



Rearranging the deck chairs: Australia's carbon "leadership" without comparable followers

Tim Wilson
Director of Climate Change Policy

February 2013

 **Institute of
Public Affairs**
Free people, free society

1.0 Executive Summary

- Leading up to Doha Climate Change Conference, Australia agreed to ratify the Kyoto Protocol's second commitment period covering emissions targets from 2013 – 2020.
- Only Australia, the European Union, Norway and Switzerland have agreed to ratify Kyoto's second commitment period.
- Of the emissions reduction pledges made by those countries that intend to ratify Kyoto's extension, Australia made the most generous offer of a 47 per cent cut from business-as-usual projections.
- By comparison, Europe's offer to cut emissions is only 23 per cent off business-as-usual projections.
- Australia's offer to cut emissions is more than double the 27 nations of the European Union.
- Most of the major developed countries that Australia negotiates with in international climate talks – the Umbrella group of non-European developed countries – have not ratified a second commitment period under Kyoto, including Canada, Japan, New Zealand and Russia.
- Having not ratified the first commitment period of the Kyoto Protocol, the United States has also turned its back on Kyoto's second commitment period.
- The second commitment period of the Kyoto Protocol only covers 15 per cent of global emissions.
- The key source of growth in global emissions – developing countries – are also not bound by Kyoto despite now accounting for nearly 60 per cent of global emissions, and rising.
- By ratifying a second commitment period under Kyoto, Australia has also adopted the revised calculations for the global warming potential of greenhouse gases. These projections upwardly revise the global warming potential of some gases, particularly methane, and reduce others, particularly nitrous oxide.
- Now that these calculations have to be adopted Australia's emissions profile will:
 - Increase by the equivalent of 22 million tonnes of carbon dioxide per annum.
 - Increase the cost impact of the carbon tax by nearly \$230 million per annum.
 - Increase the average carbon tax impost to households, which is wholly passed through, would likely wipe out 'over-compensation'.

2.0 Abbreviations

ABS	Australian Bureau of Statistics
BAU	Business-as-usual
C₂F₆	Perfluoroethane (Hexafluoroethane)
C₂H₃F₃	Hydrofluorocarbon (Trifluoroethane)
C₂HF₅	Hydrofluorocarbon (Pentafluoroethane)
C₄F₁₀	Perfluorobutane
CF₄	Perfluoromethane (Tetrafluoromethane)
CH₂FCF₃	Hydrofluorocarbon (Tetrafluoroethane)
CH₄	Methane
CHF₃	Hydrofluorocarbon (Fluoroform)
CO₂	Carbon dioxide
CO_{2-e}	Carbon dioxide equivalent
COP	Conference of Parties
DCCEE	Department of Climate Change and Energy Efficiency
FAR	Fourth Assessment Report of the Intergovernmental Panel on Climate Change
GCF	Green Climate Fund
GG	Gigagrams
GWP	Global warming potential
GHG	Greenhouse gas
IPA	Institute of Public Affairs
IPCC	Intergovernmental Panel on Climate Change
Kyoto I	The first commitment period of the Kyoto Protocol (2008 – 2012)
Kyoto II	The second commitment period of the Kyoto Protocol (post 2013 - 2020)
LCA	Long term cooperative action
N₂O	Nitrous oxide
QELRO	Quantified emissions limitation and reduction objective
SAR	Second Assessment Report of the Intergovernmental Panel on Climate Change
SF₆	Sulphur hexafluoride
t	Tonnes
UNFCCC	United Nations Framework Convention on Climate Change

3.0 Doha's outcome

In 1997 the UNFCCC successfully negotiated the Kyoto Protocol – the only legally binding international treaty to cut greenhouse gas emissions. The key components to Kyoto were the targets for emissions reduction by developed countries and the mechanisms that allowed them to achieve these targets. Kyoto also included the process of calculating emissions cuts. In practice Kyoto covered a five year timeframe from 1998 until 2002 for countries to meet their emissions reduction targets.

Officially, since 2007, countries have been seeking to negotiate an extension of the Kyoto Protocol and/or a successor agreement. At the 2007 UNFCCC summit in Bali countries split negotiations into two tracks. The first track was to negotiate the extension of the Kyoto Protocol, the second was to negotiate a pathway for long-term cooperative action toward a new, successor agreement.

The two tracks highlight the structural disagreements between countries in negotiating an international framework for cutting emissions.

In summary, developing countries wanted to focus on the Kyoto pathway which bound developed countries to cut emissions and left them without obligations. It was an extension of the principles included in the original Framework Convention of “common, but differentiated responsibilities”¹ between developed and developing countries. Developed countries preferred the long-term cooperative action pathway which was designed to treat all countries roughly equally under a non-binding agreement to cut emissions.

The spectacular collapse of the 2009 Copenhagen conference was essentially caused because of a failure of these two divergent approaches to cutting emissions.

Since then countries have continued to progress negotiations and at the 2012 Doha Summit there was agreement to extend the Kyoto Protocol from 2012 – 2020 through a second commitment period to cut emissions.

The extension came with strings attached – non-European countries withdrew their support leaving only Australia, the European Union, Norway and Switzerland as ratifying members. The United States never ratified the original Protocol. Canada, New Zealand, Japan and Russia have now joined the United States.

Countries will continue to progress negotiations through the Durban Platform established in 2011. The Durban Platform included agreement by countries to negotiate a successor to the Kyoto Protocol by 2015 to cover emissions cuts after 2020 and included the first reference to major developing countries being a part of that process. At the current pace of negotiations the 2015 deadline for Kyoto's post-2020 successor agreement is unlikely to be met, though some flexibility is available in the negotiating timeframe beyond 2015.

Currently negotiations continue to be bogged down by the problematic “common, but differentiated responsibilities”² attitude bought toward negotiations founded in the Framework Convention. As a consequence developing countries continue to negotiate alternate policy objectives to assist them in

¹ United Nations Framework Convention on Climate Change. 1992. “Full text of the convention – Article 3: Principles”. United Nations. At

http://unfccc.int/essential_background/convention/background/items/1355.php

² *Ibid.*

the significant costs they would face resulting from decarbonising their economies and potential consequences from a changing climate.

For example, the Copenhagen Accord included a loose agreement to establish a Green Climate Fund. The Green Climate Fund is designed to eventually attract \$100 billion a year from developed countries to assist developing countries in financing adaptation to a changing climate.

Similarly, a key sticking point at the Doha conference was a push for equivalent, and potentially duplicative, financing by developed countries for developing countries to assist in “loss and damage” caused by a changing climate.³

These trade-offs have become central to negotiations and whether developing countries will, in the end, accept obligations through the UNFCCC process.

³ United Nations Framework Convention on Climate Change. 2012. “Draft decision -/CP.18: Agreed outcome pursuant to the Bali Action Plan”. United Nations. At http://unfccc.int/files/meetings/doha_nov_2012/decisions/application/pdf/cop18_agreed_outcome.pdf

4.0 Australia's Kyoto II commitments

In international negotiations countries often form negotiating blocs. These negotiating blocs normally reflect broad vested national interests and cooperation between countries that share those interests. Doing so makes negotiations more streamlined and avoids countries individually stating their positions and negotiating specific proposals that may reflect broad positions.

In the UNFCCC Australia predominantly participates as part of the Umbrella group of predominantly non-European developed countries. Countries that make up the Umbrella group include Australia, Canada, Japan, Kazakhstan, New Zealand, Norway, Russia, Ukraine and the United States.

As outlined in his speech to the COP, Parliamentary Secretary, Mark Dreyfus QC, argued Australia:

- remained committed to the extension of Kyoto into a second commitment period
- wanted to end the LCA to progress the Durban Platform
- provide ongoing financial support for mitigation and adaptation in developing countries (including both fast-start finance and longer term finance through the Green Climate Fund).⁴

In particular, a key provision of extending Kyoto was the quantified emissions limitation or reduction commitments from 2013 – 2020.

Australia's QELRO offer was increased from its Kyoto first commitment period of 108 per cent of emissions off 1990 levels.⁵ Following the conclusion of the Doha conference Australia had increased its emission reduction target to 99.5 per cent of emissions from 1990 levels (referred to as the base year), or 98 per cent of 2000 levels (referred to as the reference year), as shown in Figure 1. The low variability between emissions cuts off the base and reference years is because there was not a significant difference in Australia's overall emission footprint in 1990 and 2000.⁶

Some have wrongly argued that such cuts would be insignificant in comparison to seemingly more generous offers by European countries to cut their emissions by 80 per cent of 1990 levels.

First, doing so ignores the fact that Europe's post-Communist circumstances promptly cut emissions levels across the Continent as a result of deindustrialisation and that those countries successfully manipulated their obligations under Kyoto to secure free emissions cuts.

Second, European countries committed to a 92 per cent reduction of 1990 levels in the first commitment period of Kyoto and achieved it mostly due to the economic consequences of the GFC.

⁴ Dreyfus, M. 2012. "Umbrella Group Statement – High Level Segment". United Nations Framework Convention on Climate Change. 03/12/2012. At http://unfccc.int/resource/docs/cop18_cmp8_hl_statements/Statement%20on%20behalf%20of%20the%20Umbrella%20Group.pdf

⁵ United Nations Framework Convention on Climate Change. 1997. "Kyoto Protocol to the United Nations Framework Convention on Climate Change". United Nations. At http://unfccc.int/essential_background/kyoto_protocol/items/1678.php

⁶ United Nations Framework Convention on Climate Change. 2012. "Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex 1 Parties under the Kyoto Protocol: Amendment to the Kyoto Protocol pursuant to its Article 3, Paragraph 9". United Nations. FCCC/KP/CMP/2012/L.9. At <http://unfccc.int/resource/docs/2012/cmp8/eng/l09.pdf>

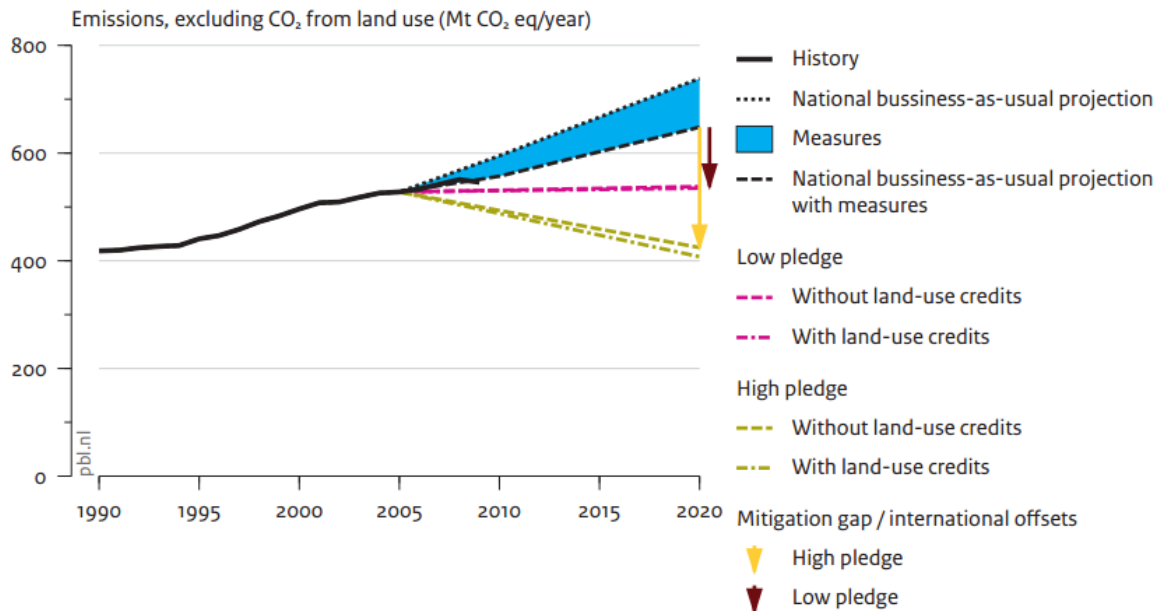
Figure 1 | commitments under Kyoto I and II

Party	Kyoto I: 2008 – 2012 QELRO (base year)	Kyoto II: 2013 – 2020 QELRO (base year)	Reference year	Kyoto II: 2013 – 2020 QELRO (ref year)
Australia	108	99.5	2000	98
Austria	92	80	N/A	N/A
Belarus		88	1990	N/A
Belgium	92	80	N/A	N/A
Bulgaria	92	80	N/A	N/A
Canada	94			
Croatia	92	80	N/A	N/A
Cyprus		80	N/A	N/A
Czech Republic	92	80	N/A	N/A
Denmark	92	80	N/A	N/A
Estonia	92	80	N/A	N/A
European Union	92	80	1990	N/A
Finland	92	80	N/A	N/A
France	92	80	N/A	N/A
Germany	92	80	N/A	N/A
Greece	92	80	N/A	N/A
Hungary	94	80	N/A	N/A
Iceland	110	80	N/A	N/A
Ireland	92	80	N/A	N/A
Italy	92	80	N/A	N/A
Japan	94			
Kazakhstan		95	1990	95
Latvia	92	80	N/A	N/A
Liechtenstein	92	84	1990	84
Lithuania	92	80	N/A	N/A
Luxembourg	92	80	N/A	N/A
Malta		80	N/A	N/A
Monaco	92	78	1990	78
Netherlands	92	80	N/A	N/A
New Zealand	100			
Norway	101	84	1990	84
Poland	94	80	N/A	N/A
Portugal	92	80	N/A	N/A
Romania	92	80	N/A	N/A
Russian Federation	100			
Slovakia	92	80	N/A	N/A
Slovenia	92	80	N/A	N/A
Spain	92	80	N/A	N/A
Sweden	92	80	N/A	N/A
Switzerland	92	84.2	1990	N/A
Ukraine	100	76	1990	N/A
United Kingdom	92	80	N/A	N/A
United States of America	93			

Source: Adapted from the United Nations Framework Convention on Climate Change. 1997. “Kyoto Protocol to the United Nations Framework Convention on Climate Change”. United Nations. At http://unfccc.int/essential_background/kyoto_protocol/items/1678.php and United Nations Framework Convention on Climate Change. 2012. “Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol: Amendment to the Kyoto Protocol pursuant to its Article 3, paragraph 9”. United Nations. FCCC/KP/CMP/2012/L.9. At <http://unfccc.int/resource/docs/2012/cmp8/eng/l09.pdf>.

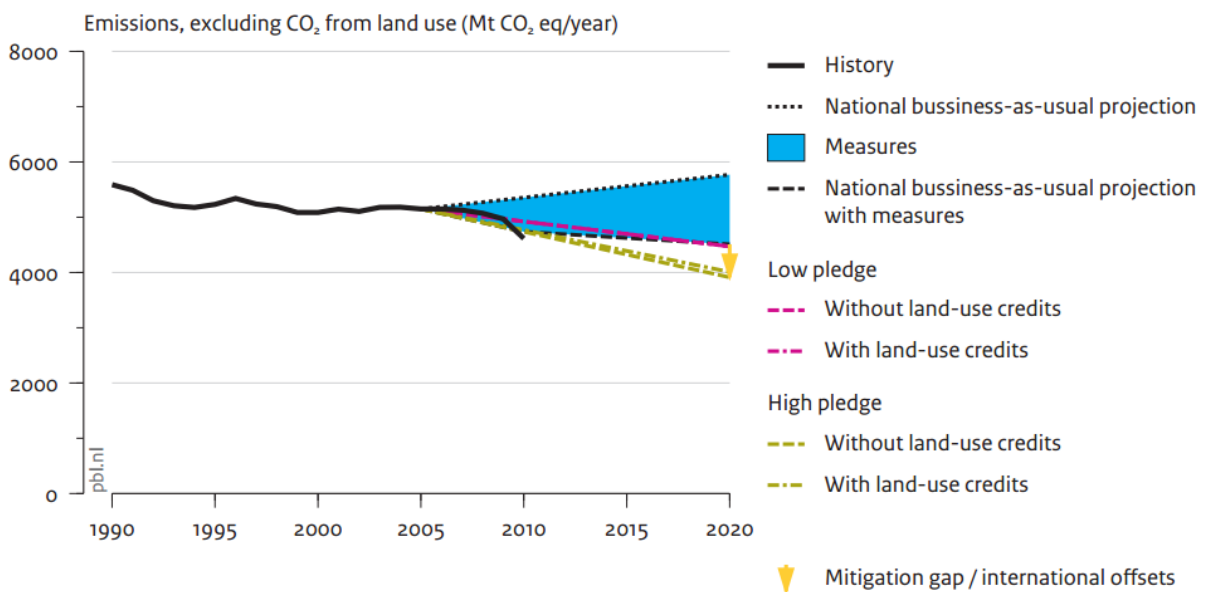
Third, it ignores the significance of Australia’s emissions targets against BAU. As Figures 2 highlight, Australia’s projected BAU is set to rise considerably from 1990 and 2000 levels. The same cannot be said for Europe.

Figure 2 | Australia’s emissions trends



Source: Elzen, M. Roelfsema, M. Hof, A. Bottcher, H. & Grassi, G. 2012. “Analysing the emission GAP between pledged emissions reductions under the Cancun agreements and the 2C climate target”. Policy Studies. PBL Netherlands Environmental Assessment Agency. At <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2012-analysing-the-emission-gap-between-pledged-emission-reductions-500114021.pdf>.

Figure 3 | Emissions trend for the 27 members of the EU



Source: Elzen, M. Roelfsema, M. Hof, A. Bottcher, H. & Grassi, G. 2012. “Analysing the emission GAP between pledged emissions reductions under the Cancun agreements and the 2C climate target”. Policy Studies. PBL Netherlands Environmental Assessment Agency. At <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2012-analysing-the-emission-gap-between-pledged-emission-reductions-500114021.pdf>.

Dutch research presented in Figure 3 shows, Europe's BAU emissions trend by 2020 is essentially level with 1990 emissions levels before the collapse of the Soviet Union. The effect is that the EU's QELRO offer under Kyoto II means it will be cutting emissions at 23 per cent off BAU.⁷

Calculations of UNFCCC data shows a similar trend.

Of the few countries that committed to cutting emissions between 2013 and 2020, Australia's cuts are the largest in the developed world (substantially more than Europe's) when compared against BAU emissions projections.

When compared to 1990 levels, Australia's emissions cuts are the largest at 47 per cent, followed by Norway at 43 per cent, Belarus at 41 per cent, then the European Union at a mere 23 per cent. The lowest offer was from Ukraine at 6 per cent. Australia's offer to cut emissions is more than double the 27 nations of the European Union.

Measurements of BAU scenarios are particularly important for Australia. As the Treasury's own *Strong Growth, Low Pollution* modelling for the carbon tax and emissions trading scheme shows, much of the emissions reduction achieved by Australia occurs offshore.

Therefore there will be limited domestic emissions reduction, in comparison to emissions reductions traded into Australia through forms of international linking.

While Australia's offer is clearly the largest, it need not have been had other countries also committed to emissions reduction and not walked away from extending the Kyoto Protocol.

⁷ Elzen, M. Roelfsema, M. Hof, A. Bottcher, H. & Grassi, G. 2012. "Analysing the emission GAP between pledged emissions reductions under the Cancun agreements and the 2C climate target". Policy Studies. PBL Netherlands Environmental Assessment Agency. At <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2012-analysing-the-emission-gap-between-pledged-emission-reductions-500114021.pdf>.

Figure 4 | National Emissions (Mt)

Country	Base emissions (1990), Mt	Reference emissions (2000), Mt	BAU emissions (2020), Mt	Kyoto II commitment		Emissions using Kyoto II commitment		
				1990	2000	1990, Mt	2000, Mt	% off BAU
Australia	416	494	739	95%	98%	395	484	47%
Austria	78	81		80%	N/A	62	-	-
Belarus	140	79	210	88%	N/A	123	-	41%
Brazil	577	759	2,703	-	-	-	-	-
Canada	592	718	850	-	-	-	-	-
China	4,057	N/A	-	-	-	-	-	-
EU-27	5,564	5,109	5,769	80%	N/A	4,451	-	23%
Indonesia	267	334	3,000	-	-	-	-	-
Japan	1,208	1,346	1,369	-	-	-	-	-
New Zealand	25	31	85	-	-	-	-	-
Norway	50	53	73	84%	84%	42	45	43%
Russia	3,350	2,040	2,750	-	-	-	-	-
Switzerland	53	52	55	84%	N/A	44	-	19%
South Africa	347	380		-	-	-	-	-
Ukraine	930	396	755	76%	N/A	707	-	6%
United States	6,099	7,008	7,416	-	-	-	-	-

Source: UNFCCC data and IPA calculations.

Notes: 2000 figure for Iceland is from 1999, 1990 figure for China is from 1994.

5.0 What wasn't offered in Doha

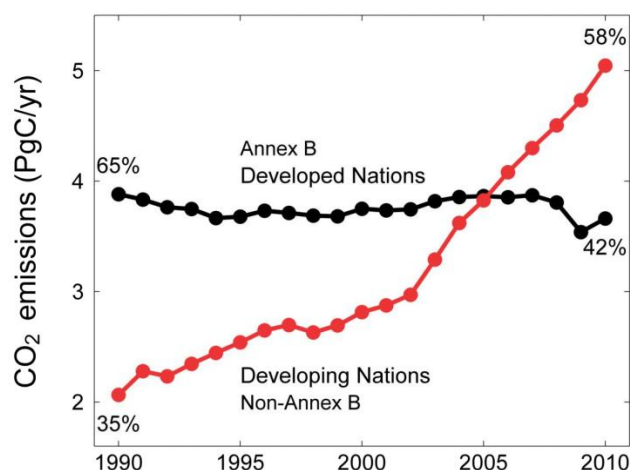
While Australia made one of the most generous offers to cut emissions in Doha, a key point was the absence of certain commitments by countries. In the lead up to the Doha conference Canada, Japan, New Zealand, Russia and the United States all signalled that it was not their intention to be bound by an extended Kyoto Protocol.⁸⁹ The United States was never going to be bound by an extension because it failed to ratify the Kyoto Protocol.

Under the final amending text of Kyoto the absence of their commitment was notable with no QELROs made. As Figure 1 outlines, none of these countries made QELRO offers in the final negotiations. Only European countries and Australia remain parties to the Kyoto Protocol.

The other notable absence was any obligations on developing countries. In the past, international climate negotiations have focused on commitments from developed countries based on the “common, but differentiated responsibilities” of countries as outlined in the original Framework Convention.

However, to limit global emissions that is no longer practically feasible. Politically it has become evident that it is difficult, and possibly unsustainable, for many developed countries to accept emissions reduction pledges while developing countries do not.

Figure 5 | Developing country emissions now eclipse those of developed countries



Source: Global Carbon Project. 2012. “Global Carbon Budget 2012”. Presentation. 03/12/2012. At <http://www.globalcarbonproject.org/carbonbudget/12/files/CarbonBudget2012.pdf>.

The substantive reason it is unsustainable is because developing countries have become the primary source of emissions growth. As the Global Carbon Project’s graph Figure 5, shows, since around 2005 developing countries have overtaken the total emissions of developed countries, meanwhile developed country emissions have plateaued and dropped – though mostly because of the GFC.

Concurrently developing countries have risen at a rapid rate and now account for nearly 60 per cent of global emissions, and are expected to continue to rise.

⁸ Ritter, K. 2012. “New Zealand slams Kyoto extension”. Daily Telegraph. 03/12/2012. At

⁹ Doyle, A. 2012. “UN calls for urgency on climate, says Doha deal to delight no one”. Reuters. 30/11/2012. At

6.0 Kyoto II's sting

As outlined in the IPA's July 2012 research paper, *Recalculating the impact of the carbon tax: How changes to global carbon accounting standards will wipe out household over-compensation*, as part of the negotiations for a second Kyoto Protocol commitment period, there is a sting that has gone unnoticed in negotiations for the agreement.

Not all greenhouse gases are the same. Each has a different global warming potential. A gas with a higher GWP essentially captures more heat than carbon dioxide and/or stays in the atmosphere for a longer time than carbon dioxide, increasing its possible contribution to capturing heat.

Because different greenhouse gases have different GWPs it is useful to convert them to an equivalent environmental impact in terms of the most common greenhouse gas emitted by humans – carbon dioxide, or CO₂.

When a greenhouse gas is converted to CO₂ its GWP is reflected in its carbon dioxide equivalence, or CO_{2-e}.

For example, methane (CH₄) is less commonly emitted by humans than CO₂. But, it has a much higher GWP than CO₂ and therefore the calculations of its GWP have a significant impact on a country's emissions profile.

When methane is converted to CO_{2-e} it needs to be multiplied by a factor of 21 to be equivalent to CO₂, according to the IPCC's SAR¹⁰ and as required under the Kyoto Protocol.¹¹ Put simply:

$$1 \text{ tonne of methane} = 21 \text{ tonnes of carbon dioxide equivalent greenhouse gases}$$

or

$$1\text{t CH}_4 = 21\text{t CO}_{2-e}$$

As outlined in Figure 6, other gases also have different GWPs.

Figure 6 | Select global warming potentials of greenhouse gases for the Kyoto Protocol

Greenhouse gas	Chemical formula	Second assessment report		
		20 years	100 years	500 years
Carbon dioxide	CO ₂	1	1	1
Methane	CH ₄	56	21	6.5
Nitrous oxide	N ₂ O	280	310	170
Hydroflurocarbon (Fluoroform)	CHF ₃	9,100	11,700	9,800
Hydroflurocarbon (Pentafluoroethane)	C ₂ HF ₅	4,600	2,800	920
Hydroflurocarbon (Tetrafluoroethane)	CH ₂ FCF ₃	2,900	1,300	310
Hydroflurocarbon (Trifluoroethane)	C ₂ H ₃ F ₃	8,000	3,800	1,400
Perfluoromethane (Tetrafluoromethane)	CF ₄	4,400	6,500	10,000
Perfluoroethane (Hexafluoroethane)	C ₂ F ₆	6,200	9,200	14,000
Perfluorobutane	C ₄ F ₁₀	4,800	7,000	10,100
Sulphur hexafluoride	SF ₆	16,300	23,900	34,900

¹⁰ Intergovernmental Panel on Climate Change. 1995. "IPCC Second Assessment: Climate Change 1995". Available at <http://ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf>.

¹¹ United Nations Framework Convention on Climate Change. 1997. "Kyoto Protocol". Available at <http://unfccc.int/resource/docs/convkp/kpeng.html>.

In Kyoto's first commitment period the calculations for converting methane into equivalent carbon dioxide emissions was based on the IPCC's SAR. All calculations for Australia's carbon tax, including its cost impact on business and households, is based on the Kyoto standard from the IPCC's SAR.

At the 2011 Durban Summit, UNFCCC Parties agreed to include revised calculations for assessing the global warming potential of greenhouse gases. In the decisions of the Durban Summit it was agreed that a second commitment period under the Kyoto Protocol would use the GWPs of greenhouse gases included in the Fourth Assessment Report of the IPCC.

According to Decision 4/CMP.7, countries agreed to new 'common metrics'. The section states:

The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol ... Decides that, for the second commitment period of the Kyoto Protocol, the global warming potentials used by Parties to calculate the carbon dioxide equivalence of anthropogenic emissions by sources and removals by sinks of the greenhouse gases listed in Annex A to the Kyoto Protocol shall be those listed in the column entitled "Global Warming Potential for Given Time Horizon" in table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, based on the effects of greenhouse gases over a 100-year time horizon, taking into account the inherent and complicated uncertainties involved in global warming potential estimates.¹²

The IPCC's revised GWPs for greenhouse gases are available in the FAR and are predominantly revised upward from the SAR.¹³

Of the gases listed in Figure 6, and of all gases included in the IPCC's FAR, the three gases that matter most are carbon dioxide, methane and nitrous oxide. Those three gases are the most commonly emitted gases. Methane's GWP has increased by 19 per cent, and nitrous oxide's GWP has decreased by four per cent.

Now that Australia has decided to remain a Party to Kyoto, the revised GWPs will need to be adopted in Australia's regulations to be internationally consistent.

¹² United Nations Framework Convention on Climate Change. 2011. "Decision 1/CMP.7: Outcome of the work of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its sixteenth session", FCCC/KP/CMP/2011/10/Add.1. Available at <http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf#page=2>.

¹³ Intergovernmental Panel on Climate Change. 2007. "Fourth Assessment Report: Climate Change 2007". Available at http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html.

Figure 7 | Select global warming potentials of greenhouse gases

Greenhouse gas	Chemical formula	Second assessment report			Fourth assessment report			Change between SAR and FAR
		20 years	100 years	500 years	20 years	100 years	500 years	
Carbon dioxide	CO ₂	1	1	1	1	1	1	0%
Methane	CH ₄	56	21	6.5	72	25	7.6	19%
Nitrous oxide	N ₂ O	280	310	170	289	298	153	-4%
Hydrofluorocarbon (Fluoroform)	CHF ₃	9,100	11,700	9,800	12,000	14,800	12,200	26%
Hydrofluorocarbon (Pentafluoroethane)	C ₂ HF ₅	4,600	2,800	920	6,350	3,500	1,100	25%
Hydrofluorocarbon (Tetrafluoroethane)	CH ₂ FCF ₃	2,900	1,300	310	3,830	1,430	435	10%
Hydrofluorocarbon (Trifluoroethane)	C ₂ H ₃ F ₃	8,000	3,800	1,400	5,890	4,470	1,590	18%
Perfluoromethane (Tetrafluoromethane)	CF ₄	4,400	6,500	10,000	5,210	7390	11,200	14%
Perfluoroethane (Hexafluoroethane)	C ₂ F ₆	6,200	9,200	14,000	8,630	12,200	18,200	33%
Perfluorobutane	C ₄ F ₁₀	4,800	7,000	10,100	No noted change			No noted change
Sulphur hexafluoride	SF ₆	16,300	23,900	34,900	16,300	22,800	32,600	-5%

Note: Green shaded GWPs are those required to be used under Kyoto I and the blue shaded GWPs are those required to be used under Kyoto II.

7.0 The Impact of Revising Australia's GWPs

Australia's emissions are available from the National Greenhouse Gas Inventory, operated by the DCCEE. The National Greenhouse Gas Inventory explicitly states that calculations are made using the Kyoto I accounting framework.

As Figure 7 outlines, the predominant impact is on methane emissions.

Based on the Kyoto GWPs Australia's methane emissions were 114,037,220 CO_{2-e} and 111,619,560 CO_{2-e} in 2009 and 2010 respectively. But, as shown in Figure 8, when they are adjusted for the Kyoto II GWPs they increase by a further 21,721,280 CO_{2-e} and 21,260,940 CO_{2-e} to 135,758,500 CO_{2-e} and 132,880,500 CO_{2-e} respectively.

Figure 8 | Increase in emissions from publicly available National Greenhouse Gas Inventory data based on revised GWPs under Kyoto II, including agriculture (tonnes)

Gas	2009	2010
CH ₄	21,721,280.00	21,260,940.00
N ₂ O	-972,750.00	-902,450.00
C ₂ HF ₅	364,000.00	392,000.00
CH ₂ FCF ₃	416,000.00	439,400.00
C ₂ H ₃ F ₃	13,400.00	13,400.00
SF ₆	-11,000.00	-11,000.00
CF ₄	35,600.00	26,700.00
C ₂ F ₆	14,667.39	10,643.48
Total	21,581,197.39	21,229,633.48

Source: IPA calculations based on National Greenhouse Gas Inventory data.

Calculating the impact of the revised calculations on the carbon tax requires the exclusion of agriculture, which is not covered by the carbon tax. As Figure 9 outlines, excluding agriculture essentially halves the increase of emissions from methane and slashes the decrease in emissions from nitrous oxide by four fifths.

Figure 9 | Increase in emissions from publicly available National Greenhouse Gas Inventory data based on revised GWPs under Kyoto II, excluding agriculture (tonnes)

Gas	2009	2010
CH ₄	9,273,660.00	9,338,790.00
N ₂ O	-251,370.00	-248,290.00
C ₂ HF ₅	364,000.00	392,000.00
CH ₂ FCF ₃	416,000.00	439,400.00
C ₂ H ₃ F ₃	13,400.00	13,400.00
SF ₆	-11,000.00	-11,000.00
CF ₄	35,600.00	26,700.00
C ₂ F ₆	14,667.39	10,643.48
Total	9,854,957.39	9,961,643.48

Source: IPA calculations based on National Greenhouse Gas Inventory data.

When emissions are calculated using the Kyoto II accounting standards and multiplied by the \$23 per tonne CO_{2-e} carbon price, the difference in calculations increases the impact of the carbon tax by between \$227 million and \$229 million per annum.

Figure 10 | Carbon tax impact of using Kyoto II accounting standards (AUD\$)

Gas	2009	2010
CH ₄	\$213,294,180.00	\$214,792,170.00
N ₂ O	-\$5,781,510.00	-\$5,710,670.00
C ₂ H ₅ F	\$8,372,000.00	\$9,016,000.00
CH ₂ FCF ₃	\$9,568,000.00	\$10,106,200.00
C ₂ H ₃ F ₃	\$308,200.00	\$308,200.00
SF ₆	-\$253,000.00	-\$253,000.00
CF ₄	\$818,800.00	\$614,100.00
C ₂ F ₆	\$337,350.00	\$244,800.00
Total	\$226,664,020.00	\$229,117,800.00

Source: IPA calculations.

As Figure 11 shows, using ABS data, when the cost of the increase in the carbon taxed is passed onto households, the cost impact for the average Australian household will be around \$27 per annum and thus it will wipe out the over-compensation from the tax offered by the Gillard government.

Figure 11 | Carbon tax impact of using Kyoto II accounting standards for the average household (AUD\$)

Gas	2009	2010
CH ₄	\$25.89	\$25.59
N ₂ O	-\$0.70	-\$0.68
C ₂ H ₅ F	\$1.02	\$1.07
CH ₂ FCF ₃	\$1.16	\$1.20
C ₂ H ₃ F ₃	\$0.04	\$0.04
SF ₆	-\$0.03	-\$0.03
CF ₄	\$0.10	\$0.07
C ₂ F ₆	\$0.04	\$0.03
Total	\$27.52	\$27.29

Source: IPA calculations using ABS data.

8.0 Available National Greenhouse Gas Inventory Data and Calculations

Figure 12 | Australia's methane emissions, gigagrams (GG)

Category	Methane adjustment (CH ₄)									
	Kyoto I (1t CH ₄ = 21t CO _{2-e})				Revised Kyoto II (1t CH ₄ = 25t CO _{2-e})					
	2009		2010		2009			2010		
	CH ₄	CO _{2-e}	CH ₄	CO _{2-e}	CH ₄	CO _{2-e}	Difference	CH ₄	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	5,430.34	114,037.22	5,315.22	111,619.56	5,430.34	135,758.50	21,721.28	5,315.22	132,880.50	21,260.94
Energy	1,626.78	34,162.31	1,634.18	34,317.73	1,626.78	40,669.50	6,507.19	1,634.18	40,854.50	6,536.77
Fuel Combustion	83.47	1,752.79	82.96	1,742.26	83.47	2,086.75	333.96	82.96	2,074.00	331.74
Fugitive Emissions From Fuels	1,543.31	32,409.52	1,551.21	32,575.47	1,543.31	38,582.75	6,173.23	1,551.21	38,780.25	6,204.78
Industrial Processes	2.96	62.13	3.13	65.75	2.96	74.00	11.87	3.13	78.25	12.50
Chemical Industry	0.58	12.13	0.58	12.13	0.58	14.50	2.37	0.58	14.50	2.37
Metal Production	2.38	50.00	2.55	53.62	2.38	59.50	9.50	2.55	63.75	10.13
Agriculture	3,111.88	65,349.38	2,980.53	62,591.10	3,111.88	77,797.00	12,447.62	2,980.53	74,513.25	11,922.15
Enteric Fermentation	2,606.26	54,731.43	2,566.45	53,895.41	2,606.26	65,156.50	10,425.07	2,566.45	64,161.25	10,265.84
Manure Management	83.39	1,751.10	82.38	1,730.02	83.39	2,084.75	333.65	82.38	2,059.50	329.48
Rice Cultivation	2.20	46.28	8.32	174.77	2.20	55.00	8.72	8.32	208.00	33.23
Prescribed Burning of Savannahs	409.73	8,604.24	312.39	6,560.25	409.73	10,243.25	1,639.01	312.39	7,809.75	1,249.50
Field Burning of Agricultural Residues	10.30	216.33	10.98	230.64	10.30	257.50	41.17	10.98	274.50	43.86
Waste	633.63	13,306.29	648.82	13,625.32	633.63	15,840.75	2,534.46	648.82	16,220.50	2,595.18
Solid Waste Disposal on Land	517.12	10,859.56	530.47	11,139.86	517.12	12,928.00	2,068.44	530.47	13,261.75	2,121.89
Wastewater Handling	113.50	2,383.57	114.95	2,414.00	113.50	2,837.50	453.93	114.95	2,873.75	459.75
Other	3.01	63.17	3.40	71.45	3.01	75.25	12.08	3.40	85.00	13.55
Land Use, Land-Use Change and Forestry KP	55.10	1,157.11	48.56	1,019.67	55.10	1,377.50	220.39	48.56	1,214.00	194.33
Afforestation and reforestation	0.01	0.14	0.00	0.04	0.01	0.25	0.11	0.00	0.00	-0.04
Deforestation	55.09	1,156.97	48.55	1,019.62	55.09	1,377.25	220.28	48.55	1,213.75	194.13

Source data: National Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

Figure 13 | Australia's nitrous oxide emissions, gigagrams (GG)

Category	Nitrous oxide adjustment (N ₂ O)									
	Kyoto I (1t N ₂ O = 310t CO _{2-e})				Kyoto II (1t N ₂ O = 298t CO _{2-e})					
	2009		2010		2009			2010		
	N ₂ O	CO _{2-e}	N ₂ O	CO _{2-e}	N ₂ O	CO _{2-e}	Difference	N ₂ O	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	81.19	25,167.37	75.11	23,285.23	81.19	24,194.62	-972.75	75.11	22,382.78	-902.45
Energy	9.02	2,795.37	8.58	2,659.22	9.02	2,687.96	-107.41	8.58	2,556.84	-102.38
Fuel Combustion	8.91	2,762.82	8.47	2,624.51	8.91	2,655.18	-107.64	8.47	2,524.06	-100.45
Fugitive Emissions From Fuels	0.10	32.54	0.11	34.71	0.10	29.80	-2.74	0.11	32.78	-1.93
Industrial Processes	10.11	3,135.32	10.58	3,280.96	10.11	3,012.78	-122.54	10.58	3,152.84	-128.12
Chemical Industry	10.07	3,121.38	10.53	3,263.83	10.07	3,000.86	-120.52	10.53	3,137.94	-125.89
Metal Production	0.04	13.94	0.06	17.14	0.04	11.92	-2.02	0.06	17.88	0.74
Agriculture	60.13	18,640.12	54.50	16,895.16	60.13	17,918.74	-721.38	54.50	16,241.00	-654.16
Manure Management	5.04	1,563.91	5.08	1,573.53	5.04	1,501.92	-61.99	5.08	1,513.84	-59.69
Agricultural soils	45.94	14,240.68	42.48	13,167.87	45.94	13,690.12	-550.56	42.48	12,659.04	-508.83
Prescribed Burning of Savannahs	8.83	2,737.86	6.62	2,051.91	8.83	2,631.34	-106.52	6.62	1,972.76	-79.15
Field Burning of Agricultural Residues	0.32	97.66	0.33	101.85	0.32	95.36	-2.30	0.33	98.34	-3.51
Waste	1.41	437.58	1.36	420.74	1.41	420.18	-17.40	1.36	405.28	-15.46
Wastewater Handling	1.39	429.49	1.33	411.60	1.39	414.22	-15.27	1.33	396.34	-15.26
Other	0.03	8.09	0.03	9.15	0.03	8.94	0.85	0.03	8.94	-0.21
Land Use, Land-Use Change and Forestry KP	0.51	158.98	0.09	29.15	0.51	151.98	-7.00	0.09	26.82	-2.33
Afforestation and reforestation	0.00	0.04	0.00	0.01	0.00	0.00	-0.04	0.00	0.00	-0.01
Deforestation	0.51	158.94	0.09	29.13	0.51	151.98	-6.96	0.09	26.82	-2.31

Source data: National Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

Figure 14 | Australia's pentafluoroethane emissions, gigagrams (GG)

Category	Pentafluoroethane Adjustment (C ₂ HF ₅)									
	Kyoto I (1t C ₂ HF ₅ = 2,800t CO _{2-e})				Revised Kyoto II (1t C ₂ HF ₅ = 3,500t CO _{2-e})					
	2009		2010		2009			2010		
	C ₂ HF ₅	CO _{2-e}	C ₂ HF ₅	CO _{2-e}	C ₂ HF ₅	CO _{2-e}	Difference	C ₂ HF ₅	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	0.52	1,456.00	0.56	1,568.00	0.52	1,820.00	364.00	0.56	1,960.00	392.00
Industrial processes	0.52	1,456.00	0.56	1,568.00	0.52	1,820.00	364.00	0.56	1,960.00	392.00
Consumption of halocarbons and Sulphur Hexafluoride	0.52	1,456.00	0.56	1,568.00	0.52	1,820.00	364.00	0.56	1,960.00	392.00

Source data: Australia's Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

Figure 15 | Australia's Tetrafluoroethane emissions, gigagrams (GG)

Category	Tetrafluoroethane (CH ₂ FCF ₃)									
	Kyoto I (1t CH ₂ FCF ₃ = 1,300t CO _{2-e})				Revised Kyoto II (1t CH ₂ FCF ₃ = 1,430t CO _{2-e})					
	2009		2010		2009			2010		
	CH ₂ FCF ₃	CO _{2-e}	CH ₂ FCF ₃	CO _{2-e}	CH ₂ FCF ₃	CO _{2-e}	Difference	CH ₂ FCF ₃	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	3.20	4,160.00	3.38	4,394.00	3.20	4,576.00	416.00	3.38	4,833.40	439.40
Industrial processes	3.20	4,160.00	3.38	4,394.00	3.20	4,576.00	416.00	3.38	4,833.40	439.40
Consumption of halocarbons and Sulphur Hexafluoride	3.20	4,160.00	3.38	4,394.00	3.20	4,576.00	416.00	3.38	4,833.40	439.40

Source data: National Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

Figure 16 | Australia's trifluoroethane emissions, gigagrams (GG)

Category	Trifluoroethane (C ₂ H ₃ F ₃)									
	Kyoto I (1t C ₂ H ₃ F ₃ = 3,800t CO _{2-e})				Revised Kyoto II (1t C ₂ H ₃ F ₃ = 4,470t CO _{2-e})					
	2009		2010		2009			2010		
	C ₂ H ₃ F ₃	CO _{2-e}	C ₂ H ₃ F ₃	CO _{2-e}	C ₂ H ₃ F ₃	CO _{2-e}	Difference	C ₂ H ₃ F ₃	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	0.02	76.00	0.02	76.00	0.02	89.40	13.40	0.02	89.40	13.40
Industrial processes	0.02	76.00	0.02	76.00	0.02	89.40	13.40	0.02	89.40	13.40
Consumption of halocarbons and Sulphur Hexafluoride	0.02	76.00	0.02	76.00	0.02	89.40	13.40	0.02	89.40	13.40

Source data: National Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

Figure 17 | Australia's Sulphur hexafluoride emissions, gigagrams (GG)

Category	Sulphur hexafluoride (SF ₆)									
	Kyoto I (1t SF ₆ = 23,900t CO _{2-e})				Revised Kyoto II (1t SF ₆ = 22,800t CO _{2-e})					
	2009		2010		2009			2010		
	SF ₆	CO _{2-e}	SF ₆	CO _{2-e}	SF ₆	CO _{2-e}	Difference	SF ₆	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	0.01	239.00	0.01	239.00	0.01	228.00	-11.00	0.01	228.00	-11.00
Industrial processes	0.01	239.00	0.01	239.00	0.01	228.00	-11.00	0.01	228.00	-11.00
Consumption of halocarbons and Sulphur Hexafluoride	0.01	239.00	0.01	239.00	0.01	228.00	-11.00	0.01	228.00	-11.00

Source data: National Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

Figure 18 | Australia's perfluoromethane emissions, giga grams (GG)

Category	Perfluoromethane (CF ₄)									
	Kyoto I (1t CF ₄ = 6,500t CO _{2-e})				Revised Kyoto II (1t CF ₄ = 7,390t CO _{2-e})					
	2009		2010		2009			2010		
	CF ₄	CO _{2-e}	CF ₄	CO _{2-e}	CF ₄	CO _{2-e}	Difference	CF ₄	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	0.04	260.00	0.03	195.00	0.04	295.60	35.60	0.03	221.70	26.70
Industrial processes	0.04	260.00	0.03	195.00	0.04	295.60	35.60	0.03	221.70	26.70
Metal production	0.04	260.00	0.03	195.00	0.04	295.60	35.60	0.03	221.70	26.70

Source data: National Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

Figure 19 | Australia's hexafluoroethane emissions, gigagrams (GG)

Category	Hexafluoroethane (C ₂ F ₆)									
	Kyoto I (1t C ₂ F ₆ = 9,200t CO _{2-e})				Revised Kyoto II (1t C ₂ F ₆ = 12,200t CO _{2-e})					
	2009		2010		2009			2010		
	C ₂ F ₆	CO _{2-e}	C ₂ F ₆	CO _{2-e}	C ₂ F ₆	CO _{2-e}	Difference	C ₂ F ₆	CO _{2-e}	Difference
National Greenhouse Gas Inventory Total	0.00	44.98	0.00	32.64	0.00	59.65	14.67	0.00	43.28	10.64
Industrial processes	0.00	44.98	0.00	32.64	0.00	59.65	14.67	0.00	43.28	10.64
Metal production	0.00	44.98	0.00	32.64	0.00	59.65	14.67	0.00	43.28	10.64

Source data: National Greenhouse Gas Inventory, www.ageis.climatechange.gov.au and IPA calculations.

9.0 About the Institute of Public Affairs

The Institute of Public Affairs, founded in 1943, is the world's oldest free market think tank. The IPA is a not-for-profit research institute based in Melbourne, Australia with staff and associates based around Australia.

Think tanks act as public policy incubators and develop public policy solutions. The objective of the IPA is to promote evidence-based public policy solutions rooted in a liberal tradition of free markets and a free society.

The IPA achieves these objectives by undertaking and disseminating research; participating in national and international policy debate through the media; and engaging with opinion leaders, stakeholders and public policy makers.

The IPA is Australia's most prominent think tank in national debate. IPA researchers have regular columns in the *Australian Financial Review*, *The Age* and *Sydney Morning Herald* and the *Herald Sun*, and are regularly published in most newspapers across the nation, including *The Australian*. IPA researchers also have regular slots in electronic media, including ABC television and radio, Sky News and the Fairfax radio network, including 2UE, 3AW & 4BC.

All work completed by the IPA is published in the public domain for the consumption of governments, politicians, domestic and international policy makers and the public-at-large.

The IPA has a demonstrated track record of contributing to, and changing the terms of the public policy debate in Australia and internationally. In particular, in recent years the IPA has been at the centre of public discussion in Australia and in appropriate international fora on:

- Economic development
- Investment
- Trade
- Intellectual Property
- Climate change policy
- Water
- Energy
- Housing
- Industrial relations
- Taxation
- Regulation

10.0 About the author | Tim Wilson

Tim is a trained carbon accountant and Director of Climate Change Policy and the Intellectual Property and Free Trade Unit at the Institute of Public Affairs.

He also serves on the Department of Foreign Affairs and Trade's IP industry consultative group as well as being a Senior Fellow at New York's Center for Medicine in the Public Interest.

He can be seen and heard being outspoken, challenging and thought provoking on 3AW, 4BC, Sky News, Channel Ten and the ABC, and pens columns in the *The Australian* and *Australian Financial Review*. Tim has also contributed chapters to numerous books and regularly gives speeches to international and national conferences.

In 2009 *The Australian* newspaper recognised him as one of the ten emerging leaders of Australian society, he is a recipient of an Australian Leadership Award from the Australian Davos Connection, and was selected to participate in the inaugural Australian-ASEAN emerging leaders program.

Tim is currently a Director of Alfred Health and a Board Member of the Australian Health Practitioner Regulation Agency. He formally served on the Board of Monash University as well as a number of service companies in the tertiary education sector.

He's worked in international development across South East Asia, consulting and politics, including delivering Australia's aid program for the Vietnamese government to host APEC and advising State and Federal politicians.

At University Tim was twice elected President of the Student Union.

He previously served on the steering committee of the Sydney Opera House's Festival of Dangerous Ideas, and was a news and public affairs judge for the 2012 TV Week Logie awards.

Tim's currently completing a Graduate Diploma of Energy and the Environment (Climate Science and Global Warming) at Perth's Murdoch University. He has a Masters of Diplomacy and Trade and a Bachelor of Arts from Monash University, a Diploma of Business and has completed Asialink's Leaders Program at the University of Melbourne.

He has also completed specialist executive education on IP at the World Intellectual Property Organisation's Worldwide Academy and international trade, intellectual property, diplomacy and global health at the Institut de Hautes Études Internationales et du Développement, Geneva.