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Emissions Tax: The Least Worst Option

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Following warnings from mainstream scientists, politicians around the world have rushed to implement a range of taxes, regulations, subsidies and schemes to save humanity from the impending dangers of warmer winters and higher waters.

But while the climate change *science* debate has focused minds for the past few decades, the climate change *policy* debate has sadly not enjoyed the same attention. Not all policy responses are equal. Before taking action, it is incumbent on our political leaders to carefully consider the benefits and costs of different policy options.

Many countries, including New Zealand, have started to move towards an emission trading system (ETS), combined with ongoing spending on targeted research. This is the wrong approach. A more flexible, efficient, effective, and transparent approach would be to replace all current efforts with a moderate and revenue-neutral emissions tax.

An ETS raises a number of concerns, such as lack of flexibility for business, the corporate welfare implicit in giving away permits, the difficulty in removing or reforming the scheme when change is needed, significant compliance and administration costs, lack of transparency, continued rent-seeking and lobbying behaviour, and market manipulation. These costs would likely outweigh any potential environmental benefits.

A less damaging alternative is an emissions tax. Not only would an emissions tax avoid many of the problems associated with an ETS but importantly it would raise an ongoing consistent amount of revenue and could therefore be linked with offsetting tax cuts. Linking climate change policy to tax cuts is vital to ensure that the policy does not cause significant economic damage.

A $30 per tonne CO_2-e emission tax could be linked with a reduction in the company tax rate from 30% down to a more internationally competitive 25%. Or a $20 emission tax could entirely replace the current fuel tax, effectively making the current environment tax (fuel tax) more efficient by applying a lower rate to a broader base. Alternatively, a $40 emission tax would allow the government to drop the top marginal income tax rate down to 30%. This paper considers these options and more.

Politicians around the world are feeling the pressure to introduce climate change policy. But poor policy will leave us in a worse position than no policy. An ETS is poor policy and before following the world down that path the NZ government should pause to consider other options such as a revenue neutral emissions tax.

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Introduction[1]

In 2008, the government introduced legislation for an emissions trading system[2] that will come into force in 2010 for energy and 2013 for agriculture. This is not the right approach. If the government is determined to take further action on climate change,[3] it would be better to go with an emissions tax rather than an emissions trading system, with the revenue used to reduce or remove other taxes.

Any climate change policy is going to have economic costs. To compensate for these costs, it is vital that climate change policy be linked with tax cuts which can provide an offsetting economic benefit. This paper considers a range of emissions taxes from $10 to $40 per tonne CO_2-e (carbon dioxide or equivalent emissions) and looks at how the revenue could be used to reform fuel tax, income tax, or company tax.

The emissions tax would cover the energy sector and the industrial processing sector, but there is no reason to include agriculture.[4]

It would be better to go with an emissions tax rather than an emissions trading system, with the revenue used to reduce or remove other taxes.

The impetus for action

In 2007 the International Panel on Climate Change (IPCC) said they were more than 90% certain that humans are contributing to global warming. Computer models suggest a temperature increase of about 2–4 degrees over the next 100 years.[5] While we don't know exactly what is going to happen in the future, many people are worried about the possible impact and are demanding political action.

But there is an important difference between having good intentions and introducing good policy.

To combat man-made climate change it is thought necessary to decrease the emissions of greenhouse gases, including carbon dioxide. This can be achieved by switching to new technologies that emit less greenhouse gas. The goal of climate change policy should be to speed up the transition to new, 'cleaner' technology. The goal is *not* to reduce the use of energy powered activities, transport or agriculture, which provide significant benefits to society. This distinction is important.

All climate change policies have costs. If a climate change policy is needed, then the issue for policy makers is to determine which policy has most benefits for a given cost, or least cost for given benefits.

Encouraging the transition from a greenhouse-intensive economy to a low-emission economy can be achieved in many ways. One option is for the government to subsidise or enforce low-emission technologies. For example, in the 2008 budget the NZ government allocated $45.7 million towards energy efficiency investments.[6]

This approach to industry policy is referred to as 'picking winners' and requires government to choose which ideas get extra funding and which ideas are left out. The problem with picking winners is that government generally does a poor job of it.[7] There is no reason to believe that politicians will correctly predict the progress of future technology. In addition, government spending must be paid for through higher tax (either now or in the future), which harms other areas of the economy. Instead of spending taxpayer money in an effort to 'predict' the future, the government would be better served by using a price signal.

By putting a price on greenhouse gases, all other 'clean' technologies are made relatively more competitive. This will encourage more funds to flow into new 'clean' technologies, with the market (not bureaucrats) deciding which projects should get more funding.

There are two ways to put a price on greenhouse gas emissions—either through an emissions trading scheme (ETS) or through a tax.

Trading vs tax

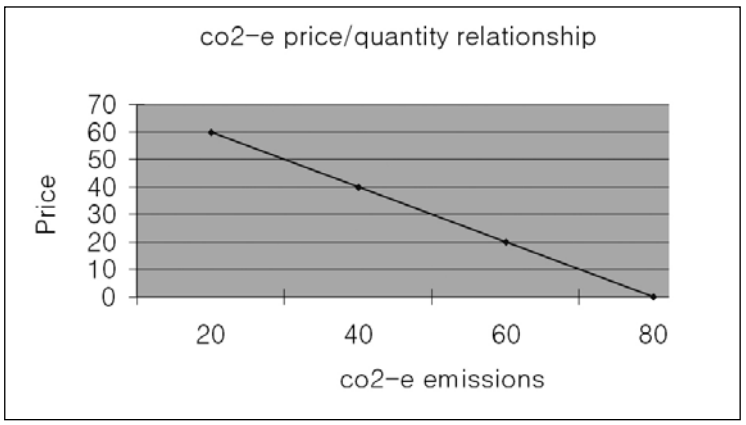
Both emissions trading and an emissions tax involve manipulating the price and quantity of emissions released into the atmosphere from human activity. An ETS involves fixing the quantity of greenhouse gases that can be emitted and then allowing the price of emissions

to fluctuate. In contrast, an emissions tax involves setting a fixed price for emissions and allowing the quantity emitted to fluctuate.

The difference between the two approaches can be seen in figure 1. The graph plots a hypothetical relationship between CO_2-e and the CO_2-e price. When the price (y-axis) is zero, the emissions (x-axis) are 80 million tonnes of CO_2-e. As the price increases, the amount of emissions decreases.

An ETS involves fixing the quantity of CO_2-e (for example, 60 million tonnes) and allowing the market to work out the price (for example, $20 per tonne). An emissions tax would involve fixing the price of CO_2-e (for example, $20 per tonne) and allowing the market to work out the quantity (in the example, 60 million tonnes).

Figure 1



Fixed emissions are less efficient than a tax because quotas do not allow production decisions to adjust to changing circumstances.

In reality the price-quantity relationship will not stay constant. If the demand for fossil fuel energy increases (through strong economic growth, for instance), the curve would move right. If the demand for fossil fuel energy decreases (for example, through alternative energy becoming cheaper), then the curve would move left. Under the proposed **trading** system, these changes would lead to a fluctuation in price. Under a **tax** system, these changes would lead to a fluctuation in the quantity of emissions.

Both systems create a price for emissions, which will artificially increase the price of emissions-intensive activities such as transport, some electricity generation, and stock farming. Both approaches will have a negative effect on producers (driving up their costs, leading to lower demand) and consumers (higher prices). This consequence is true of both trading and taxes, and so does not help us to differentiate between the two alternatives.

Some economists—for example John Quiggin and Joshua Gans[8]—advocate the use of a trading system. The supposed benefits of trading include having a fixed level of emissions (and therefore fixed environmental impact), the subsidy to recipients of trading credits, and the difficulty in removing a trading system because of entrenched special interest groups.

All these factors, however, could also be seen as arguments against a trading scheme.

As with any fixed quota, fixed emissions are less efficient than a tax because quotas do not allow production decisions to adjust to changing circumstances, and fluctuating trading prices would create uncertainty. This is directly analogous to the situation in trade theories where tariffs are preferred to quotas because they are more efficient. As McKibbin and Wilcoxen[9] (advocates for a tax-trading hybrid approach) admit, 'from an economic perspective, an emissions tax would be an ideal instrument for addressing climate change. It would be efficient given the uncertainties surrounding climate change, and it would definitely work,' while an emissions trading system 'would be inefficient.' As environmental economist Jack Pezzey notes, a tax 'is still a highly cost-effective measure, better in most economists' view than emissions trading because it keeps the carbon price stable.'[10]

Despite the negative connotation of taxes, an emissions tax is actually more flexible, efficient and responsive to the market than an ETS because changed circumstances can result in changed use of resources.

With an emissions tax, money flows from emitters to the government. In a trading scheme, money flows from emitters to organisations that have credits. Giving away credits amounts to a subsidy for some producers; while this would be popular among the recipients of the subsidy, it would likely promote further inefficiencies by picking winners and creating perverse incentives (not least the incentive to pollute heavily in the base year to get more credits the year after). Discussing how emissions trading became politically popular, John Broder says 'it is almost perfectly designed for the buying and selling of political support through the granting of valuable emissions permits to favour specific industries.'[11]

This problem can be addressed by the government auctioning trading credits.[12] However, the trading system being introduced in New Zealand does have free emission credits, and there will be strong political pressure to maintain the allocation of some credits.

McKibbin and Wilcoxen suggest an ETS may be preferable because it will create a special interest group (emission credit holders) who will lobby to make sure the system is maintained. However, it is not likely that an emissions tax would be repealed without a good reason, and the continued existence of the fuel excise shows that the government is willing to maintain environmental taxes.

Further, it is possible in the future that we would legitimately want to abolish the emissions price, and so the political durability of the trading system is potentially a strike against it.

Perhaps the strongest argument for an emissions tax over an ETS is that it provides a constant and ongoing revenue stream for the government that can be used to reduce or remove other taxes. All taxes introduce costs into the economy. While the introduction of an emissions tax will have economic costs, offsetting tax cuts will reduce other distortions in the economy, therefore providing an offsetting economic benefit. If designed well, it is possible that a revenue-neutral emissions tax could have no net cost to the economy.

An objection to this argument is that it is politically naive—that no government would realistically drop taxes elsewhere in the tax system, especially given current government debt and the global financial crisis. But this is not true for New Zealand, where there is precedent for such a move. Emissions taxes can be marketed like GST was in the 1980s, introduced in concert with dropping other taxes. Also it seems a good way to get public support.

This benefit is not as easily available with a trading system, which raises less money because of credit give-aways and raises an inconsistent revenue stream because of the variable price of emissions credits.

Other problems with the ETS include significant compliance and insurance costs. Also, resources used in trading are a net waste that could otherwise be used elsewhere in the economy. Quiggin and Gans also note that while a trading scheme can put a price on emissions compared with tax, it does so 'in a less transparent measure.'[13]

Emissions trading would also have higher administration costs because a trading system is new and necessarily highly technical. The constant renegotiation of credits is likely to lead to continued rent-seeking behaviour, lobbying, and strategic behaviour in avoiding or manipulating the market.

Some of these problems also exist with a tax, but to a lesser degree and in a more transparent way. For example, New Zealand already has a tax bureaucracy and, as the Australian Productivity Commission (PC) notes, 'most countries find it easier and administratively less challenging to implement environmental taxes than emissions trading' and 'the administrative costs of an emissions tax are likely to be relatively low.'[14] In contrast, the PC suggests that 'emissions trading usually requires new institutions, such as a registry, mechanisms for trading and a body for monitoring and enforcement';[15] while

An emissions tax is actually more flexible, efficient and responsive to the market than an ETS because changed circumstances can result in changed use of resources.

Quiggin and Gans agree that 'some measure of independent regulation and review will be required.'[16] Alex Robson goes further, warning that 'enforcement costs, compliance costs and administrative costs involved in this kind of wholesale regulation, and control over individual and firms could be truly staggering.'[17]

Many of these costs of trading are already apparent in other trading systems, such as the European Union ETS (see box 1).

Despite including the word *trading* in the name, an emissions trading system is not the best market solution for creating an emissions price. Like import quotas, emissions trading is a costly, bureaucratic and inflexible approach. In contrast, an emissions tax is a relatively efficient and flexible alternative that allows market participants the maximum freedom to do business.

Emissions trading is a costly, bureaucratic and inflexible approach, whereas an emissions tax is a relatively efficient and flexible alternative that allows the market the maximum freedom to do business.

Kenneth Green, Steven Hayward, and Kevin Hassett[18] of the American Enterprise Institute echo these arguments, saying that a revenue-neutral emissions tax is preferable to emissions trading because it is more effective and efficient, includes less corruption and rent-seeking, provides price stability, allows for other tax cuts, and has greater adjustability and lower administration costs. They point out that emissions tax has broad support from across the political spectrum—Al Gore, the Earth Policy Institute, NASA scientist James Hansen, Harvard Economist Gregory Mankiw, and the CEO of Duke Energy all endorse it and suggest that 'the irony is that there is a broad consensus in favour of a carbon tax everywhere except on Capitol Hill.'[19]

Proposal for a NZ emissions tax

The two key variables with any tax are the base (what is being taxed) and the rate (how high is the tax).

The proposed ETS will cover stationary energy and industrial processes in 2010; liquid fossil fuels in 2011 and synthetic gases; and agriculture and waste by 2013. The total greenhouse gas emissions in 2007 by all sectors was 75.6 Mt of CO_2-e.[20]

The controversial issue regarding the tax base is whether to include the agricultural sector, which emitted 36.4 Mt CO_2-e in 2007.[21]

This paper argues that agriculture should not be included. The rationale for pricing emissions is *not* to reduce the use of energy, transport or agriculture. The goal is to speed up the shift to new 'cleaner' technologies. This is a viable goal for the transport and stationary energy sectors where there is the possibility of alternative technologies. However, it is not clear what a tax on emissions from agriculture will achieve.

Box 1: The European Emissions Trading Scheme (EU ETS)

In 2004, the European Union started the largest emissions-trading system in the world. New Carbon Finance, an EU ETS advisory firm, has released a summary of performances.

Since the EU ETS' inception it has had a volatile price index and large variation in the numbers volume of credits traded. Since 2004, under the first phase of trading the price has ranged from under €10 per tonne of CO_2-e (late 2004) to nearly €30 per tonne (mid 2005); €20 per tonne (late 2005); €30 per tonne (early 2006); and then a crash back to €10 per tonne (April 2006) before collapsing to €1 per tonne (2007).

Since the second phase began, the prices have been somewhat more stable although still fluctuating—from €20 in February 2008 to €30 in July 2008 to €10 in February 2009. Outcomes of political negotiations within the European Union are always uncertain so future credit prices share that uncertainty. This uncertainty leads to delayed investment, and risk aversion leads to less inventive to invest. The potential economic costs have been discussed by William Nordhaus[22] and Robert J Shapiro[23] among others.

Another problem identified with the scheme is over-allocation of permits for some polluters, which has led to substantial profits for some but also perverse incentives to retain inefficient operations elsewhere. The authors highlight the fact that such allocations could be regarded as state aid. New allocations provided to new entrants amounts to an investment subsidy, and is therefore picking winners. It can amount to windfall gains for those companies that successfully lobby for free credits. As these allocations are linked to the carbon intensity of operations, they also encourage investment in carbon intensive industry.

In fact, Nick Shulz, from the American Enterprise Institute has a more startling take on the EU ETS, likening it to the mortgaged-back securities situation that helped cause the global financial crisis.

'Europe has in place a cap-and-trade program that today looks a little like the American mortgage-backed securities market—it's a total mess. The price of carbon recently fell—plummeting from over $30 to around $12 per ton—as European firms unloaded their permits on the market in an effort to shore up deteriorating balance sheets during the crunch.'[24]

The constant need for re-negotiations and the complexity of the system has made the EU ETS highly political, and the nature of the re-negotiations is such that they may encourage polluters to set a high emissions standard in 'base' years so that they receive a higher allocation of permits in future negotiations. This 'updating' problem means that emissions trading can lead to higher energy prices without offering any incentive for carbon reform.

Not only will a tax on agriculture provide little help in shifting towards a sustainable low-emission economy, it is also the part of the tax base that produces the highest possible costs.

By excluding agriculture, an emissions price would still provide important incentives towards new technology while not unduly harming the NZ economy.

The second issue is regarding the rate at which the emissions tax should be set.[25] Western Australia has suggested a tax of up to A$25 per tonne, and the Australian Department of the Environment and Water Resources has looked at options ranging form A$1 to A$50 per tonne. Sweden has a tax of US$150 per tonne. Japan has considered options ranging from around US$10 to US$100 per tonne. Some studies suggest a Pigouvian rate should be between US$4 and US$25 per tonne, or between US$3 and US$95 per tonne. *The Stern Review* suggested a social cost of emissions of US$85, and William Nordhaus suggested US$16. The effective tax from the EU trading system has fluctuated between €1 and €30.

By excluding agriculture, an emissions price would still provide important incentives towards new technology while not unduly harming the economy.

The table below provides estimates for revenue from an emissions tax ranging from NZ$10 to $40 per tonne of CO_2-e. Information is provided on both the 'broad base' and 'excluding agriculture' scenarios. Revenue has been adjusted for an elasticity of demand of 0.7,[26] which factors in the long-run behavioural response from the tax changes.

Table 1: Revenue estimates from various emissions tax proposals

Tax rate	Non-agriculture (39.2Mt)	Broad base (75.6 Mt)
$10 per tonne	$353 million	$680 million
$20 per tonne	$706 million	$1361 million
$30 per tonne	$1058 million	$2041 million
$40 per tonne	$1411 million	$2722 million

Source: Authors' calculations based on 2007 emissions as outlined in New Zealand's Greenhouse Gas Inventory 1990–2007.[27]

Irrespective of which tax is chosen, it would be preferable to introduce it in stages to allow carbon emitting firms and electricity consumers a greater capacity to adjust.

Irrespective of which tax rate is chosen, it would be preferable to introduce the tax in stages over time to allow carbon emitting firms and electricity consumers, who will both face higher prices, a greater capacity to adjust. A tax of $20 per tonne of CO_2-e could be introduced in four increments of $5 per tonne over several years. This incremental approach would also give policy makers time to assess the economic, social and environmental impacts of marginal change.

In addition, it may be possible to link an emissions tax with the degree of anthropogenic global warming (AGW), as suggested by Canadian economist Ross McKitrick. The 'McKitrick tax'[28] would link the size of the tax to the warming in the tropical troposphere (up to 15km altitude, between 20°N and 20°S). According to the International Panel on Climate Change (IPCC), warming in the tropical troposphere should be an early and strong signal of AGW. McKitrick suggests a tax at 20 cents for every hundredth of a degree Celsius of warming in the tropical troposphere (above the 1979–98 average). For example, if temperatures were 0.5°C over the average then the tax would be $10 per tonne CO_2-e. If greater warming became apparent, the tax rate would increase.

This approach could be used in New Zealand, where the tax increments could be dependent on observed warming and the emissions tax could be decreased or abolished if man-made warming failed to occur.

Tax swap possibilities

All taxes distort the economy and create costs. An emissions tax will not be any different. However, by using emissions tax revenue to reduce or eliminate other taxes it is possible to create an offsetting economic benefit so that the total reform has minimal impact on economic welfare.

There are various options for tax cuts in New Zealand and a strong argument in favour of lower taxes and tax reform in their own right.

Income tax reform

The New Zealand income tax system is a burden on economic growth and job creation. While the tax rates are not excessively high by international standards, the higher tax rates cut in at a low level—meaning that many ordinary workers are facing a relatively high marginal tax rate.

A $40 per tonne CO_2-e non-agriculture emissions tax would be expected to raise over $1.4 billion. This could be used to increase the cut-off point for the 21% tax bracket (from $48,000 to $60,000) and the cut-off point for the 33% tax bracket (from $70,000 to $140,000)—thereby moving more average workers into lower tax brackets.[29]

Alternatively, the emissions tax revenue could be used to reduce the top marginal tax rate from 38% and 33% down to only 30%. Given that the higher marginal tax rates apply to workers on an average income, this reform would improve incentives where it is needed most. Further, reducing the number of tax brackets would reduce the problem of 'bracket creep,' where economic growth and inflation push people into higher tax brackets.

Another option would be to simply remove the 33% bracket so that anybody earning up to $70,000 paid only 21% marginal income tax.

Lower emissions tax options would still allow worthwhile income tax reform. A $30 per tonne CO_2-e non-agriculture emissions tax would raise about $1.1 billion and allow the government to shave 1% of each tax bracket, or drop the top marginal tax rate from 38% and 33% down to 32%.

Even a $10 per tonne CO_2-e non-agriculture emission tax would provide enough revenue for the government to reduce the 33% tax rate to 30%, or drop the bottom rate from 12.5% to 11.5%.

The exact impact on the budget, economic welfare, and equality would depend on the exact sort of emissions-income tax trade-off. However, given the detrimental impact of income taxes on growth and employment, any opportunity to reduce income taxes should be given serious consideration.

One possible objection to providing income tax relief is that higher after-tax income might be used on energy consumption. This complaint is based on a misunderstanding of the goal of climate change policy. The goal of putting a price on emissions is not to reduce the use of energy but to encourage a long-term shift towards 'cleaner' technology. Even if short-term energy use were to increase, the important issue is that a price on emissions will adjust the relative competitiveness of alternative technology and speed up the process until New Zealand transfers to a low-emission economy.

The goal of putting a price on emissions is not to reduce the use of energy but to encourage a long-term shift towards 'cleaner' technology.

Reforming the environment tax (replacing the fuel tax)

One way to think of an emissions tax in New Zealand is as an extension of the already existing environment tax, which applies to fuel and diesel. The transport sector emitted 14.2 Mt CO_2-e in 2005, and is taxed at 42.524¢ per litre. In contrast, in 2005 the rest of the energy sector emitted 19.3 Mt CO_2-e; industrial processes sector emitted 4.3 Mt CO_2-e; and the waste sector emitted 1.8 Mt CO_2-e—and all of these areas avoided an environment tax.

Economists have long advocated tax reform that applies a lower rate to a broader base to reduce the amount of distortions in the economy. In this context, replacing the current fuel tax with a broader and lower emissions tax is consistent with good tax policy, irrespective of the environmental arguments.

The petroleum fuel excise raised $809 million in 2007–08.[30] A $20 per tonne CO_2-e non-agriculture emissions tax would provide a similar amount of revenue and could replace the fuel excise.[31]

The consequence would be higher prices on the stationary energy, industrial processes, and waste sectors, offset by lower prices on the transport sector. As the base has expanded by a factor of nearly three, the tax rate on fuel would be reduced by nearly two-third—from 42.524 cents to about 15 cents—offering a 27-cent reduction in the price of fuel.

Replacing the current fuel tax with a broader and lower emissions tax is consistent with good tax policy, irrespective of the environmental arguments.

The economic impact of this change would be roughly neutral, as the price elasticity of demand[32] for petrol (-0.1 to -0.7)[33] is about the same as the price elasticity of demand for energy (-0.3 to -0.6).[34] That means the loss of welfare from the new tax would be offset by the welfare gain from reducing the fuel tax.

Not only would this approach be revenue-neutral and welfare-neutral, but it would also be broadly equity-neutral, as both the fuel tax and the emissions tax are flat taxes and everybody and every industry uses transport and electricity. While an emissions tax would be regressive (as poor people spend a higher percentage of their income on energy), it is no more regressive than the fuel tax. While there will be some winners (heavy transport

users) and some losers (heavy energy users), for many people the higher electricity bill will be broadly offset by the lower transportation bill.

An obvious objection to an emissions-fuel tax swap is that it will lead to more emissions from the transport sector as the fuel tax is lowered. While this is true, it does not invalidate the benefits from this policy. Fuel would still be taxed to ensure that transport users were facing the full social cost of their transport decisions. But the broader tax base would mean that more sectors of the economy are facing an incentive to shift to 'cleaner' technologies. The emissions-fuel tax swap successfully internalises the impact of emissions while not damaging the economy, the budget or equity.

The emissions-fuel tax swap successfully internalises the impact of emissions while not damaging the economy, the budget or equity.

Company tax reform

Another option worth considering is the reduction of company tax. While company tax is less immediately obvious to the average taxpayer, it is a tax on economic growth and a tax on job creation. Given the current economic environment, it makes sense for the government to be reducing barriers to business growth.

A $30 per tonne CO_2-e non-agriculture emissions tax would raise about $1.1 billion, which would allow the government to reduce the company tax rate from 30% down to 25%. This would result in stronger business growth, higher wages, and lower prices.

Conclusion

Climate change is a topical issue in the New Zealand political debate. Any policy chosen will have a very real impact on New Zealand. It is important that we have a fully robust debate about different policy responses and ensure that the government pursues the best option.

To justify any government action, it is necessary to show that the benefit of that action exceeds the costs. The free market does not create a perfect system, but there is no point in supporting government intervention if the cure is worse than the disease. Government policy should only be supported if it clearly passes a cost-benefit analysis. This paper does not attempt to address the issue of whether the government should act or whether any government action on climate change produces a net benefit.

Instead, this paper starts with the recognition that we live in a current political reality where the government (with bipartisan support) is already acting on climate change and has stated its clear intention to take further action. In this environment, it is prudent to ask which policy option will achieve the stated goal (moving to a low-emission economy) at the lowest cost.

All policy options (regulations, subsidies, emissions tax, emissions trading) are designed to reduce emission by switching our energy production and usage from emissions-intensive energy to other energy sources. The most efficient way to do this is to introduce a price signal and allow the market to produce the best alternative. The government should not attempt to pick winners or to bias the market in favour of any alternative such as biofuel, wind, solar, or 'clean' coal, and funding for these industries should be removed. A price signal can be introduced either through an emissions tax or through a trading system.

The paper argues that an emissions tax is relatively more efficient, simple and equitable than a trading system. One of the significant advantages of an emission tax is that the consistent revenue raised can be used to reduce other taxes to minimise the economic impact.

Many offsetting tax reform options exist. This paper has briefly mentioned a few alternatives. A $10 per tonne CO_2-e non-agriculture emissions tax could be used to cut the 33% income tax rate down to 30%. A $40 per tonne CO_2-e non-agriculture emissions tax would allow more fundamental income tax reform, increasing tax bracket thresholds or reducing the top marginal tax rate down to 30%.

A $20 per tonne CO_2-e non-agriculture emissions tax could be used to replace the fuel tax, resulting in petrol prices dropping by about 27 cents per litre.

A $30 per tonne CO_2-e non-agriculture emissions tax could be used to cut the company tax rate from 30% to 25%, stimulating the economy and protecting jobs.

Any of these options would provide benefits to the economy to offset the inevitable costs of an emissions tax. Given the competing political priorities of protecting the economy and acting on climate change, a revenue-neutral emissions tax is the best option for New Zealand.

Endnotes

1 This paper is based largely on a previous paper written by John Humphreys, *Exploring a Carbon Tax for Australia* (Sydney: CIS, 2007).
2 *Climate Change Response (Emissions Trade) Amendment Act 2008*.
3 This paper does not take a position on the scientific debate regarding anthropegic climate change or whether the government should introduce further policies.
4 Agriculture in this paper only refers to farming, not any of the related industries such as meat processing and so on.
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16 Quiggin and Gans, as above, 8.
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21 As above.

22 William Nordhaus, *Life After Kyoto: Alternative Approaches to Global Warming Policies*, National Bureau of Economic Research Working Paper 11889 (December 2005), www.econ.yale.edu/~nordhaus/homepage/kyoto_long_2005.pdf.
23 Robert J Shapiro, *Addressing the Risks of Climate Change: The Environmental Effectiveness and Economic Efficiency of Emissions Caps and Tradeable Permits, Compared to Carbon Taxes* (February 2007), www.pnucc.org/documents/ShapiroCapandTrade.pdf.
24 Nick Schulz, *To Slow Climate Change, Tax Carbon*, American Enterprise Institute for Public Policy Research (13 February 2009), www.aei.org/publications/pubID.29392,filter.all/pub_detail.asp.
25 The following statistics are taken from John Humphreys, *Exploring a Carbon Tax for Australia* (Sydney: CIS, 2007).
26 See the discussion later about the elasticity for demand for electricity and fuel.
27 Ministry for the Environment, *New Zealand's Greenhouse Gas Inventory 1990-2007: An Overview* (April 2009), www.mfe.govt.nz/publications/climate/greenhouse-gas-inventory-2009/new-zealands-greenhouse-gas-inventory.pdf.
28 McKitrick, Ross, 'Call their tax,' *Financial Post* (12 June 2007), www.nationalpost.com/story.html?id=d84e4100-44e4-4b96-940a-c7861a7e19ad&p=2.
29 Calculations regarding tax cuts are taken from Treasury data provided in Total Personal Taxable Income Contributed To Each Income Band (30 May 2008).
30 Financial Statements to the government of New Zealand, B.11, Note 2: Tax and Levies Collected through the Crown's Sovereign Power (Cash).
31 Note that an emissions fuel tax would have offsetting behavioural responses as the higher tax on stationary energy is offset by lower taxes on the transport sector. Under this scenario the revenue raised would be higher than estimated in table 1. A more accurate revenue estimate with an emissions-fuel tax swap would not factor in any net behavioural response, which would produce a revenue estimate of $796 million per year for a $20 tonne CO_2-e non-agriculture emission tax.
32 The elasticity of demand measures the change in quantity demanded caused by a change in price. A high elasticity (>1) means that a change in price will cause a large change in quantity demanded. A low elasticity (<1) means that the change in price will cause little change in the quantity demanded.
33 Department of Transport and Regional Services, *Petrol Demand Elasticities, Australia 1958–81*, http://dynamic.dotars.gov.au/btre/tedb/pdf/table5B04.pdf.
34 Muhummad Akmal and David Stern, *The Structure of Australian Residential Energy Demand*, Working papers in Ecological Economics for the Australian National University's Centre for Resource and Environmental Studies Ecological Economics Program (Canberra: ANU, March 2001), http://een.anu.edu.au/download_files/eep0101.pdf.

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