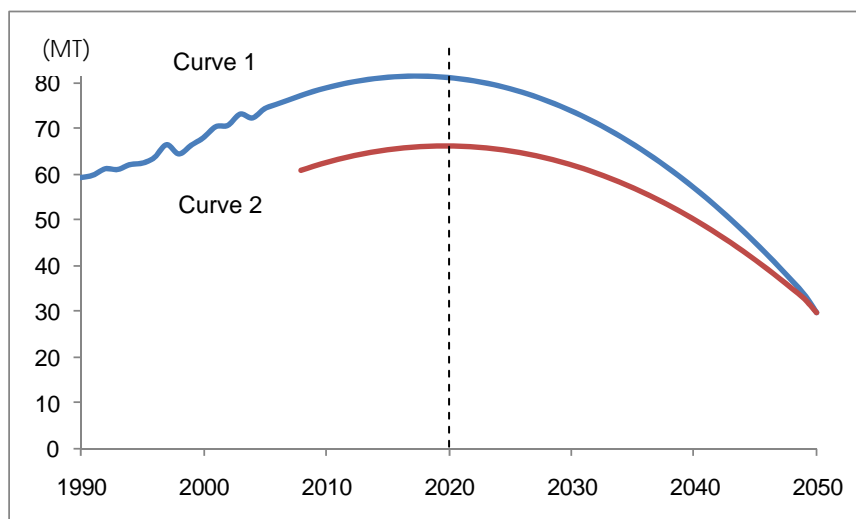
<sup>1</sup> Officials assume that this is calculated on a "gross-net" basis, meaning that sinks are accounted for at the target point but not in the baseline year. This is consistent with Kyoto accounting rules for the first commitment period.

<sup>2</sup> The predicted rate of change in net emissions for the period 2008-2050 is illustrated in Figure 4 and highlights how sequestration distorts actual emissions growth.



**Figure 1 Growth of gross and net emissions since 1990**

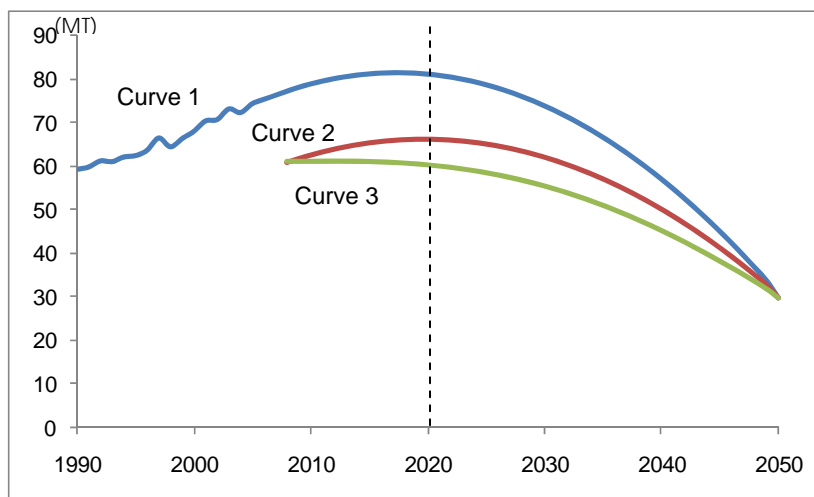
8. The 2008 Net Position Report shows average growth in New Zealand's gross emissions between 1990 and 2006 is about 1.6% of 1990 emissions each year, equivalent to about 1 mega tonne (Mt) per annum<sup>3</sup>.
9. Given that estimated gross emissions were therefore about 30% *above* 1990 levels in 2006 and have been growing by about 1.6% per year, applying a constant rate of change to emissions growth to meet a 50% *below* 1990 level target by 2050 would imply an emissions trajectory with slowing growth in emissions in the short term, a peak in emissions in 2017, and then a gradually accelerated decline.
10. The starting point of emissions in 2008 has important implications for any target trajectory. Figure 2 illustrates two possible target trajectories for New Zealand to meet a 50% below 1990 target by 2050 applying a constant rate of change. The graph shows:
  - The estimated emissions trajectory with a starting point of actual estimated gross emissions in 2008 (curve 1)
  - The estimated emissions trajectory with a starting point of the Kyoto target emissions in 2008 (curve 2).



**Figure 2 Emissions trajectories at different starting points  
(actual estimated gross emissions in 2008 and Kyoto target in 2008)**

<sup>3</sup> Updated estimates for the 2009 Net Position report were not available when this briefing was prepared. The new projections may contain differences.

11. Assuming a starting point of *actual* estimated gross emissions in 2008, a 2020 target would be about 80Mt, or 35% above 1990 levels. With a starting point in 2008 of our Kyoto target, a 2020 target would be about 66MT or 10% above 1990 levels.
12. Another possible approach is to use the Kyoto target starting from 2012, with average annual net emissions held constant for the 2008-2012 period, and applying a constant rate of change to reaching the 2050 target. This approach would give a 2020 target of approximately 61 Mt – or about 1% below 1990 levels. This approach is shown as curve 3 in Figure 3 below.



**Figure 3 Emissions trajectories at three different starting points  
(actual estimated gross emissions in 2008, Kyoto target in 2008, Kyoto target in 2012)**

13. Two major points emerge from these graphs:
  - Applying a constant rate of change to emissions trajectories appears to be more useful for target setting using gross emissions, because of short-term fluctuations in forest harvesting and sequestration.
  - The choice of starting point for a trajectory towards a 2050 target (either actual estimated gross emissions, the Kyoto target in 2008, or the Kyoto target over the period 2008-2012) has large implications for the emissions trajectories, and therefore the 2020 target.
14. Officials have an ongoing work programme to analyse both the domestic and international implications of medium-term targets. To date, the domestic work has focused on domestic mitigation potential at different emissions price scenarios and what the costs of achieving a number of hypothetical targets would be. More recent international work (still in development) is starting to assess whether New Zealand and other countries' future emissions reduction targets are 'fair' in the context of the international climate change negotiations.

## **New Zealand's emissions reduction targets and associated economic costs – domestic focus**

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15. Officials have been developing estimates of the likely mitigation and costs of a range of different climate policies. When added to baseline emissions projections and different carbon price scenarios, these provide an indication of how future emissions under those policies will compare to particular emissions targets for New Zealand, and what the cost of achieving those targets will be.

### *Baseline emission projections*

16. Significant domestic emissions cuts can only be achieved through gradual and consistent structural economic changes over the medium- to long-term (beyond 2020) if high economic costs are to be avoided. In the near term (through to 2020), current national circumstances will dominate our ability to meet a target, as reflected in our baseline emissions.
17. Historic and projected emissions from the 2008 Net Position Report (not updated for the effects of drought and the global economic downturn and excluding the impact of mitigation policies) are presented in Figure 4 below. It shows that non-LULUCF emissions are expected to grow at a fairly steady rate through time, but that emissions and removals from LULUCF add a high degree of 'lumpiness' to the projections. This has a particularly large effect in 2020 with the harvest of forests planted in the early 1990s becoming a significant contributor to New Zealand's overall emissions. The irregular emissions profile of LULUCF has implications for New Zealand's performance against intermediate targets in the context of long-term target setting and will require future management. Overall, total net emissions are expected to reach around 84.3 Mt in 2020 without mitigation policies<sup>4</sup>.

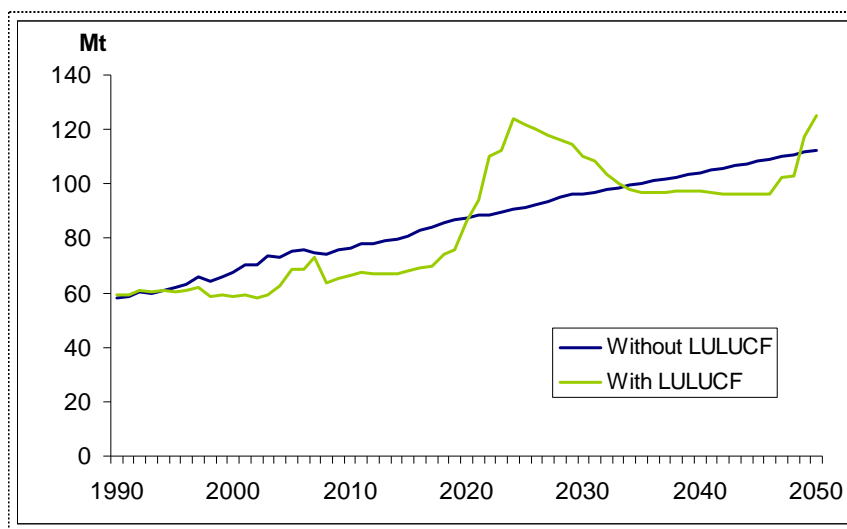


Figure 4 Baseline emissions (without measures)

*Estimated effects of mitigation policies*

18. Officials have been and are continuing to develop sector based estimates of the likely reductions in net emissions, and the costs of achieving those reductions, for a range of possible government policies through to 2020<sup>5</sup>. The main focus of these estimates has been the likely effect of different levels of emissions price on the energy, agriculture, and forestry sectors, although estimates of the effect of some non-price policies have also been made (these mainly cover a range of energy efficiency programmes and the Afforestation Grants Scheme). The estimates assume no major new technologies or behaviour changes and that emissions pricing is implemented in all sectors in the near term. A summary of the early results of this work is included in the table below.

<sup>4</sup> The effect of government programmes in place prior to 2008 are included in this figure, however any additional measures are excluded.

<sup>5</sup> These estimates are separate to those prepared for the government by the consultancy Infometrics.

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	Domestic Mitigation in 2020 (Mt)	Total emissions in 2020 (Mt)	Domestic mitigation (expressed as % of 1990 emissions)	Total emissions (expressed as % increase on 1990)
Without measures	-	84.3	-	42%
Non-price measures only	0.7	83.6	1.2%	41%
\$15 price on all emissions plus non-price measures	5.6	78.7	9.4%	33%
\$25 price on all emissions plus non-price measures	9.9	74.4	16.7%	26%
\$50 price on all emissions plus non-price measures	16	68.3	27%	15%

**Table 1** Projected emissions for various policy scenarios

19. The preliminary results of this work show that the majority of mitigation expected as a result of emissions pricing is due to reduced deforestation and increased afforestation, and fuel switching in the energy sector. Comparatively little mitigation is expected in the agriculture sector by 2020.
20. Continued further work is required on these estimates. In particular, a better understanding of how emissions pricing is likely to affect forestry (afforestation and deforestation) and the likely uptake rates of farmers to agricultural mitigation technologies in response to a price signal remain key areas for improvement. For these reasons, the results to date should only be taken as indications of what might be expected under different emission price scenarios and should not be relied upon as authoritative of what will happen.
21. Figure 5 below shows how different emissions prices combined with non-price measures are expected to reduce emissions below baseline levels. With a \$25 emissions price, total net emissions are expected to be approximately 26% higher than 1990 levels by 2020 (15% higher under a \$50 price), compared to an increase of 42% under business-as-usual (i.e., in the absence of an emissions price or any other new mitigation policies).

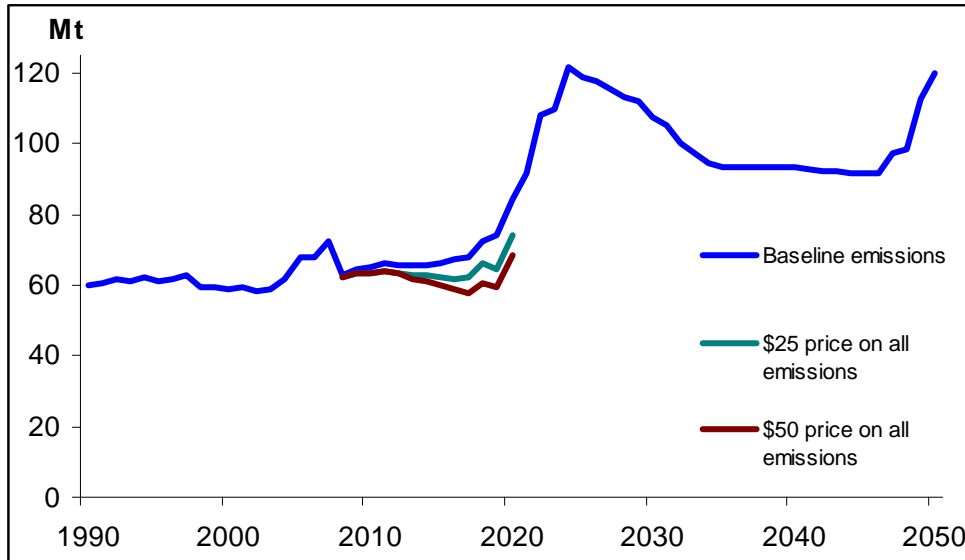


Figure 5 Emission mitigation scenarios

*Performance against a 2020 target*

22. The use of these mitigation estimates along with baseline projections allows performance against particular hypothetical targets for 2020 to be assessed for each of the policy scenarios. To use a **purely hypothetical example** (for illustrative purposes only) of a 2020 target to reduce emissions 20% below 1990 levels, our analysis suggests that a \$25 price on all emissions would result in the target being met approximately 25% through domestic mitigation and 75% by purchasing units offshore. This is shown Figure 6. With a \$50 price on all emissions, approximately 43% of this target is met through domestic mitigation.

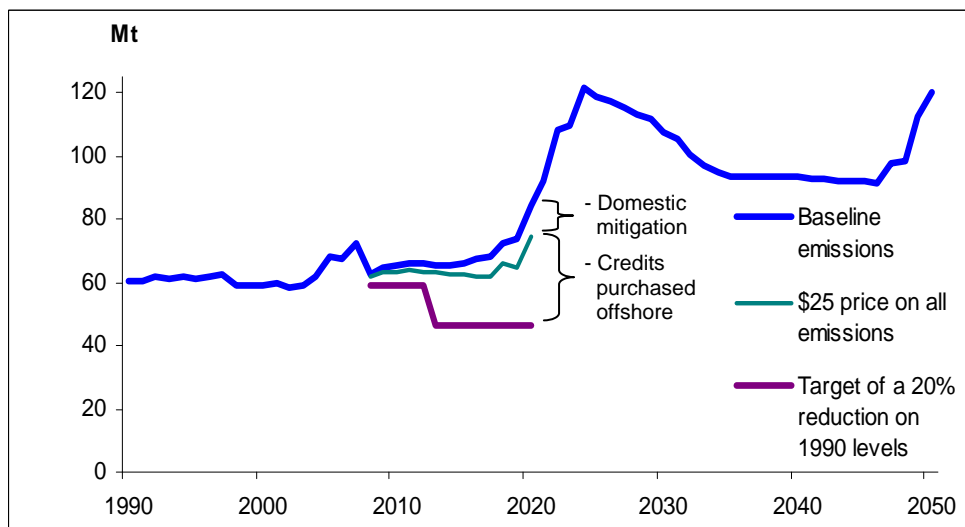


Figure 6 Scenario with a -20% target and \$25 emissions price

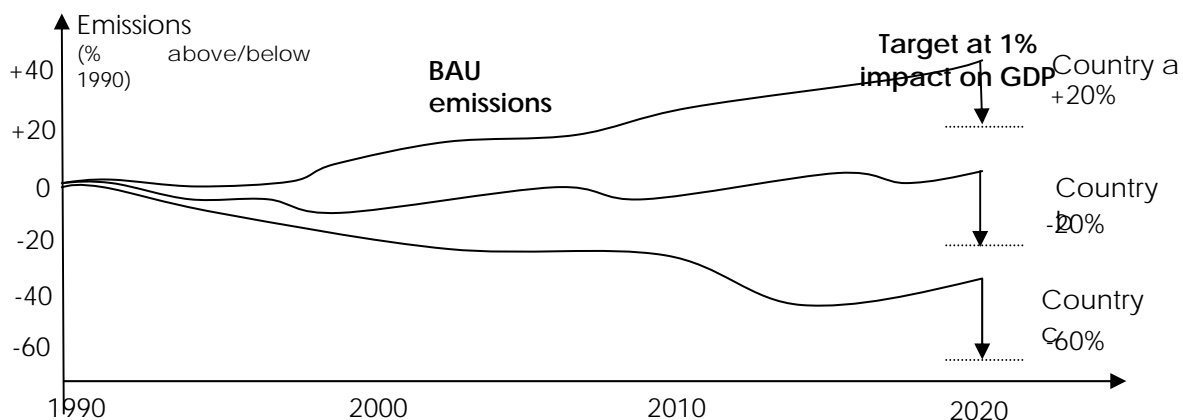
23. Under another hypothetical example of a target for 2020, to reduce emissions to 1990 levels, a \$25 emissions price would result in about 40% of that target being met by domestic mitigation and the rest by purchasing units offshore. At a \$50 price, about 60% of the target is met through domestic mitigation.

*Further work required*

24. The mitigation estimates included in this briefing require further refinement. Results are sensitive to a range of uncertainties, in particular the effect that an emissions price would have on afforestation and farmer uptake of mitigation technology. Further work is required in these areas, and to provide error bands for the estimates (including baseline projections).
25. We can undertake further analysis comparing different constant rate of change emissions trajectories with estimated emissions under a range of different policy settings.

## Assessing what would constitute a fair target for New Zealand – international focus

26. In the international climate change negotiations, Annex I Parties (developed countries) will be required to agree future emission reduction targets for the next commitment period beginning in 2013 (the end date is yet to be determined, but there is some support for 2017). Most Annex I Parties have announced medium-term targets for 2020. Various approaches have been proposed for assessing whether individual targets are comparable (or fair).
27. Officials have explored a range of “effort sharing” approaches from Parties such as the European Commission and Japan and international organisations such as the OECD. Of these approaches, those that use the costs of mitigation to an economy show that New Zealand’s emissions and economic profiles imply smaller cuts in emissions than other developed countries. While these approaches provide a useful starting point, officials consider that none of them provide an accurate analysis of national circumstances or are transparent enough to be widely applied in the negotiations
28. In order to provide Ministers and officials with a better understanding of what would constitute a fair target for New Zealand (relative to those of other countries), officials are beginning to develop a framework for assessing comparable effort. The framework is intended to provide a coherent and transparent approach which adequately takes into account the national circumstances of individual countries.
29. The framework is based primarily on the premise that the targets of individual countries should reflect the costs that each country faces in meeting their target in terms of a percentage impact on their GDP. The framework uses a set of baseline emission projections and abatement cost estimates at a sectoral level for each Annex I Party to indicate each country’s mitigation potential and the relative impact on GDP that each country would face in meeting any given target. ‘Fair efforts’ under this framework involve targets which lead to equal percentage impacts on GDP, as expressed in the Figure 7 below.



**Figure 7 Hypothetical emission reduction targets for 2020 assuming an equal percentage impact on GDP**

30. While largely being developed as a cost framework, it will be adjusted to take into account the principles of “common but differentiated responsibilities and respective capabilities” (Art. 3, UNFCCC) using a range of generally accepted indicators such as GDP per capita. This will ensure the credibility and acceptability of the approach internationally.
31. Given the differing national circumstances between countries in Annex I, such as differences in emissions growth since 1990 and mitigation potential, an approach that ensures each country’s target would have a similar impact on GDP is likely to lead to a wide range of targets for 2020 when expressed relative to 1990 emissions.
32. Further work to develop the framework is planned. More data on mitigation potential will be gathered to improve accuracy. Once the framework has been completed, it will be used to develop a series of scenarios, showing individual country targets. The results will then be compared with other effort-sharing approaches. To improve reliability and acceptance of the tool, information is being and will continue to be shared between Parties and international think tanks with the intent of creating a collaborative process to assist the international climate change negotiations and transparently assess the comparability of individual country targets.
33. Use of the framework will ensure that New Zealand's national circumstances (for example relatively high population/economic growth since 1990 and low mitigation potential in energy and agriculture sectors) are recognised. Advice will be provided before June on the specific implications of using this approach to determine a future New Zealand target.