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Meeting National Emissions Reduction Obligations: A Case Study of Australia

Tek Maraseni * and Kathryn Reardon-Smith

Institute for Life Sciences and the Environment, University of Southern Queensland, Toowoomba 4350, Queensland, Australia; kathryn.reardon-smith@usq.edu.au

* Correspondence: Tek.Maraseni@usq.edu.au; Tel.: +61-746-312-995

Received: 30 November 2018; Accepted: 24 January 2019; Published: 30 January 2019

Abstract: Akin to a public good, emissions reduction suffers from the 'free rider' syndrome. Although many countries claim that they are meeting their greenhouse gas (GHG) emissions reduction commitments, the average global temperature and GHG emissions continue to rise. This has led to growing speculation that some countries may be taking advantage of the system by effectively exploiting a range of loopholes in global agreements. Using a case study approach, we critically review the evidence from Australia, exploring how Australia has participated in global climate change negotiations and the way in which this emissions intensive country's national emissions reduction obligations have been met. The findings suggest that: (1) successful negotiation to include Article 3.7 ('Adjusting the 1990 Baseline' or 'the Australia Clause') in the Kyoto Protocol significantly favored Australia's ability to meet its First Kyoto Commitment (2008–2012); and (2) successful bargaining for the accounting rule that allowed carbon credits from the first commitment period to be carried over to the second commitment period of the Kyoto Protocol benefitted Australia by 128 $MtCO_2e$. At the national level, a lack of bipartisan political support for an effective mechanism to drive emissions reduction has also been problematic. While the introduction of the Carbon Pricing Mechanism (CPM) in 2012 reduced emissions from electricity production from about 199.1 $MtCO_2e$ to 180.8 $MtCO_2e$ in 2014, a change of government led to the abolition of the CPM in 2014 and emissions from electricity production subsequently rose to 187 $MtCO_2e$ in 2015 and 189 $MtCO_2e$ in 2016 with adverse impacts in many sectors as well as Australia's overall emissions. The current Australian government continues to undermine its commitment to mitigation and the integrity and credibility of its own emissions reductions policy, introducing a softer 'calculated baseline' for its own Safeguard Mechanism, which allows companies to upwardly adjust their calculated baselines on the basis of their highest expected emissions, permitting emissions in excess of their historical emissions. While disappointing in the context of the global emissions reduction project, Australia's actions are sadly not unique and we also provide examples of loopholes exploited by countries participating in a range of other negotiations and emissions reduction projects. Such strategies undoubtedly serve the short-term political and economic interests of these countries; however, it is increasingly apparent that the cumulative impact of such tactics will ultimately impact the entire global community.

Keywords: Kyoto protocol; nationally determined contribution; clean development mechanism; Australia

1. Introduction

The 2015 Paris Agreement has been hailed as a major breakthrough in global climate policy negotiations [1]. The central aim of the Agreement is to limit global average temperature increases to between 1.5 °C and 2 °C, relative to the pre-industrial level. By the end of June 2018, 178 parties (i.e., nations) had ratified the Agreement and submitted their Nationally Determined Contributions

(NDCs)—greenhouse gas (GHG) emissions reduction targets, which represent the basis of the Agreement [2]. However, despite this, and several previous global efforts, there remains little sign of a slowing down of global GHG emissions. For instance, between 2010 and 2016, global emissions from anthropogenic sources increased from 50.1 $GtCO_2e$ [3] to 51.9 $GtCO_2e$ [4]—an annual increase of 0.6%. To meet the agreed target of keeping the global average temperature increase to below 2 °C, GHG emissions need to fall by more than 4%/y, concurrent with projected global GDP growth of 2.1%/y [5].

Part of the challenge is that the NDCs only cover about one third of the emissions reductions needed to avoid the 2 °C average global temperature increase threshold target. Even if these are realised, the carbon budget will still be about 80% short of the required GHG emissions reduction by 2030 and, by 2100, the Earth will be about 3.2 °C warmer compared to pre-industrial levels [4,6]. Meeting the even more ambitious goal of avoiding a 1.5 °C rise seems extremely unlikely on current trajectories. To achieve their NDCs, most countries are heavily reliant on reduced emissions/increased carbon sequestration associated with land use, land use change, and forestry (LULUCF) [7,8]. This is problematic and carries significant risk due to the non-permanent nature of such measures. Moreover, there are concerns about the transparency, integrity and credibility of the GHG estimates submitted by parties to the United Nations Framework Convention on Climate Change (UNFCCC) [9]. For example, in the case of the LULUCF sector, there is a 3 $GtCO_2e/yr$ difference in the cumulative GHG emissions based on country reports and those estimated in scientific studies [9]. Surprisingly, most of this difference comes from reporting by the more developed OECD (i.e. Organisation for Economic Co-operation and Development) countries, which claim their LULUCF sectors as an anthropogenic sink (removing a total of 1.9 $GtCO_2e/yr$ from the atmosphere); in contrast, the Intergovernmental Panel on Climate Change (IPCC) AR5 report listed the global LULUCF sector as a net source (0.1 $GtCO_2e/yr$) [9].

Globally, emissions from fossil fuel, cement, and industrial processes account for more than 70% of total carbon emissions [4]. Under current trends, achieving the Paris target will require that 80–90% of global coal, 35% of oil, and 50% of gas reserves remain in the ground [4]. The big question is 'to what extent can countries achieve this?' Most political leaders in the world are highly sensitive to the concerns of their voters, who, in turn, tend to be focused on the cost of living and are against further taxation. Therefore, in the face of climate change uncertainty, the overwhelming tendency of political leaders is to buy excuses and delay climate action. However, while this could meet their short-term national political interests, it is likely to have cumulative and potentially catastrophic global impact. For example, US President Trump's current decision to withdraw from the Paris Agreement increases the likelihood of 'lock-in' emissions-intensive activities and infrastructure, making future emissions reductions far more costly (at best) and potentially impossible to achieve [10]. Construction of a new coal fired power generator, for instance, will have impact over the lifespan of the facility, likely for another 50 years [10].

Political leaders believe that, if they are responsive to the public sentiment of their voters, they do not need to be concerned about whether their decisions serve the greater global good [11]. Some studies support a direct link between trust in government and public support for development of pro-environmental [12,13] and climate-friendly policies [14]; however, recent research in Australia shows that political leaders/parties also have the ability to adversely influence voters' environmental positions, particularly when climate action comes at a perceived cost to 'jobs and growth'. In other contexts, there is also potential to overcome the polarisation of political viewpoints and build consensus when leaders have a common bipartisan view on environmental policies [15].

Climate change is the most serious problem the global human society has faced and its solution must come from a collective, coordinated, clearly defined, ethical, and comprehensive response from all countries [16,17]. However, being akin to a public good, emissions reduction suffers from the 'free rider' syndrome [18], increasing the risk that each country may try to influence, if not manipulate, emissions reduction policies, rules, regulations, and activities in such a way to derive short-term national benefit, often at the longer-term cost to global society and the planet [19,20]. Moreover, most of the highest GHG emitting countries, such as China, the USA, Canada, and Australia, are considered least

vulnerable to climate change, while the lowest GHG emitting African and Small Island countries are considerably more vulnerable [18]. This further escalates the 'free rider' and 'forced rider' problem [18], compounding injustice and inequality and threatening the 2030 Sustainable Development Goal (SDG) 10, which specifically aims to reduce inequality within and between countries [21].

In this paper, taking Australia as a case example, we explore how global climate change negotiations have been conducted and the extent to which national emissions reduction obligations have been met.

2. Methods

2.1. Reasons of Selecting Australia as a Case Example

We have elected to examine the Australian situation for two key reasons. Firstly, it makes an interesting test case; while Australia is a small contributor to global GHG emissions, accounting for 1.3% of the global total (China, the US, and India account for 23.7%, 12.9%, and 6.6%, respectively), in terms of per capita emissions, it is one of the highest (22.5 tCO_2e) in the world [22]; and secondly, Australia is considered to be a successful country in meeting its global commitments. For example, it met its Kyoto Protocol First Commitment (2008–2012) and is on track to meet its Kyoto Protocol Second Commitment (2013–2020). Therefore, it provides an interesting example for the global community. Moreover, the authors are based in Australia and are regularly updated with the policy development process in Australia through different media.

2.2. How We Conducted the Study

We followed a systematic review approach in which we identified relevant studies including: (1) reports from Australian government departments; (2) National Communications to the United Nations Framework Convention on Climate Change (UNFCCC); (3) policy documents produced by the Australian Government; and (4) peer-reviewed journal articles related to the climate change negotiations and mitigation targets. In addition, the principal author has actively participated in two meetings of the Conference of Parties (COPs) to the UNFCCC. Key policy documents reviewed include: (1) White Paper for the Carbon Pollution Reduction Scheme; (2) terms and conditions of the first (2008–2012) and second (2013–2020) Kyoto Protocol; (3) Carbon Pricing Mechanism (CPM) and Emissions Trading Scheme; (4) Carbon Farming Initiatives (CFI, previously) and Emission Reduction Fund (ERF, Now); (5) historical trends and facts and figures of reverse auction; (6) Nationally Determined Contribution target for Paris Agreement; and (7) the safeguard mechanism. Details of these reports are discussed below.

3. Results and Discussions

3.1. A Brief Snapshot of Australia's International Commitments

Australia's former John Howard-led Liberal Government (1996–2007) played an important role in the formulation of the UNFCCC's Kyoto Protocol, but did not ratify the Protocol, saying that it would damage the fossil fuel dependent Australian economy [23]. Further, the Australian government of the day also demanded a level of commitment from developing countries, given their share of contributions to global GHG emissions was rapidly growing. For example, in 1990, developing countries contributed 40% of total global emissions, but, by 2013, this had grown to 60% [24]. Subsequently, keeping an election promise, the newly elected Kevin Rudd-led Labor Government ratified the Kyoto Protocol in December 2007 (effective from March 2008) and showed significant leadership in addressing climate change both domestically and internationally. As a result, Australia legally adhered to its Kyoto target, limiting emissions to 8% above 1990 levels during the first commitment period of 2008–2012. Since then, Australia has made two more international commitments: (1) The Kyoto Protocol Second Commitment Period (2013–2020), with a target of 5% emissions reduction below 2000 levels by 2020; and (2) the

2015 Paris Agreement NDC, with a target of 26–28% national emissions reduction below 2005 levels by 2030. While these commitments are substantial, the targets have been criticised on the basis that they are likely to be inadequate to meet the 1.5–2 °C warming limit set in the Paris Agreement. In fact, the 2030 emissions reduction target is some 1–3% above 1990 levels, excluding emissions from the LULUCF sector [25]. If most other countries followed Australia's example, warming would likely exceed 3–4 °C [25]. A developed and well-resourced country, such as Australia, could (and arguably, should) have aimed for deeper cuts and led the global community by example.

3.2. Meeting the Kyoto Protocol First Commitment Period (2008–2012) Target

The Kyoto Protocol set legally binding emissions reduction targets of at least 5.2% below 1990 levels by the end of the first commitment period (2008–2012). To achieve this collective target, each developed country (i.e., listed in Annex B of the Protocol) was given a specific emissions reduction target: For example, the European Union, by 8%; Canada and Japan, by 6%. Australia successfully argued for, and was generously allowed, an 8% increase in emissions over 1990 levels. Citing its coal dependent and emissions intensive economy, Australia claimed that it would still need to cut emissions from business-as-usual levels by 17% in order to meet its +8% target. Further, Australia bargained until the eleventh hour and was successful in keeping Article 3.7 (called the Australia Clause), which is about 'Adjusting the 1990 Baseline'. Australia was the only Annex B country to benefit from this clause and, as a result, was allowed to include its net emissions from deforestation in calculating its 1990 baseline emissions. This was a bonus to Australia, as, at the time, forest clearing for agricultural land uses (cropping and grazing) was rampant (about 546,000 ha/year in 1988) and a huge source of emissions. Although the rate of clearing has since significantly decreased, it still totaled 179,682 ha in 2013 (latest available data) [26,27].

Australian negotiators knew that they could predominantly rely on the LULUCF sector to meet the national Kyoto Target of +8%. In 1990, Australia's total emissions, including emissions from LULUCF, were 545 $MtCO_2$ and, by 2012, this had only marginally increased to 559 $MtCO_2e$ (Figure 1). However, 1990 was the highest land clearing year in the country's history, with more than 80% of this occurring in Queensland [28]. Net emissions from LULUCF activities were about 132.6 $MtCO_2e$ in 1990; with the introduction of stringent vegetation management legislation (e.g., Vegetation Management Act in Queensland), by 2012, this had been drastically reduced to 14.4 $MtCO_2e$. Thus, the 1990 baseline favoured Australia. In fact, when the Kyoto Protocol was signed in 1997, Australia had already reduced its LULUCF emissions by 66.3 $MtCO_2e$ from 1990 levels, which was already more than enough to offset its increased carbon emissions from the electricity (23.2 $MtCO_2e$), stationary energy (7.1 $MtCO_2e$), transport (10.9 $MtCO_2e$), and fugitive emissions (0.9 $MtCO_2e$) sectors (Figure 2). Similarly, in 2008, the year in which the Kyoto Protocol became effective in Australia, LULUCF emissions had been reduced by 79.5 $MtCO_2e$—enough to offset increased emissions from electricity production (76.4 $MtCO_2e$), Australia's largest (>35% of total) GHG emitting sector. As a result of the massive decrease in forest clearing, Australia was not only able to meet its Kyoto Protocol first commitment period target, but was also able to secure 128 $MtCO_2e$ more in credit [29]. While this is more to do with good negotiating skills than moral compromise, Australia benefitted from its ability to successfully negotiate this deal, limiting the need for emissions reduction in sectors reliant on fossil fuel energy production and use, though arguably at the expense of the global community [18].

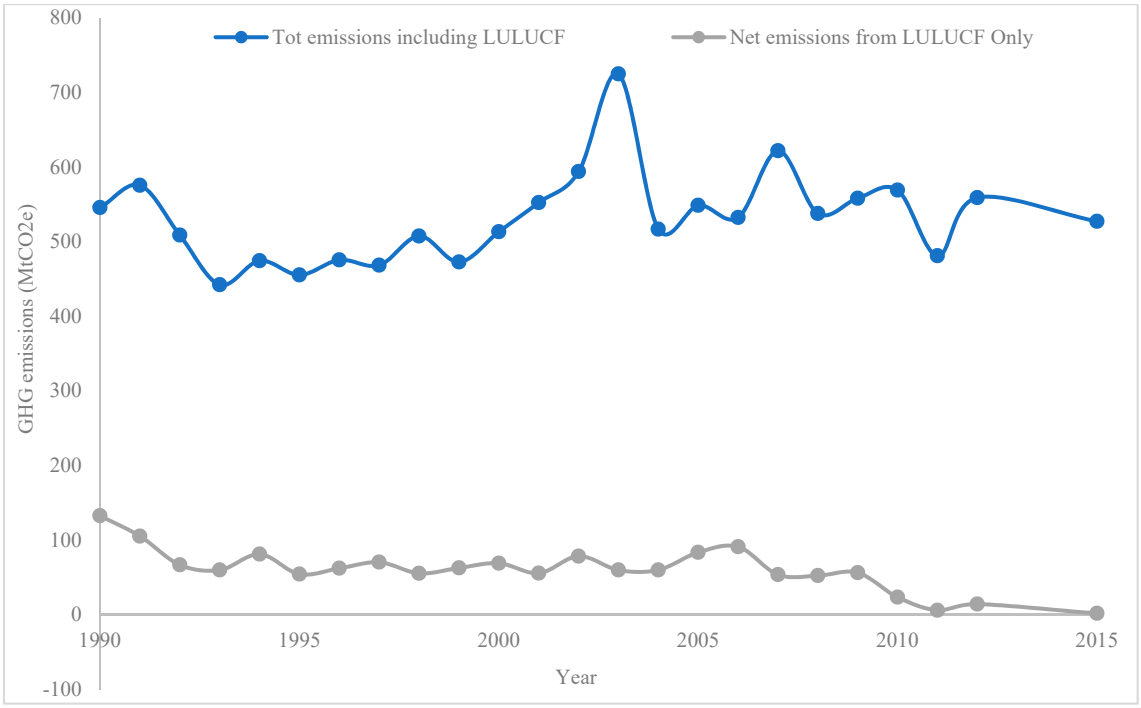

Figure 1. Greenhouse gas (GHG) emissions from Australia during the 25 year period, 1990–2015. (Data sources: total GHG emission data for year 1990 to 2012 from the UNFCCC [30]; year 2015 data from Australian Government (2016a/b); net emissions from land use, land use change, and forestry (LULUCF) data from Department of Environment and Energy [31].

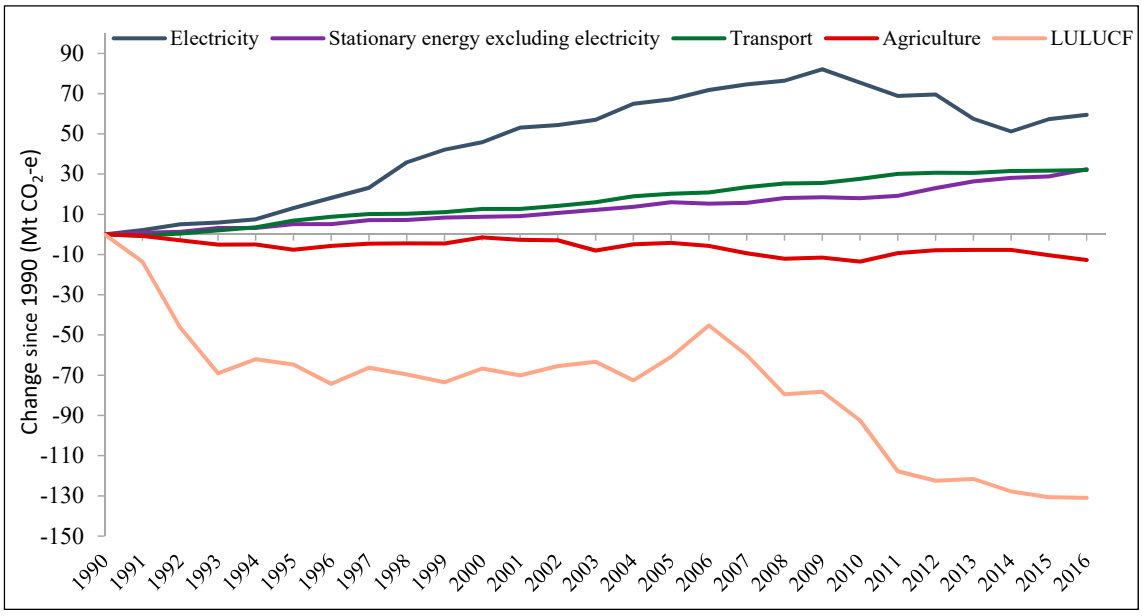

Figure 2. Change in Australia's greenhouse gas emissions by sector from June 1990 to June 2016 [31].

3.3. Meeting the Kyoto Protocol Second Commitment Period (2013–2020) Target

As noted, for the Kyoto Protocol second commitment period (2013–2020), Australia has again pledged a relatively soft target of 5% emissions reduction below 2000 levels by 2020. Again, the Australian negotiating team was looking for relatively easy ways to meet its 2020 target. On Friday 4 December 2015, the Australian team successfully argued for the accounting rule that allowed its 128 $MtCO_2e$ surplus carbon credits from the first commitment period of the Kyoto Protocol to be carried

over to the second commitment period. The Sydney Morning Herald (on 4 December 2015) praised this act, stating that "If Senator Robert Hill arrived home to a standing ovation from Howard government colleagues after securing the "Australia clause" in 1987, Greg Hunt is due at least a decent slap on the back from his Coalition mates". This all suggests a certain lack of commitment to the global pact to significantly address global warming and associated climate change, the risks of which will be both overarching and likely to significantly impact the Australian economy in the long run. For example, while there is little research in this area in Australia, a study in the US showed that transitioning to renewable energy sources and cutting carbon emissions by 30% from 2014 levels could deliver climate and public health benefits worth up to US$93 billion/yr in 2030, far outweighing the costs of climate action, which were estimated at US$8.8 billion [32].

In order to meet its current 5% emissions reduction target, Australia, under the Julia Gillard-led Labor government (2010–2013), introduced a Carbon Pricing Mechanism (CPM) and a range of Carbon Farming Initiatives (CFI). The CPM (introduced on 1 July 2012) was comprehensive; it included all six major GHGs recognised by the Kyoto Protocol, covered many sectors, and accounted for >75% of the national GHG emissions at that time by bringing all companies that produced > 25,000 tCO_2e of GHG emissions per year under the Scheme. Under the overarching Clean Energy Futures Plan, households were compensated for additional energy costs by the revenue derived from the emissions charge [33]. The carbon price was initially fixed at AU$23 for the 2012–13 financial year and increased to AU$24.15 for 2013–14. This fixed price system was to have transformed to an emissions trading scheme in 2014–15; however, under a subsequent change of government (this time to the Tony Abbott-led Coalition government), the CPM legislation was repealed on 1 July 2014, and replaced by the current Emission Reduction Fund (ERF) in December 2014.

When the CPM was introduced in 2012, emissions from electricity production, which was covered by the CPM, was about 199.1 $MtCO_2e$—about 37% of total Australian emissions [31]. The impact of the CPM can be visibly seen in this sector (Figure 2), with emissions from electricity production reduced to 187 $MtCO_2e$ in 2013 and 180.8 $MtCO_2e$ in 2014. Following the abolition of the CPM in 2014, emissions from electricity production rose (and continue to do so), totaling 187 $MtCO_2e$ in 2015 and 189 $MtCO_2e$ in 2016 [31]. The abolition of the CPM has also impacted overall emissions; these had decreased between 2012 and 2014, but have since risen continuously. While abolishing the CPM serves the interests of major polluters in Australia, it fails both the Australian and global communities.

Having abandoned the CPM, Australia is now solely dependent on the ERF to meet its 2020 Kyoto Protocol target. Rather than imposing a penalty for emissions, the ERF provides incentives for emission reduction activities for a range of Australian economic sectors. Under the program, the Australian Government allocated AU$2.55 billion in the 2014/15 budget. The Clean Energy Regulator, on behalf of the Australian government, has set a benchmark price and conducted a number of reverse auctions, which allow it to choose the lowest priced abatement programs on offer. So far, seven reverse auctions have been conducted (Table 1) and 445 Carbon Abatement Contracts to the value of AU$2.3 billion have been awarded [34]. The average price per tonne of CO_2e abatement was relatively high in the first auction, bottomed out in the third auction, and has since gradually increased, with an average price over all seven auctions of AU$11.97/$tCO_2e$. The successful contractors have committed to delivering 192 Mt of CO_2e abatement. The latest projections show Australia is currently on track to beat its 2020 target by 224 $MtCO_2e$, including the 128 $MtCO_2$-e surplus carryover from the Kyoto Protocol first commitment period [35]. Thus, it appears that the ERF will largely contribute to Australia meeting its 2020 commitment.

Under the ERF, most of the successful Carbon Abatement Contracts have been awarded in the land and agriculture sectors (Land: 125.5 Mt from vegetation projects and 13.5 Mt from savanna fire management projects; and Agriculture: 18.1 Mt), which in total account for >80% of the total contracted abatement [34]. The ERF allows farmers and other land managers to earn carbon credits by storing carbon or reducing GHG emissions on land. At the same time, they can adopt 'better management practices' (BMPs) and earn carbon credits and reputational benefits. A report from the Australian

Farm Institute [36] shows that about AU$239 million in annual revenue accrues to landholders who have been awarded contracts under the scheme. However, while reducing emissions from the land and agriculture sectors is a cost-effective way of meeting our Kyoto Protocol targets [23], these sectors are also highly vulnerable to climate change and sequestered carbon can be released back into the atmosphere at any time. This issue of 'non-permanence' is well recognised internationally. Recognising such risks, the largest global carbon market, the European Emissions Trading Scheme, has never bought emissions abatements from these sectors [37]. This suggests that there is very real probability that carbon gains under the ERF could well be reversed under future adverse environmental conditions. While there are indeed additional benefits in many of the ERF projects, it could be argued that—rather than relying predominantly on these sectors—a resource-rich and capable developed country, such as Australia, should also commit to phasing out its carbon intensive coal power plants and investing in clean and energy efficient technologies. Yet, there is apparently little political will to do so.

Table 1. Key statistics of seven reverse auctions held under Australia's Emission Reduction Fund (2015–2018); dollars are AUD (adopted from 34).

	Auction 1	**Auction 2**	**Auction 3**	**Auction 4**	**Auction 5**	**Auction 6**	**Auction 7**
Date of auction	15–16 Apr 2015	4–5 Nov 2015	27–28 Apr 2016	16–17 Nov 2016	5–6 Apr 2017	6–7 Dec 2017	6–7 Jun 2018
Number of contracts awarded	107	129	73	47	31	26	32
Purchased amount ($MtCO_2e$)	47	45	50.5	34.4	11.25	7.95	6.67
Average price (AU$/$tCO_2e$)	13.95	12.25	10.23	10.69	11.82	13.08	13.52
Total cost (AUD millions)	660	557	516	367	133	104	90

3.4. Meeting the 2015 Paris Agreement Nationally Determined Contribution target

After the 2015 Paris Agreement, all countries, except those that are least developed, each agreed to submit their NDCs. Australia has set its NDC target at 26–28% emissions reduction below 2005 levels by 2030. As previously noted, this target is not particularly ambitious, especially when compared to that of other countries. For example, (1) both New Zealand and Canada have set a 30% reduction target below 2005 levels (including LULUCF); (2) the European Union (EU) has set a 34% reduction on 2005 levels; (3) China aims to decrease its emission intensity by 60% to 65% on 2005 levels; and (5) South Korea will deliver 37% reduction on business-as-usual levels by 2030 [38]. Critically, the Australian target may also be insufficient to meet the Paris Agreement global climate target [25].

In order to meet its 2030 target, Australia currently plans to continue the ERF after 2020. In addition, it has implemented a Safeguard Mechanism (SM) from 1 July 2016 (Commonwealth of Australia, 2017). The SM applies to 146 businesses, which emit >100,000 tCO_2e/yr of direct emissions, covering >50% of total national emissions. However, the critical aspect of any SM is how it sets the baseline for different companies and how deeply they reduce emissions over time. Initially, baselines were to be based on the highest level of a company's emissions during 2009/10 and 2013/14, as reported under the National Greenhouse and Energy Reporting (NGER) framework; however, the government subsequently allowed a softer approach, referred to as a 'calculated baseline' [39]). Under this new approach, if a company reasonably expects its emissions to exceed its reported NGER baseline, it can apply for a calculated baseline. With this amendment, starting from 1 July 2016, a company with a reported baseline is allowed to upwardly adjust its calculated baseline on the basis of its highest expected emissions over the subsequent three-year period (2016/17 to 2018/19), effectively allowing companies to emit more than their historical emissions. The Clean Energy Regulator has already approved many calculated baselines. For example, by January 2018, 57 industrial facilities had been granted permission to increase their emissions baselines, allowing them an additional 22 $MtCO_2e$ per annum [40]. This provision undermines the integrity and credibility of emissions reductions and may

not serve the Government's own core objective, which is "to ensure emissions reductions purchased by the Government are not offset by significant increases in emissions above business-as-usual levels elsewhere in the economy" [41].

An Australian Government [35] report suggests that, from 2021 to 2030, Australia needs to reduce its total emissions by 990 $MtCO_2e$ to meet its 2030 target. Of the AU$2.55 billion committed ERF funds, only AU$250 million are currently unspent. When spent (based on the average outcome from Table 1), the ERF is expected to deliver about 242 $MtCO_2e$ abatements by 2030, which is insufficient to meet Australia's 2030 target. To meet its 2030 targets solely by means of the ERF, it is estimated that an additional AU$24 billion investment is required [38]. Given this, it should not be a surprise, in upcoming climate negotiations, to see Australia bargaining to carry over its surplus carbon from the 2020 target.

However, this is not the only option. Using a Marginal Abatement Cost (MAC) curve across 10 sectors of the Australian economy, Reputext [40] has identified more than 150 GHG abatement measures and suggests that Australia could cut emissions by 600 $MtCO_2e$ (to 45%) below 2005 levels by 2030 at a cost of under US$16/$tCO_2e$, with the electricity generation and land sectors identified as the most effective sectors within which the largest levels of GHG emissions abatement might be achieved. This analysis indicates that emissions reductions in Australia are possible and at far less cost relative to a similar scale of cut at the global level, which has been estimated at some US$100/$tCO_2e$ [4]. Further, if the Australian government is serious about real emissions reduction, it could increase the effectiveness of the SM by: (1) expanding it to cover all facilities that emit >25,000 tCO_2e/yr, reducing the current threshold of 100,000 tCO_2e/yr; (2) reducing baselines over time and in line with the national targets for 2030; and (3) allowing companies/facilities to trade emissions (effectively, an emissions trading system) between themselves. In the latter instance, some of the facilities covered under the SM may have lower marginal costs of emissions reduction and may therefore have greater capacity to reduce emissions, which could then be sold to other companies with inherently higher marginal abatement costs. As a result, Australia as a whole would then have the capacity to effectively and efficiently achieve its 2030 emissions target.

Meanwhile, Australia may plan to use international credits to help meet its 2030 emissions target from 2020 [25], although the rules for this are not yet established. In a recent UNFCCC meeting, Australia strongly lobbied in favour of using international credits, as did some 60 other nations [22]. However, this is a complex area. There are several types of international carbon credits and the credibility of these is an important issue. For example, Norway has bought 30 million carbon credits from Clean Development Mechanisms to meet its 2020 target. These CDM credits are very cheap, costing less than a dollar (USD) per abatement [42]. On the other hand, citing the non-permanent nature of CDM credits, the EU is not buying any bio-sequestration based carbon credits to meet its emissions reduction targets. Again, as a developed nation with significant capacity to set a leading example, Australia should select those international credits which, though more expensive, are reputed for their credibility and integrity in the international market (e.g., the EU and Tokyo ETS and California Cap and Trade programs [43].

4. Further Discussion

4.1. Australia is not Alone

Of course, Australia is not alone in finding and using loopholes to effectively gain advantage; many other countries and companies operate in a similar manner. For example, the Clean Development Mechanism (CDM) of the Kyoto Protocol was developed with twin objectives, providing sustainable development opportunities for developing countries and enabling developed countries to meet emissions reduction targets in a cost-effective way [2]. In addition, a range of projects may be registered under the CDM [44], some of which have little sustainability benefit. One example is the hydrofluorocarbon (HFC-23, used in refrigeration) reduction/avoidance projects [45,46]. Given this

gas has 11,700 times more global warming potential than CO_2, refrigerant companies find it cheaper to install an incinerator to burn HFC-23 and then sell carbon credits into the carbon markets. In fact, these companies earn millions of dollars from these credits and considerably more than they do from selling their refrigerator products [42]. Somewhat surprisingly, investors from a number of developed countries (such as Canada, Netherlands, Italy, Denmark, Finland, Sweden, Germany, UK, Switzerland, Japan, Norway, and Spain) have been involved in these obviously problematic projects [42].

Other countries, such as Congo, Ghana, and India, amended their 'forest' definition in 2008 to better align with the requirements of the CDM program [47]. Under the CDM, each project is individually considered and the case can be made for additionality; therefore, these loopholes are easily exploited [48]. For example, in 2008, India successfully negotiated a change in its definition of a forest to make agroforestry with shrubs (such as Jatropha) an eligible activity under the CDM. In another example, estimates of the area of deforestation and forest degradation, and, hence, reference emissions levels (RELs), are significantly impacted by the definition of forest used. In Indonesia, the total area of deforestation between 2000 and 2009 was 4.9 million ha when using the United Nations Food and Agriculture Organisation (FAO) definition, 18% higher when using a 'natural forest' definition, and 27% higher when using the national definition [49]. Countries can exploit such loopholes to negotiate for an upward shift in RELs by using the forest definition that best suits their interests. Similarly, many countries, in submitting their REL to the UNFCCC, apply a land cover based definition for 'deforestation' rather than a land use based definition [50]. This approach will overestimate the emission reductions associated with deforestation by: (1) not considering regrowth potential; and (2) if the criteria for forest definition is 'over 10% crown cover', reduction in crown cover to under 10% can change the classification to non-forest area (i.e., deforested) [51].

Other developed nations also fail to fulfil their global commitments. Part of this lies in the fact that some of the highest GHG emitting countries, such as the USA and Canada, are also considered least vulnerable to climate change. Such countries may consequently feel less inclined to disburse committed funds for mitigation and adaptation projects in developing countries. To date, the $US100 billion a year commitment has not been realised and there is need for further agreement on the post-2025 collective finance goal from developed countries. Failure to deliver on these commitments would not only affect the global climate stablishing goal, but would also compromise global capacity to achieve the 2030 Sustainable Development Goal (SDG 10) to 'reduce inequality within and between countries' [52]. Further, the vested interest of some oil states (Russia, US, Saudi Arabia, and Kuwait) was particularly evident in COP24 in Poland, when they strongly objected to the adoption of the IPCC's Special Report of a 1.5 °C threshold, pushing instead for a 'take note' response [53]. These multiple lines of evidence indicate that many countries appear to come to the negotiation table to realise their vested interests rather than to solve this critical global challenge.

4.2. Issues and Potential Solutions

Several other issues further complicate the global mitigation agenda. Firstly, as noted, even if all countries met their nationally determined contributions (NDCs), they cannot meet the 2 °C climate change target [6]. Compared to 2005, CO_2 emissions for the top 10 emitting countries will increase by 26.5–36.5% by 2030 [54]. Among these countries, the USA, Japan, Germany, South Korea, Saudi Arabia, Iran, and Indonesia are predicted to be unable to meet their NDCs [54]. Moreover, President Trump has informed the UNFCCC Secretariat that the US will withdraw from the Paris Agreement and is no longer obliged to meet its NDC. Similarly, Brazil is also considering exiting the Paris Agreement.

Secondly, without a credible global carbon mechanism, the Paris Commitments cannot be achieved; yet, discussion on the development of an international carbon market is still pending. There are several existing carbon markets, such as the EU and Tokyo ETS, California Cap and Trade programs, and CDM and Joint Implementation under the Kyoto Protocol [42,43]. Developing national and international carbon markets crucially relies on understanding the concerns around existing marketing mechanisms and companies' preferences [55], without which the carbon market would be

unable to achieve its desired objectives. More importantly, those industries with lower energy intensity and advanced production technologies can contribute more and should therefore be prioritised in the design of the international market mechanism [55].

Thirdly, many towns and cities around the world, such as Melbourne and Copenhagen, have declared "net zero emissions" goals by 2020 [56]. They are adopting a wide range of environmental policies, including improving energy efficiency and transitioning towards renewable energies [56]. Globally, the share of renewable energy is about 11% of global energy production, but its estimated potential share is about 60% [57]. Therefore, there is ample opportunity for global energy transition; however, appropriate national and international policies are necessary for this transition to be realised. Another way of achieving emissions targets at local and regional levels is to jointly use the 2006 IPCC methodology and the ISO 14064-1 certification standard. These provide the basis for developing best practice environmental policy and management decisions. For example, in Central Italy, where they have been successfully applied, they are predicted to deliver significant reductions in GHG emissions [58].

Finally, while researchers have developed marginal abatement cost curves for different sectors in many countries, the adoption of cost-effective emissions measures remains rare. As noted, Australia could cut its emissions by 45% from 2005 levels by 2030 at far less cost (<US\$16/tCO_2e) than that of a similar scale of cut at the global level, which has been estimated at some US\$100/tCO_2e [24,40]. Directing scarce resources into the right abatement measures would also have sustainable financial and environmental benefits for both Australia and the global community [59]. In addition, mitigation measures have multiple synergies with Sustainable Development Goals, including: Health; Clean energy; Cities and communities; Responsible consumption and production; and Oceans (SDGs 3, 7, 11, 12, and 14, respectively) [60].

5. Conclusions

Climate change is one of the most serious problems the global community has faced and its solution must come from a collective, coordinated, clearly defined, ethical, and comprehensive response from all countries. While each country reports success in its efforts to reduce GHG emissions and meet their international Kyoto protocol and Paris Agreement commitments, it is increasingly evident that many countries attempt to gain a 'free ride', negotiating special consideration, exploiting loopholes, and/or gaming the system of international agreements on climate action to gain short-term domestic political and economic benefit.

As we have shown, neither developed countries, such as Australia, nor developing countries are innocent of this; nor is any country immune to the potential consequences—both direct (e.g., increasing climate variability; increased frequency and intensity of extreme weather events) and indirect (e.g., declining agricultural productivity; pressure from environmental refugees escaping extreme weather events in neighbouring countries; loss of ecological services with the collapse of ecosystems; increased geopolitical conflict)—if the global community fails to address the drivers of climate change as a matter of urgency. However, we argue that, as a developed and resourceful country, Australia could and should be leading the world by example, especially as, compared to many other countries, its emissions reduction potential is significant.

Real progress in reducing emissions and addressing the overall threat to global security posed by climate change requires honest and concerted effort by all parties. In the interests of all, the international community should, wherever possible, guard against actions driven by the parochial and vested interests of individual countries.

Author Contributions: T.M. designed research and collected and analysed the data; T.M. and K.R.-S. wrote the manuscript and approved the final version.

Acknowledgments: We thank the University of Southern Queensland for logistical support.

Conflicts of Interest: The authors declare no conflict of interest.

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