Australasian Agribusiness Perspectives
2024, Volume 27, Paper 3
ISSN: 2209-6612

Policies Adopted in Different Countries to Reduce Greenhouse Gas Emissions and Implications for Australian Agriculture

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Abstract

Greenhouse gas emissions are a primary universal concern, with many countries worldwide making serious efforts to mitigate their contribution to global warming. Different countries have implemented various initiatives to reduce emissions, especially following the signing of the Paris Climate Agreement. Countries have adopted different approaches to reach the goal they have committed to, with some relying mainly on legislation and regulation, some using market-based policies and others using a combination of approaches to reduce emissions and meet their environmental commitments. This paper examines and explains different legislations, taxes, return revenue taxes, cap-and-trade, incentives, subsidies, and other direct and indirect approaches adopted in the European Union, the United States, Finland, Sweden, Japan, New Zealand and China. The impacts of these approaches on markets and their contributions to correcting pollution externalities are outlined.

In contrast, few policies and plans have been implemented in Australia to tackle carbon emissions, even though Australia is among the largest twenty emitter countries of carbon dioxide equivalents. What has been done in Australia is reviewed and compared to international best practices. Looking at some of the cost-efficient policies in use elsewhere in the world could help inform the climate policy debate in Australia and help put Australia on track to meet the emission reduction target agreed to under the Paris Climate Agreement. A conclusion is that more research is required regarding Australian climate policies specific to each sector to implement cost-efficient regulations that could reduce emissions while maintaining satisfactory economic growth.

Keywords: emissions, climate policies, social cost, negative externality

Introduction

Environmental issues, including increased greenhouse gas emissions, are a significant challenge and a global threat to a prosperous future. International science agencies and powerful countries call for emergency action to reduce global emissions (Rogelj *et al.,* 2021). Across the world, different policy approaches have been implemented to limit the volume of pollutants emitted (Smith *et al.,* 2007).

Governments have a role in assembling and assessing data on carbon dioxide emissions: identifying emissions and emitters, the category of the emissions, and the potential impact of policies and their possible distortionary effects, to develop and implement workable and efficient pollution reduction policies. Broadly, the common interventions are command and control policies or market-based policies (Freebairn, 2009).

A wide range of legislation, taxes, return revenue taxes, cap-and-trade, incentives, subsidies, and other direct and indirect approaches have been adopted in many other countries such as the European Union, the United States, Finland, Sweden, Japan, New Zealand and China to moderate greenhouse gas emissions. In contrast, few policies and plans have been implemented in Australia to tackle carbon emissions, even though Australia is among the largest twenty emitter countries of carbon dioxide equivalents. This is despite Garnaut (2011) making a solid case for the advantages of an Emission Trading Scheme (ETS) in meeting Australia's climate commitments and the importance of including the agricultural sector in the ETS. Australia was one of the last developed countries to implement actions to mitigate climate change, and further actions are still needed to meet international climate commitments. The history of climate policies in Australia includes many failures due to opposition from interest groups. These attempts at greenhouse gas policy are reviewed below. There is increasing international pressure to reduce emissions and meet global climate targets, and Australia is perceived internationally still to have far to go with climate policy.

Following this review, the policies of these other countries are examined and explained by employing a systematic literature review. These include ETSs in Europe, the United States and China, and the climate policies in Finland, Sweden, Japan and New Zealand. The impacts of these approaches on markets and their contributions to correcting pollution externalities are outlined. Lessons are drawn from successful systems, and the causes of failure from others are outlined. The specific research question asked is “What climate policies could Australia implement to meet most cost-efficiently its international commitments to achieving net-zero emissions by 2050?”

The study has some limitations within which the findings need to be interpreted. In particular, Australia launched its national commitment very recently, in July 2023. Hence, a limited number of published descriptions of the various regulations and incentives exist.

Method

A structured literature review process was followed to obtain relevant information. The scope of the research reviewed included general economic concepts about climate policies (such as Freebairn, 2009), specific strategies implemented in each of the countries studied (as detailed below), the background of historical climate policies in Australia (such as provided by Garnaut, 2011), and schemes issued to reduce emissions from the Australian agriculture sector and in particular the beef industry (such as MLA, 2023).

First, four commonly accessible databases were identified to find literature related to the broad scope of the research. These were Web of Science, Scopus, AgEcon Search and EBSCO. Then, the search for relevant articles was undertaken by including the keywords: "environment* polic*", “pollut*”, "emission*", "climate regulation*", "climate change" and "ETS". In addition, a search was conducted on Australian Government and agricultural industry websites related to climate change. Data on emissions from Australian agriculture were mainly found on the websites of the Australian Office of Financial

Management, the Department of Climate Change, the CSIRO, and the MLA, as well as in a report prepared by KPMG on natural capital (KPMG, 2019). English was the primary language used in the search.

The primary search resulted in 2,070 articles, with eight found in Web of Science, 16 in Scopus, 210 in AgEcon Search, and 1,836 peer-reviewed in EBSCO. A pre-screening selection based on eliminating duplicates resulted in 2017 citations remaining. Data relevant to the research question and study objective were extracted in a staged process. In the first screening, titles and abstracts were checked, and articles irrelevant to research on climate policies and their application in certain countries were eliminated. Of the 2017 possibilities, 136 had relevant titles and articles and passed the first screening. These 136 records were then sought for full-text screening, but six were excluded after failing to access the full-text through multiple libraries. Another screening reviewing the full text selected the most relevant results to climate regulation, ETS, environmental policies, pollution, climate change and emission. After this second screening, 58 results remained and included in the list of references.

Historical Greenhouse Gas Policies in Australia

After the failure of the Kyoto Protocol, the Copenhagen Agreement set new strategies to reduce greenhouse gas emissions, and the Cancun meeting supported it. Australia had the lowest commitment to international agreements, because of the dominance of business groups' interests, until 1983 and had the highest emissions rate per person amongst developed countries. This inaction led to Australia having enormous economic growth in almost all sectors since the beginning of the 20th century. However, other countries that had made strong commitments increased pressure on Australia to react and reduce its emissions.

More than a decade ago, Garnaut (2011) argued that the advantages of mitigating climate change in Australia far outweighed its costs, and these advantages would be seen over many generations. In particular, Garnaut (2011) provided insights into the role of an ETS in meeting Australia's climate commitments. An ETS was argued to be more cost-efficient in reducing emissions with fewer negative impacts on the economy and low-income households than regulatory and carbon tax approaches. Such a scheme would encourage more significant participation by Australians by providing incentives to adopt it and by promoting innovations.

It was recognised by Garnaut (2011) that Australia's choices to mitigate climate change by implementing a regulatory approach or a market-based approach must be carefully considered. Carbon prices must ensure a sustainable pathway to emissions reduction and be suitable for an easy link to carbon trading nationally and internationally. For example, in 2011, an agreement of the Council of Australian Governments defined proactive steps to increase disaster resilience against the impacts of climate change (Garnaut, 2011).

At the time of Garnaut's report in 2011, carbon prices in the European Union were around A$23, the United States had a carbon price of around A$20, and the UK price was around A$40. Based on this international experience, Garnaut (2011) suggested setting a carbon price within Australia in the A$20 – 30 range. Once a fixed carbon price was set, the country's economic stability would enable a smooth transition toward a floating price. Garnaut also recommended creating an independent committee to monitor and evaluate the fixed carbon price, the shift to a floating price, carbon trading, and all operational aspects of the scheme. He also advised the Australian Government on the required adjustments to achieve the global targets.

Garnaut (2011) also recognised that timing is an essential factor that could help avoid carbon leakage if Australia applied it earlier or later than other, competitor countries. However, carbon leakage is in different directions for different sectors in Australia. At the same time, some export industries are subject to carbon leakage when trading from Australia to other destinations with fewer carbon restrictions; other sectors, such as Australian aluminium production, involve high emissions. Therefore, Garnaut (2011) claimed that it would be good for Australia to remove exemptions on all sectors, including trade-exposed high emitter sectors, when all competitor countries implement the same carbon constraints to reduce distortions.

Therefore, Garnaut (2011) recommended an ETS to be introduced in 2012 with a fixed carbon price for three years to ensure economic stability and gain industry trust in the approach, followed by a floating price, which would be a promising pathway for Australia to start achieving its global climate commitments. In addition, independent committees would be appointed to monitor and evaluate the carbon pricing scheme, to follow up on international carbon pricing progress and the status of trade-exposed industries, and to set the adequate rate and time for the floating price. These committees would remove the governance of the scheme away from the targeted industries. Firms would, therefore, be forced to follow the rules to grow their business while reducing their emissions.

The Carbon Pollution Reduction Scheme (CPRS) was first proposed in July 2012 and followed the European Union model, but it was not implemented. A Carbon Pricing Mechanism was introduced for firms with emissions greater than 25Mt of CO2, with a carbon price starting at $23/ tonne of CO2 eq. in 2012, and targeted half of Australia's emissions. The tax increased by 2.5% annually in 2013 and 2014 (Verschuuren, 2017).

When the scheme was introduced, the cost of high-emission industries increased; therefore, many firms left the market. After a while, when new firms entered the market, they were directed to new sectors, especially unexplored low-emission sectors in developing countries. This is when Australia's intensive emission industries, such as coal and natural gas, regained their competitive advantage (Garnaut, 2011).

From July 2015 onward, the Australian ETS was planned to include Australia in the global carbon market and to connect it with other countries to meet the Kyoto Agreement, and a cap-and-trade policy was to start with a price floor and a price ceiling set up to the year 2018 (Verschuuren, 2017; Ike, 2020). However, the ETS did not include the agricultural, forestry, land use, and landfills due to the complex process involved in assessing emissions in these sectors and were instead regulated through a Carbon Farming Initiative (CFI) that enabled the launch of emission offset projects and the Australian carbon credit units (ACCUs) (Verschuuren, 2017).

The scheme did not go as planned, and the cap-and-trade ETS was opposed and rejected in 2014 by the 'veto actors' of the Liberal Government, leading to the absence of an Australian climate change policy (Ike, 2020).

After its first attempt, Australia signed a new commitment at the climate change conference in Paris in 2015 to reduce emissions by 26-28 per cent by 2030 compared to 2005 levels. An Emission Reduction Fund (ERF) was introduced in 2014, similar to the CFI but covering a more comprehensive range of emitting sectors, and replacing the carbon price policy. The CFI was also part of the ERF plan (Verschuuren, 2017). The ERF included several projects related to distinct aspects of agriculture, such as but not limited to carbon sequestration in grazing land, methane reduction in pigs, and prevention of deforestation, as shown in Table 1, with the related activities and the corresponding outcomes.

Table 1. Some projects run under the ERF, activities undertaken and outcomes of each project

Agricultural projects under the ERF	Innovative activities	Outcomes
Reduction of methane emissions in 2000 acres pig farm, in Victoria in 2015	- Technological improvements - Gaining accreditation from Australia Pork to ensure animal welfare and quality assurance. - Treatment of methane in effluent and convert it into organic fertilizers.	- Reduction in methane emission - Production of renewable energy - Improvement of food safety and environment quality that led to premiums and higher returns to farmers
Reduction of carbon emissions through carbon sequestration in grazing land, in Queensland in 2015	- Rotational grazing - Fallowing the land to allow the grass to grow back and capture carbon	- Enhancement of soil health - Less use of chemicals leading to less input costs for farmers and less emissions - Increase in land quality (less erosion and better soil quality)
Preventing deforestation of 8500 hectares in New South Wales in 2014	- Protection of forest from tree clearing - Establishment of fire breaks all around the forest to prevent bushfires	- The farmer protected his land from drought - Additional revenues to farmer - Avoid deforestation

Source: Based on (Verschuuren, 2017)

The impacts of the ERF are shown in Figure 1. Emissions were reduced in 2013-2014, resulting from the carbon tax and the CFI, and then increased when the approaches were rejected.

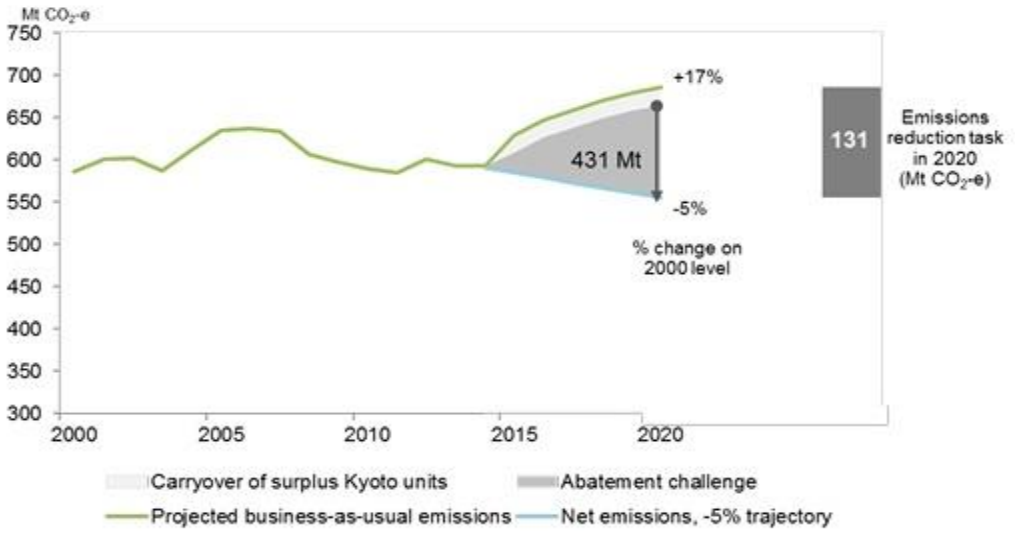
The efforts to reduce Australia's emissions continued, and a direct-action Safeguard Mechanism (SM) was introduced in 2016 to limit emissions by setting emissions baselines (Verschuuren, 2017; Crowley, 2021). However, in the absence of an ETS, emissions from the industrial sector exceeded the baselines set by the SM and surpassed abatement from land preservation, leading to the failure of the ERF program due to macro constraints, such as conflict of interests amongst different interest groups with opposed values, political and economic interests, mainly in the coal industry, as well as the ability of the political forces to influence climate policies (Crowley, 2021).

An Emissions Intensity Target (EIT), a Clean Energy Target (CET), and a National Energy Guarantee (NEG) were also proposed in 2016 to meet the Paris Agreements. They were all rejected by the Turnbull Government (Crowley, 2021).

In July 2023, the Australian Government lodged a national commitment in correspondence with the Paris Climate Change Agreement to reduce Australia's emissions by 43 per cent by 2030. The SM has also been modified and revitalised to encourage high-emitting industries to meet net zero emissions by 2050 and support low-emission investments and technological improvements, especially in the energy sector (Department of Climate Change, Energy, the Environment and Water, 2023a).

While the Australian Government has announced the National target and budget for 2023 to meet its global agreement, Australia's efforts still need to catch up, compared to other nations, in implementing successful climate policies and effectively reducing its emissions (Figure 2).

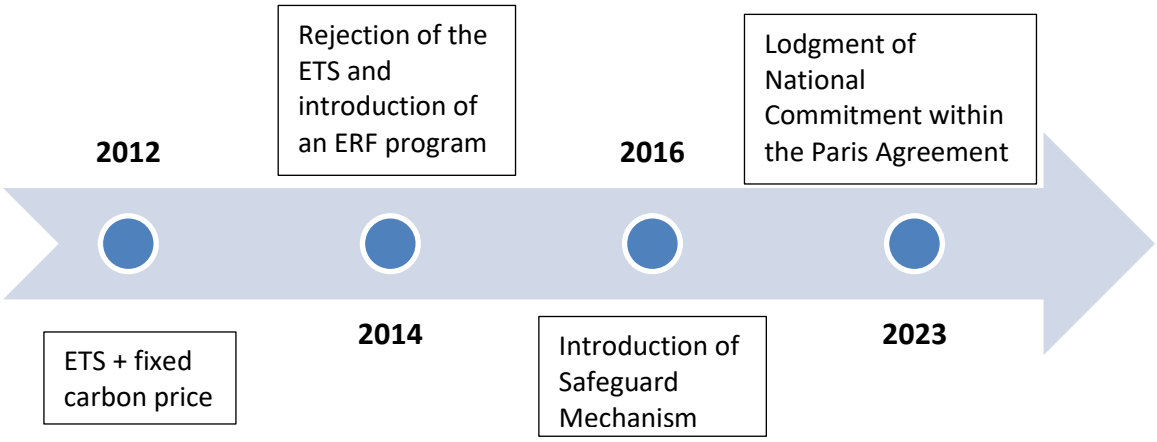
Figure 1. Figure showing the emissions reduction in 2014, resulting from the carbon tax and the CFI



	2000[3] emissions	Kyoto period average 2008-12	2020 emissions	Abatement task in 2020	Cumulative abatement task
	Mt CO_2-e	Mt CO_2-e	Mt CO_2-e	Mt CO_2-e	Mt CO_2-e
Baseline emissions	586	596	685		
-5% target			555[4]	131	431

Source: (Department of the Environment, 2013)

Figure 2. Timeline of the background of Australia's climate change strategies



Source: Author's own

Greenhouse Gas Policies in Different Countries

A comprehensive review of different climate policies implemented in some developed and developing countries is discussed in this section. Some have succeeded in reducing emissions and meeting climate commitments; others have been rejected before achieving the targets. In both cases, lessons have been drawn about the optimal conditions for some climate approaches and the reasons behind the failure of others.

The European Union Emission Trading Scheme

The ETS of the European Union was the most significant cap-and-trade strategy, implemented in 2005. A yearly cap was set with a declining trend (Hintermayer, 2020).

From 2012 to 2017, allowance prices were low. At a rate of 10 EUR/t, there was no incentive to encourage the development of abatement technologies. However, a market stability reserve (MSR) and allowance cancellation were introduced during the same period. When firms had a certain threshold of allowances, fewer allowances were allocated the following year, and the remaining allowances were shifted to the MSR (Hintermayer, 2020).

The reasons for the low abatement prices must be better explored in the literature. However, some of the main drivers could be the impact of the 2009 global economic crisis, the high quantity of allowances supplied in the market, and the cross-effects of other interventions in reducing emissions.

Therefore, a carbon price floor (CPF) of 25 EUR/t was introduced in 2019 to reduce the economic instability and market distortions resulting from low carbon prices. The increase in carbon price increased the MSR. In 2020, the European Union revised the "nationally determined contribution" and committed to increasing its greenhouse gas emission reduction from 40 per cent, as agreed in 2018, to 55 per cent by 2030 compared to 1990 (European Commission Directorate-General for Climate Action, 2023).

At the start of 2023, all allowances in the MSR exceeding previous years' numbers and allowances of closing firms were cancelled (Figure 3). This step has transformed the European Union ETS from a quantitative approach to a combined approach, simultaneously setting a price floor and quantity and achieving a cost-efficient emission reduction (Flachsland *et al.,* 2020).

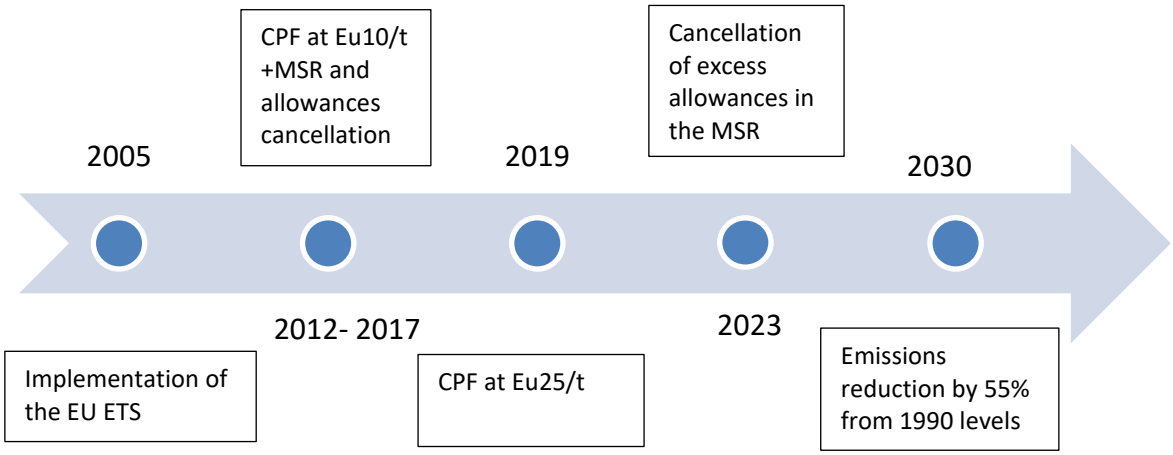
A timeline of these changes is shown in Figure 3.

A summary of the different CPF designs is shown in Table 2 to illuminate the impact of the carbon price floor on the EU ETS. The CPF designs are classified into buyback and top-up taxes (Hintermayer, 2020).

- The buyback plan sets a minimum floor price for carbon starting from the year of implementation. Immediately after the price is set, plants adapt their programs to the previewed price by increasing the carbon price and reducing carbon emissions. The remaining allowances are then cancelled. The government must provide enough allowance at the CPF. The government is worse off in this case.

- Top-up taxes are taxes applied on emissions starting from the year of implementation. Plants increase their emissions before implementation and then lower them when the tax starts to be applied. The government is better off in this case.

Figure 3. Timeline of climate strategies in Europe



Source: Author's own

After 2030, both CPF designs could generate the same governmental revenues and reduce overall emissions at a lower abatement cost than without the CPF. However, the impact of each design is different depending on the firm's dynamic (Hintermayer, 2020).

Climate Policies in New Zealand

The Government in New Zealand has adopted several strategies and tools to mitigate climate change. Gross emissions have been increasing from 1990 up to 2005, then stabilised from 2006 to 2021 (Figure 4). It has set a work program that includes greenhouse gas emissions reduction plans and adaptation plans to the ongoing changing climate. The agricultural and transport sectors mainly contributed to New Zealand's net greenhouse gas emissions (Figure 4). While methane and nitrous oxide emissions from the agricultural sector contributed to more than half of the gross emissions (Ministry for the Environment and Stats NZ, 2023) (Figure 5), the transport sector was the leading emitter of carbon dioxide.

The Government climate-change work program was developed to help New Zealand achieve its worldwide commitments and support resilient economic growth. New Zealand signed the Paris Agreement and committed to reducing its emissions by 50 per cent from 2005 to 2030.

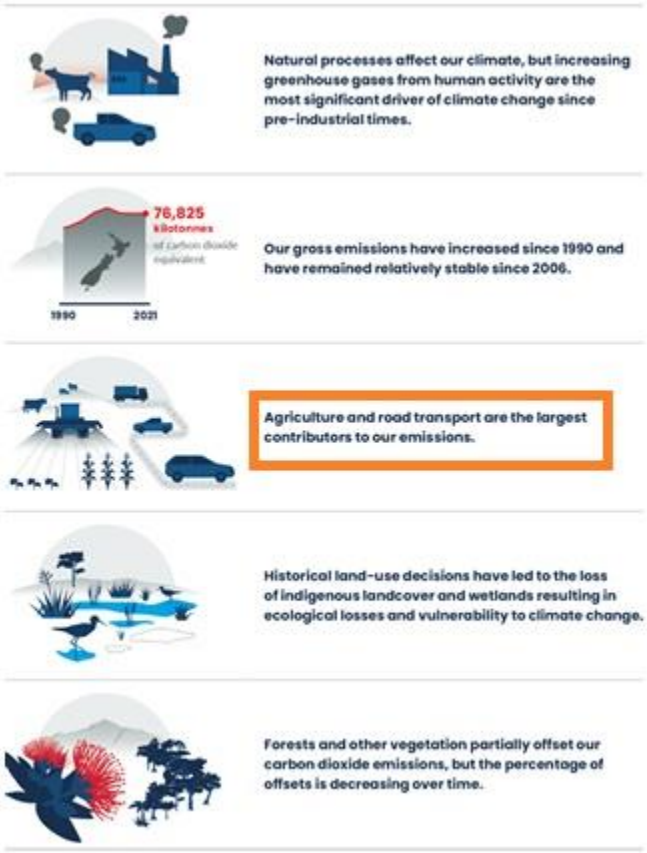
Then, in 2019, the Government issued the Climate Change Response Amendment Act to reach net zero greenhouse gas emissions, except for biogenic methane by 2050, and to reduce biogenic methane by 17 to 47 per cent from 2017 levels by 2050 (Ministry for the Environment, 2022). In 2022, the New Zealand Government issued the first emission reduction plan. It included mechanisms and emissions targets for different economic sectors.

Table 2. Advantages and disadvantages of EU ETS with different CPF designs

EU ETS	Without CPF	Buyback design	Top-up tax
Description	Carbon prices rise from 19 EUR/t in 2020, with interest rates until 2039. From 2040, the TNAC* becomes empty and the price increase will stop. No allowances left leading to less emission. In 2057: backstop costs with no more emissions.	In 2020, the government declared the implementation of CPF at a rate of 40 EUR/t in 2025. Firms anticipated the new CPF from 2020 and bought allowances, which lead to carbon price increase and emissions reduction in the short run. By 2040, the TNAC* would be empty. From 2040 onwards: Same scenario as no CPF. Cancellation slightly decreases the impact of waterbed.	Implementation in 2025. No anticipation. Firms emit more before the top-up tax implementation year, leading to lower TNAC, less MSR, and less cancellation. After the implementation, firms emit less with more TNAC - decrease in carbon price, leading to more emissions: temporal waterbed effect.
Comparison		Higher prices than base scenario Less emissions in the short term and more MSR as well as more allowances cancellation until 2030. MSR sold in auction after 2030, causing decrease in carbon price and more emission: temporal waterbed effect. High prices and cancellation effect outweigh the waterbed effect making this scenario better than the base one.	Emissions between 2030 and 2040 are higher compared to base scenario. New green paradox: less cancellation compared to buyback scenario, but similar to base scenario. The overall impact depends on the CPF level and the implementation year.
Impact on governmental revenue	Governmental revenue only until 2039.	Generates governmental revenue starting 2020.	Generates governmental revenue starting the implementation year. Taxes are a source of revenue but are counterbalanced by the decrease in revenue from auction volume.
Impact on emissions	Less impact than CPF designs.	Reduces emissions immediately and most vigorously compared to the other two designs.	Increases emissions at the time of announcement. Reduces emissions starting from the implementation year.

Source: Author's own based on (Hintermayer, 2020). *Total Number of Allowances in Circulation (TNAC)

Figure 4. Greenhouse gas emissions and offset in New Zealand



Source: adapted from (Ministry for the Environment and Stats NZ, 2023)

Figure 5. Greenhouse gas emissions in New Zealand in 2021

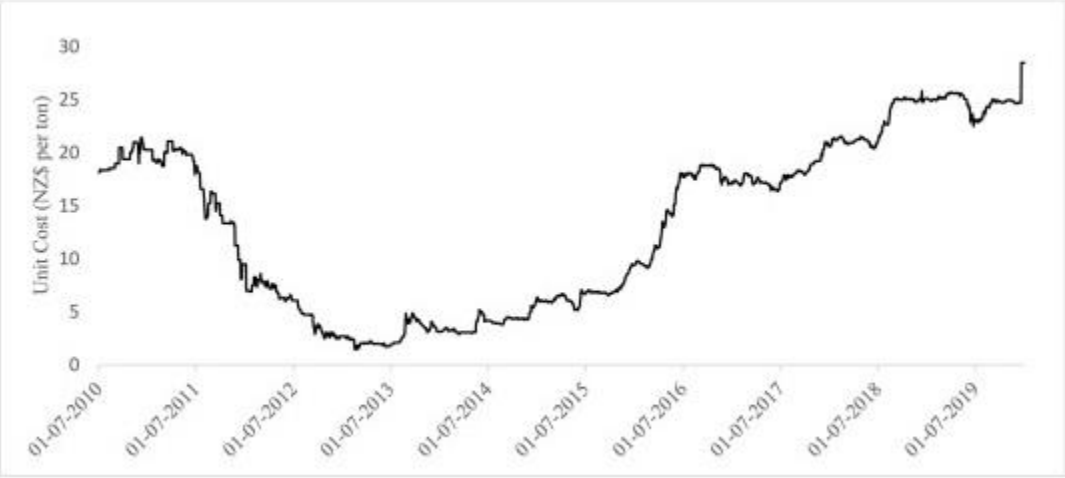
Source: (Ministry for the Environment and Stats NZ, 2023)

The ETS of New Zealand

The New Zealand ETS, implemented in 2008, was the only ETS that covered all economic sectors and included mitigation strategies for six greenhouse gas emissions (Liao *et al.,* 2023). All sectors emitting pollution, except the agricultural sector, have surrender and reporting obligations to New Zealand's government.

The market supply and demand drove the New Zealand Unit (NZU) price. In contrast with the European Union ETS, climate conditions and energy prices did not impact the New Zealand ETS carbon prices. The significant changes that have occurred to the NZ ETS since its implementation in 2008 resulted in the pricing fluctuation of the NZU (Figure 6). This price volatility was related to the interaction between supply and demand and the market conditions.

Figure 6. NZU price variability from July 2010 to July 2019



Source: (Liao *et al.,* 2023)

In 2017, New Zealand was the major contributor of gross emissions from the agricultural sector among all the Organization for Economic Co-operation and Development (OECD) countries. However, the New Zealand ETS was one of the oldest ETSs in the world and the only ETS to include the forestry sector in the scheme. It accounted for carbon offsets to neutralise some gross emissions (Figure 7) (Liao *et al.,* 2023).

Two significant announcements have occurred since the implementation of the New Zealand ETS. The first change was in June 2015, when the de-linking from the Kyoto Agreement took effect (Figure 8). Before this phase, the uncapped supply from international units increased the stock of NZU. The New Zealand Government set a Fixed Price Option (FPO) for emissions at a low rate, equivalent to NZ$25/tonne of CO2, to compensate for the supply from international units. The FPO enabled emitters to pay for their emissions and maintain their NZU stock. Most emitting firms relied on the FPO to offset their emissions, as expectations predicted an increase in emissions prices in the future.

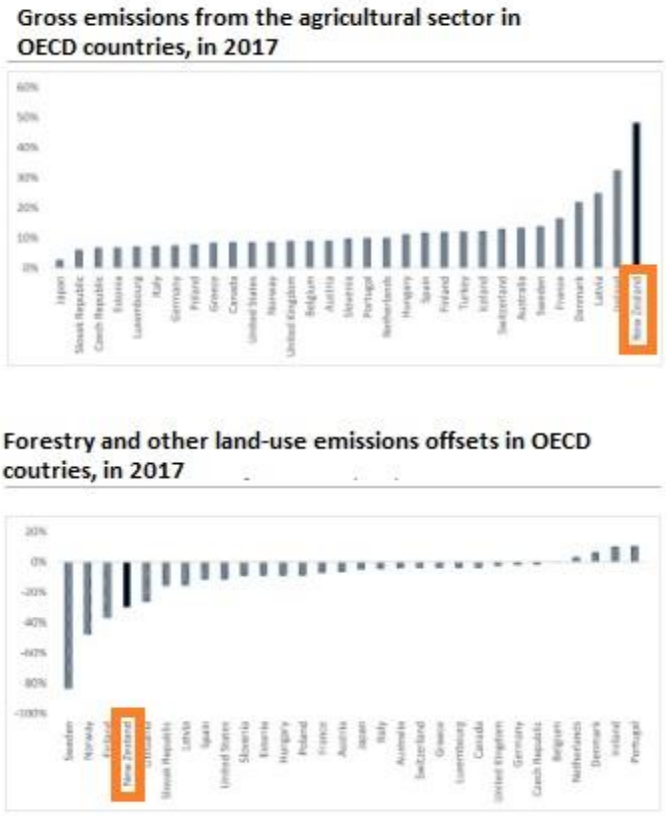
In January 2017, the second change marked the end of the one-for-two measure phase. This phase was characterised by surrendering one unit of NZU for every two tonnes of CO2 emitted from non-forestry sectors. In 2019, the New Zealand Government started to tighten the supply of allowances by increasing

the FPO. The FPO was set at NZ$35 in 2020, and then carbon units were shifted to an auctioning of units in 2021.

New Zealand's emissions remained high despite the implementation of the ETS. Thus, the Government provided funds to support low-emissions projects and training on innovative technologies and tightened the allowances supply in 2019 to increase emissions prices and incentivise businesses to adopt low-carbon technologies (Liao *et al.,* 2023).

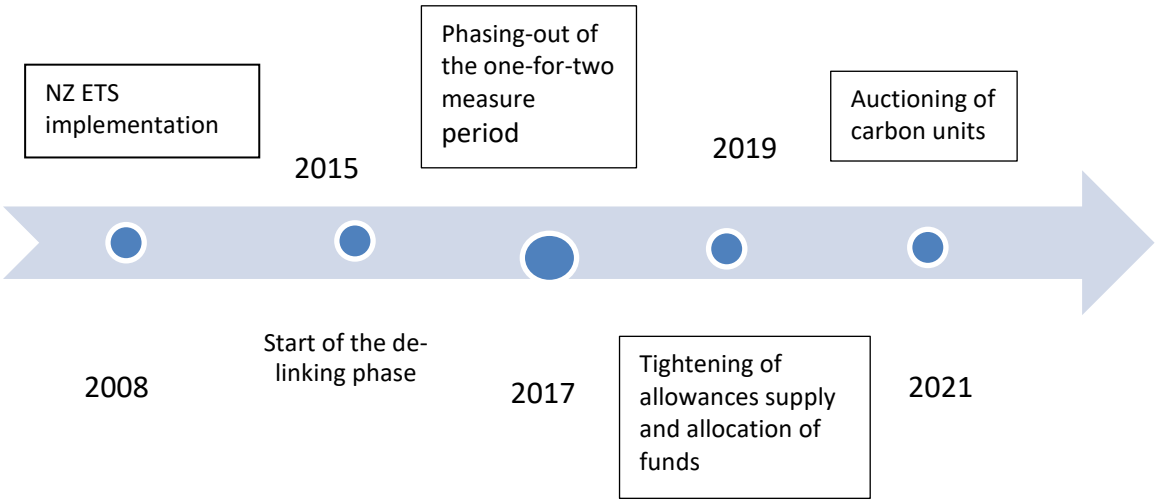
A summary of the various changes over time in New Zealand is shown in Figure 8.

Figure 7. Gross emissions from the agricultural sector in OECD countries (top graph) and forestry and land-use offsets emissions in OECD countries (bottom picture) in 2017



Source: adapted from (Liao *et al.,* 2023)

Figure 8. Timeline of the New Zealand ETS from its implementation in 2008



Source: Author's own

The United States ETS

In the absence of federal policy in the United States, regional areas have taken the initiative and implemented their policies. The Regional Greenhouse Gas Initiative and the California cap-and-trade are the policies operating today in the United States to reduce carbon emissions and encourage the adoption of low-emission innovations.

Emissions-intensive and trade-exposed firms are worse off when operating in a carbon-pricing environment than international firms without policies (Narasimhan *et al.*, 2022). Therefore, policy design has to be cost-efficient to protect the emissions-intensive and trade-exposed firms.

The Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative was the first cap-and-trade policy implemented in the United States to mitigate carbon emissions from the power sector. The policy was implemented in 2009 and included 11 Northeastern states, ensuring each state auctioned its allowances and generated revenue, refunding revenues to improve energy efficiency, encourage technological innovation and return consumer benefits. This scheme decreased carbon emissions by 60 per cent from 2009 to 2021 by maintaining the design of the ETS for an extended period and investing the policy income in other low-carbon energy programs (Narasimhan *et al.,* 2022).

California cap-and-trade

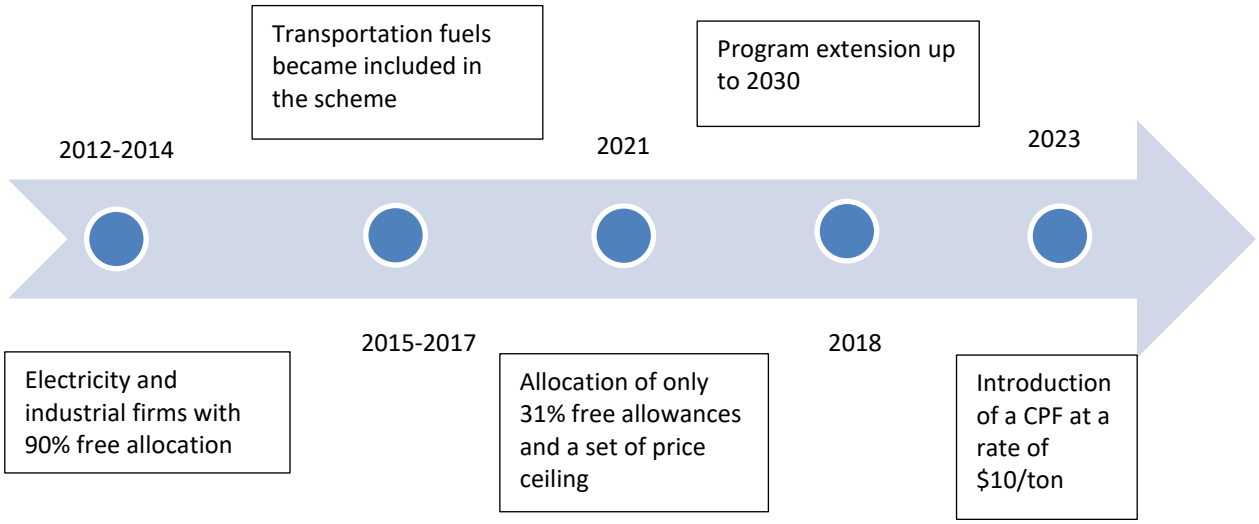
The California cap-and-trade was first implemented in 2012 to control 85 per cent of California's emissions from major high-emitting industries. It was then reviewed and updated in 2014 and linked to Canada's cap-and-trade.

The progress of California's cap-and-trade phases is shown in Figure 9. In the first phase, 90 per cent of free allowances were allocated, and only 10 per cent were auctioned. Most significant sectors were covered over the years, and fewer free allowances were allocated. In 2023, this cap-and-trade was coupled with a CPF starting at $10/ton CO2, increasing by 5 per cent yearly (Bang *et al.,* 2017).

Revenues were redirected to finance infrastructure projects and other projects led by interest groups to support low-income householders. In 2016, the policy was upgraded to include further emission reductions, up to 40 per cent by 2030 compared to 1990 (Bang *et al.,* 2017).

Due to California's economic, environmental, and public lobbying, the state's scheme was changed in 2017 to cover different GHG emissions and to include price controls and new allocation methods. The scheme was then expanded up to the year 2030. It covered different sectors involved in the state's emissions, such as significant industrial and emitting sources, natural gas suppliers, fuel and petroleum suppliers, and energy suppliers. It also included imported electricity and conferred multiple allowance types to different sectors, with free allowances allocated to the emissions-intensive and trade-exposed firms. The electricity and natural gas sectors have also benefited from free allowances, to be auctioned in the best interest of ratepayers and emission reduction.

Figure 9. Progress of California cap-and-trade



Source: Author's own

In 2021, a price ceiling of $65/allowance was implemented, with an increase of 5 per cent annually in addition to the inflation rate.

Other climate policies available in California, such as the RPS, LCFS, and energy efficiency measures, were implemented to control 80% of emissions. The rest were to be regulated by the cap-and-trade (Bang *et al.,* 2017).

California's cap-and-trade reduced emissions by 5.3 per cent between 2013 and 2017. This low outcome is due to existing carbon-reducing policies in the electricity sector and low incentives in the industry and transport sectors to switch to innovative technologies (Narasimhan *et al.,* 2022). The scheme has

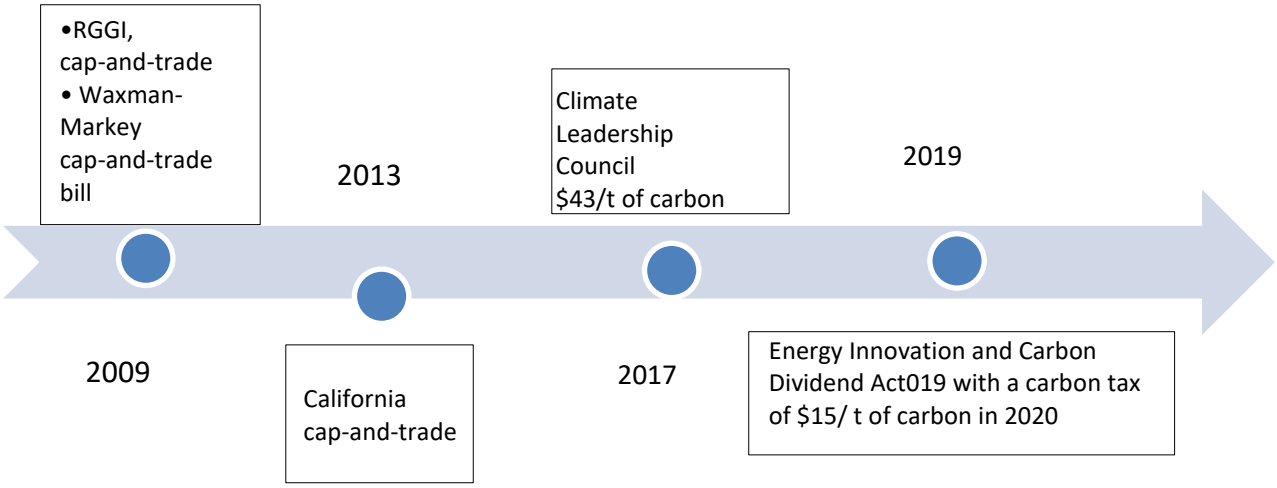
undergone multiple amendments due to interest groups' opposition. California's cap-and-trade was designed while keeping an eye on the European Union ETS and the Regional Greenhouse Gas Initiative policy to avoid making the same mistakes, especially in the first stages of implementation (Bang *et al.,* 2017).

Federal carbon price

Implementing a SO2 cap-and-trade in the United States from 1990 to 2005 reduced 94 per cent of SO2 emissions. However, the implementation of a CO2 emission reduction scheme failed. The first carbon program was proposed in 1990, followed by many rejected attempts. The progress of carbon policy attempts in the United States is shown in Figure 10.

In 2009, the Waxman-Markey cap-and-trade bill was proposed. It passed in the US House of Representatives but was rejected by the Senate due to the opposition of interest groups. In 2017, James Baker and George Shultz formed the Climate Leadership Council. They discussed the implementation of a carbon tax of $43/ton to mitigate 50 per cent of GHG emissions in the United States by 2035, with tax revenues allocated to citizens as carbon dividends. This proposal was also rejected.

Figure 10. Carbon policy attempts in the United States



Source: Author's own

In sum, the absence of a federal carbon policy in the United States was due to the opposition of key actors and the low policy entrepreneurship support, despite the presence of many supportive groups and politicians calling for a carbon pricing policy during Biden's administration (Narassimhan *et al.,* 2022).

The differences between policies at the federal level and the regional level are shown in

Table 3.

Table 3. Implementation conditions of Federal and regional cap-and-trade

Carbon pricing	Federal level	State level- RGGI	State level- California
	Lack of supporters and faces much opposition. Presence of complex interest groups. Complexity of interests within environmental groups. Environmental and public groups support regulatory policies such as CES at the federal level due to the need for immediate actions to mitigate climate change. However, the legislation includes low carbon pricing, not incentivizing industries to limit their emissions.	Limited to carbon emissions in the electricity sector. Focused on an area with common characteristics (Northeastern states). All allowances are auctioned, and revenues are allocated to interest groups in the area (public, industrial, and environmental groups) to gain their support.	Covers all GHG emissions. Multiple allowance allocation implemented due to interest groups diversity and free allowances for EITE industries. Presence of opposition from different sectors, such as oil and gas industries. Gained supporters through allocating returns from auctioned allowances to the electricity sector, thus extending the program through 2030. Although it gained industrial support, it continued to face environmental opposition, claiming to gain rebates for low-income residents in California. Linked with the Canadian cap-and-trade program.

Source: Author's own

Climate Policy in Sweden and Finland

Although Sweden and Finland have similar social and climatic conditions, their environmental statuses are quite different. As shown in Table 4, both countries, classified as corporatists at the macro-organisational level, presented many differences when assessed at the meso level (Gronow *et al.,* 2019).

Table 4. Similarities and differences between Sweden and Finland

	Finland	Sweden
Common	- Corporatist - Social-democratic - Small country - Open economy, export-oriented - Similar social environment and demography - Cold weather	- Corporatist - Social-democratic - Small country - Open economy, export-oriented - Similar social environment and demography - Cold weather
Differences	- - Reduction in emissions since the Kyoto Agreement due to the economic crisis.	- - Reduction in emissions despite economic growth.

	- - Per capita emissions are double those of Sweden.	- - Per capita emissions are half those of Finland.

Source: Author's own based on (Gronow *et al.,* 2019)

Compared to the United States (and also Australia), Sweden and Finland's environmental policies were not affected by fossil fuel producers because of their reliance on imports, as shown in Table 5. These countries imported their fossil fuel from different countries around the world.

Table 5. Sweden and Finland's major fossil fuel import sources

Imports	Crude oil	Natural gas	Coal
Sweden	42% from Russia	100% from Denmark	54% from Australia
Finland	88% from Russia	100% from Russia	64% from Russia

Source: Author's own

Sweden set itself up as a leader in mitigating GHG emissions. Swedish non-government organisations greatly influenced climate policymaking by promoting a plan in 2017 seeking zero emissions in 2045 (Gronow *et al.,* 2019). However, Sweden has faced challenges in implementing, monitoring, and evaluating climate policies due to the absence of rigid legal frameworks.

It issued a Climate Change Act (CCA) in 2017 that organised the application of climate policies and ensured that environmental targets were met. In the absence of penalties imposed on reluctant emitters, "climate policy integration" was also elaborated to evaluate the effectiveness of the Climate Change Act in successfully integrating climate change policies, reaching its targets, evaluating its outcomes, and incorporating environmental concerns as the basis of policy sectors. The presence of a climate policy framework enforced the implementation, monitoring and evaluation of climate policies and ensured that goals were reached (Matti *et al.,* 2021).

Finland was forced to apply the Kyoto Agreement and the EU strategy while prioritising its economy and granting tax exemptions to high-emitting industries, with business organisations having greater access to policymaking than non-government organisations.

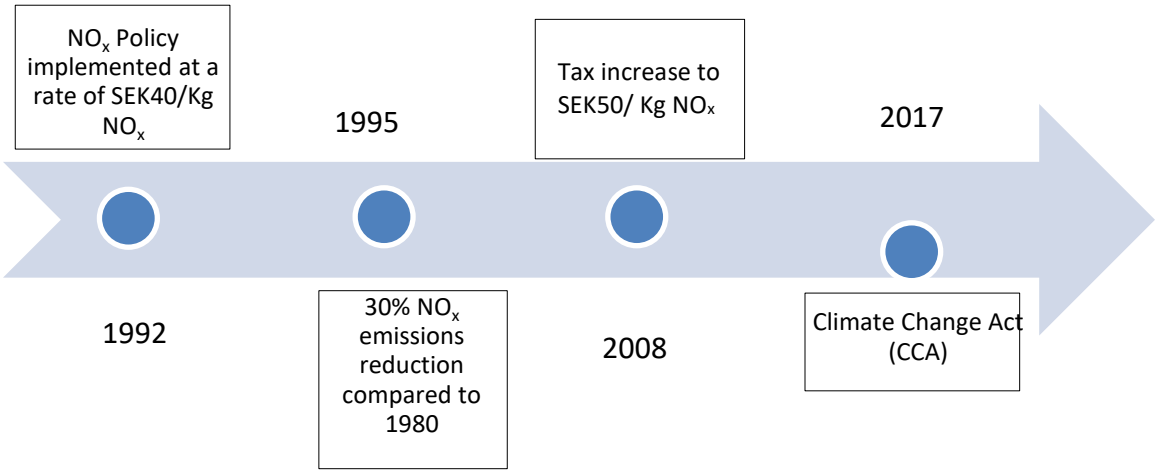
The Swedish Nitrogen Oxide Emissions policy

Sweden took early action to reduce nitrogen oxide (NOx) emissions, a component of acid rain that causes soil acidification and smog pollution (OECD, 2013). The NOx emissions policy, comprising non-tradable permits, was implemented in 1992 (Figure 11) (OECD, 2013; Tietenberg and Lewis, 2018). The aim was to reduce emissions by 30 per cent in 1995 compared to 1980.

The tracking process of NOx emissions is complex and expensive due to how NOx is formed; therefore, a high tax was required. A tax of SEK 40/Kg of NOx, equivalent to $US 6000/tonne of NOx emissions, was imposed in 1992 on prominent firms in the energy sector and was then increased to SEK 50/Kg NOx in 2008. Small firms, unable to bear the high tax burden, were exempted. When the effectiveness of the tax was proven, and the costs involved decreased, it covered all stationery combustion firms in Sweden. Revenues generated from this tax were then recycled as incentives to firms involved in the scheme and distributed according to their contribution to renewable energy production (OECD, 2013; Tietenberg and Lewis, 2018). A monitoring unit was also established to continuously assess NOx emissions.

As expected, a considerable reduction in nitrous oxide emissions of 23 per cent from all sources was recorded between 1992 and 2000. While the transport sector was excluded from the policy, emissions

Figure 11. The Swedish NO_x policy



Source: Author's own

from this sector were reduced by 13 per cent between 1980 and 1997, compared to a 50 per cent emissions reduction from stationery plants (OECD, 2013). It is also important to mention that the massive reduction in nitrogen oxide emissions resulted from the NOx tax and complementary approaches adopted by Swedish emitters to reduce different pollutant levels, including NOx (OECD, 2013).

Finally, the cost-effectiveness of this tax policy was due to the refund of the tax revenue to the taxpayers, helping to mitigate the opposition of the firms involved. The success of the program in a small open economy was also facilitated by:

- the adoption of technology innovation by firms, enabling the monitoring of emissions;
- the use of innovation enhancing emissions reduction; and
- many emission-efficient firms adopting this policy and thus being able to reduce their emissions year after year for the same level of Energy produced.

Comparison of the Swedish experience with other OECD

Norway, Denmark, France, Italy, and Spain implemented NOx policies but failed to reduce their NOx emissions effectively. However, they faced strong opposition from interest groups due to the absence of a refund scheme. They also had low emissions reduction outcomes due to low tax rates and a lack of emissions monitoring (OECD, 2013).

The Finnish approach to climate policy

In contrast with Sweden, Finland prioritised its economic growth over its environmental status when it was shown that climate change might have a positive impact on agricultural productivity and the forest

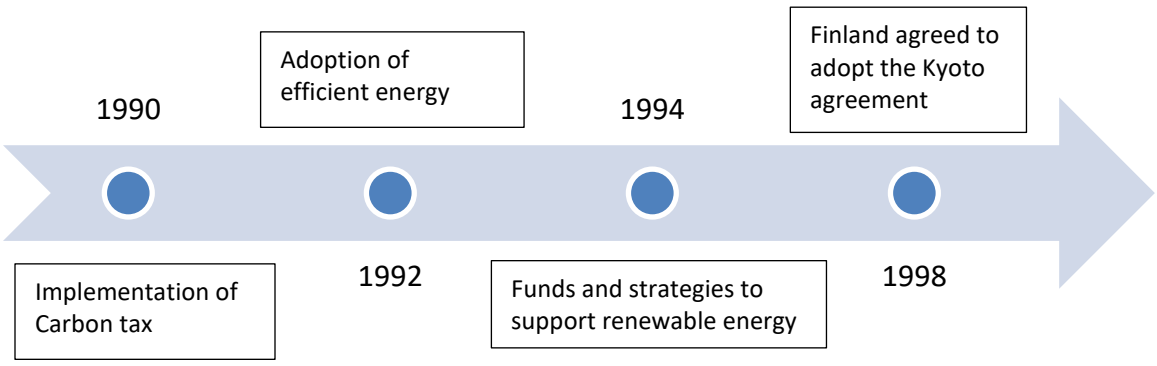
sector. However, when other interest groups raised their voice against the negative impact of climate change at the national level, they pushed toward an environmental strategy (Wilenius and Tirkkonen, 1998).

In 1990, Finland implemented the first carbon tax and supported low-emissions technologies to reduce pollution (

Figure 1). The scheme was based on carbon sequestration by forests. In 1994, the Government granted funds to support the switch from energy sector and fossil fuels to smart technologies and the use of renewable energy.

In 1998, the Finnish climate policy context shifted from a loose policy set by the Framework Convention on Climate Change to a serious commitment to the Kyoto agreement within the European Union bubble.

Figure 1. The Finnish approach to climate policy



Source: Author's own

Climate Policy in Japan

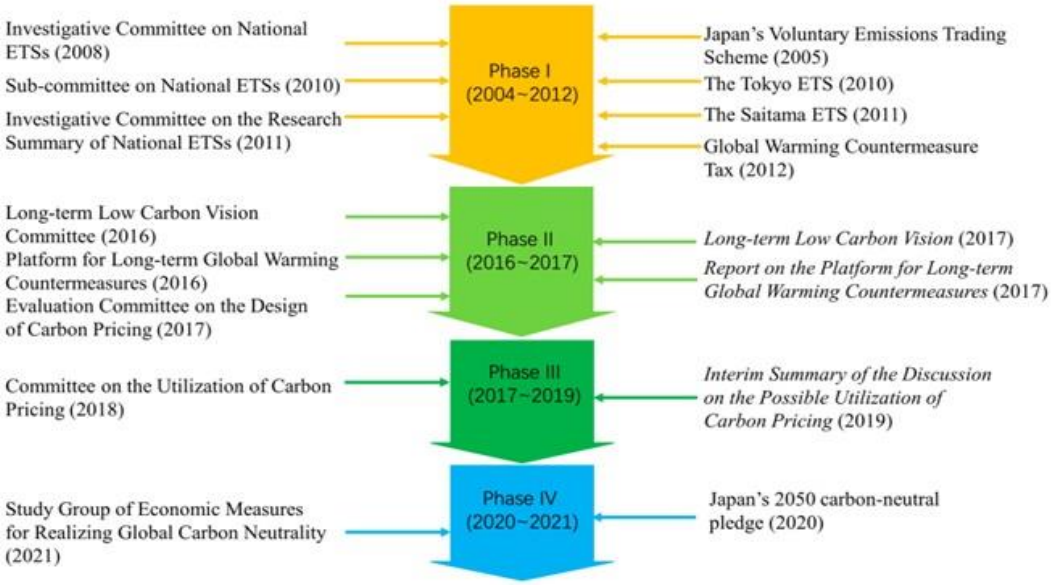
In April 2021, Japan committed to reducing greenhouse gas emissions by 46 per cent from 2013 levels (METI, 2022). However, Japan's contribution to greenhouse gas emissions reduction has been insignificant so far due to the presence of the "iron triangle," which refers to the strong bond between the Ministry of International Trade, the industry bodies, and the political parties (Kameyama, 2021).

The climate policy in Japan has undergone four stages since 2004 (Figure 2). The first ETS was implemented in 2008 and then rejected in 2010 due to industrial groups' opposition. The Global Warming Countermeasure Tax was implemented in 2012. Initially, the carbon price was set at a low level, below the efficient required rate that enables Japan to reach carbon neutrality by 2050 (Li, 2023). In following years, committees were created to negotiate and adjust the carbon pricing policies. The Ministry of International Trade opposed carbon pricing adjustment claiming that it negatively impacts international trade.

In 2020, the Japanese Government announced its commitment to reach carbon neutrality by 2050. This step was supported by both the Ministry of International Trade and the Ministry of Environment. It was considered an advantage to international competitiveness.

From 2022 onward, discussions about carbon credits trading to be implemented in the energy sector arose. But the conflicts remained as this initiative was supported by the Ministry of International Trade and opposed by the MOE. Discussions remained open to find a climate strategy that enables Japan to achieve its Zero-carbon target (USDA, 2021; Li, 2023).

Figure 2. Timeline of Japan's climate policy from 2004 up to 2021

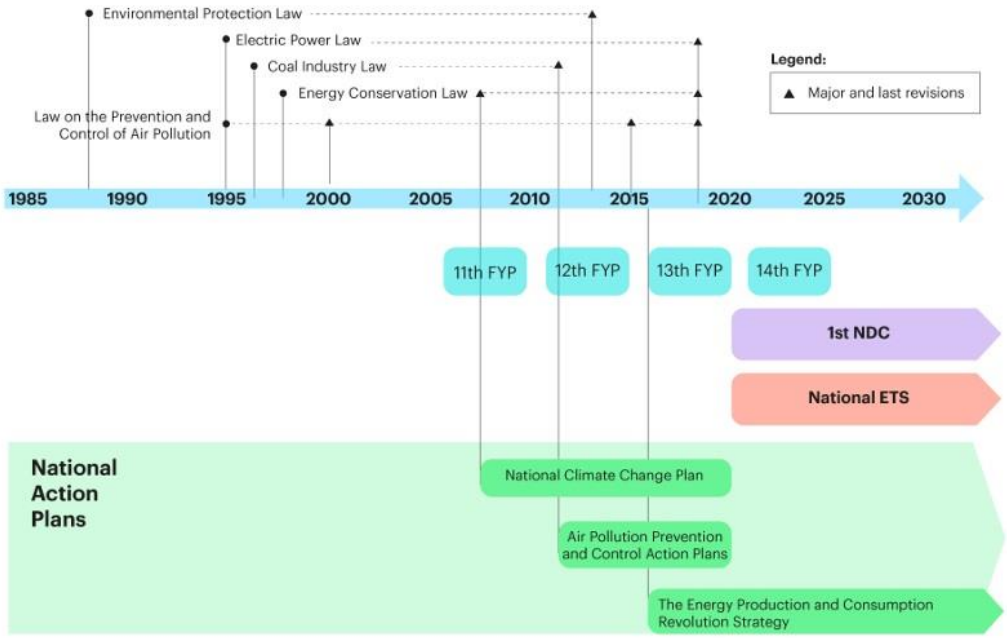


Source: (Li, 2023)

The ETS in China

The first climate acts started in China with the first environmental law introduced in 1989, as represented in Figure 3. Many schemes, laws and policies were implemented afterward.

Figure 3. Timeline of climate actions in China from 1985 up to 2030



Source: (International Energy Agency, 2020)

A five-year plan was set, comprising laws and action plans, to be implemented from 1996 to 2000 on the national and local levels. In the 11th five-year plan that defined actions for the years 2006 up to 2010, the climate change issue was raised (Figure 3). It focused on the shift to renewable energy.

Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong, and Shenzhen cities covered the electricity and power sector in their pilot ETS in 2013, in the absence of a national climate policy. Nevertheless, due to strict Chinese Government regulations, the schemes have not included consumer incentives. Therefore, the absence of incentives made the schemes unstable (Pang and Duan, 2016).

The subsequent plans, after 2010, targeted carbon emissions strategies more comprehensively. They also focused even more on converting from high-emission energy to energy-efficient industries while supporting innovative technologies (International Energy Agency, 2020).

In 2017, China released the Energy Production and Consumption Revolution Strategy, drawing China's emissions pathway to 2030. It planned to reduce coal usage and set a cap on emissions from coal-fired industries.

In 2021, China implemented its ETS covering the coal-fired power sector. The scheme was also planned to cover seven additional high-emission sectors including, but not limited to, steel, iron, and aluminium, in coming years (International Energy Agency, 2020; Climate Action Tracker, 2023).

China's pilot ETS

Beijing's scheme was the largest among all pilot ETS in China due to the city having the highest number of participants. An independent monitoring, reporting, and verification process was conducted every three years to control carbon emissions. Allowances were therefore allocated to each firm according to its emissions record (Liu *et al.,* 2022).

The Shanghai scheme had a penalty strategy besides the independent monitoring, reporting and verification process. The penalty policy made the Shanghai pilot ETS one of the most efficient in China (Liu *et al.,* 2022).

The Hubei pilot ETS provided economic stability in the province due to adequate cap-and-trade in the market. Guangdong Province and Shenzhen have adopted an ETS with 5 per cent auctioned allowances and revenues returned to participants as incentives. This scheme design attracted a large number of companies.

All these pilot ETS schemes set a roadmap for China's national ETS. Based on carbon emission trading, the successful experience of the monitoring, reporting and verification process, and the transition of high-emission industries to climate-smart businesses, China developed its first national ETS.

China's national ETS

The context for this was that the transition to clean Energy had to be faster due to the Chinese economy's reliance on coal production. This is the main point of difference with developed countries: shifting to low-emission industries will impact China's economic growth, which has acted as a barrier to implementation of the national ETS (International Energy Agency, 2020).
At the beginning of the ETS implementation covering the power sector, China allocated 95 per cent of free allowances, and only the remaining share was auctioned to involve a high number of participants and keep the scheme's impact on economic growth at a low level. However, if tax revenues were returned to firms, more firms would participate in the scheme and lower their emissions (Liu *et al.,* 2022). At the same time, China has planned awareness programs for industries and households about carbon markets to encourage the scheme's adoption and facilitate the transition to a low carbon emission phase.

Based on the ETS pilot experience, China has also set a monitoring, reporting and verification process for its national ETS. However, the national ETS did not include a penalty strategy for businesses that emit above the allowed level, as imposed in the Shanghai pilot ETS (Liu *et al.,* 2022).

China has not signed the methane and coal pledges or any other greenhouse gas emission agreement, except for the carbon emissions policy. It has yet to commit to coal, oil, and gas phase-out and 100 per cent transition to green energy (International Energy Agency, 2020).

Summary of the Policies in the Different Countries

An evaluation of the climate policies discussed in this paper is summarised in Table 6. The overall rating of each ETS was adapted from the climate action tracker (Climate Action Tracker, 2022).

Table 6. Outline of carbon tax policies in the studied countries

Country	Implementation date	Tax rate ($US)	Revenue distribution	Overall rating

EU ETS	2005	Euro 10/ton	Directed to government budget	Acceptable
NZ ETS	2008	NZ$ 25/ ton CO_2	Directed to NZU banking (government)	Acceptable
Finland	1990	$30/metric ton CO_2	Directed to government budget	Acceptable
Sweden	1991	$44.37/metric ton CO_2 (1996)	Directed to government budget	Acceptable
USA, California	2008	$0.045/metric ton CO_2 equivalent	Fund environmental schemes	Average
Japan	2012	$2.65/ ton		Poor
China	2021	5% allowances auctioned	low revenues	Poor
Australia	2012	$23/ ton	government budget + Fund environmental schemes	Poor

Acccording to Climate Action Tracker, China, Japan and Australia's emissions reduction performances still need improvement, and further steps are required to reach their net zero emissions target by 2050.

Recent Australian Approaches to Climate Policy

In recent times, Australia has developed multiple strategies to reduce its emissions. In 2022, the Australian Government declared its net zero 2050 plan in its annual Climate Statement to Parliament and, in mid 2023, specified that, to meet its international commitments it would reduce emissions by 43 per cent in 2030 compared to 2005 and reach zero emissions by 2050 (Department of Climate Change, Energy, the Environment and Water, 2023a).

The net-zero 2050 plan included the electricity and energy sectors, industry, resources, transport, environment, land, and agriculture (Department of Climate Change, Energy, the Environment and Water, 2023c). The Australian Government developed programs to reduce emissions from these six sectors by incentivising the use of renewable energy, subsidising the prices of electric cars, and supporting all sectors to reduce emissions through adopting low-emissions technologies and monitoring emissions.

Emission Reduction Fund

The Carbon Credits Act developed the Emission Reduction Fund (ERF) in 2015, after the Carbon Farming Initiative was developed in 2011. This scheme provided Australian Carbon Credit Units (ACCUs) to projects reducing their carbon emissions beyond the business-as-usual levels. The ACCUs could then be traded, constituting financial incentives for individuals and firms and encouraging them to enter the scheme (Department of Climate Change, 2022).

As shown in Figure 4, there was a significant increase in projects registered in 2022 compared to previous years, especially in the soil carbon projects. Similarly in

Figure 5, a fourfold increase was recorded in carbon credits traded in Q2 2022 compared to Q2 of the previous financial year, with 5.5 million ACCUs transacted in 2022 (Jennifer, 2022).

Climate Active program

This carbon accreditation scheme is supported by the Australian Government. It issues Climate Active certifications to firms that have achieved carbon-neutrality, thus Australian consumers play a significant role in achieving climate targets by supporting certified businesses.

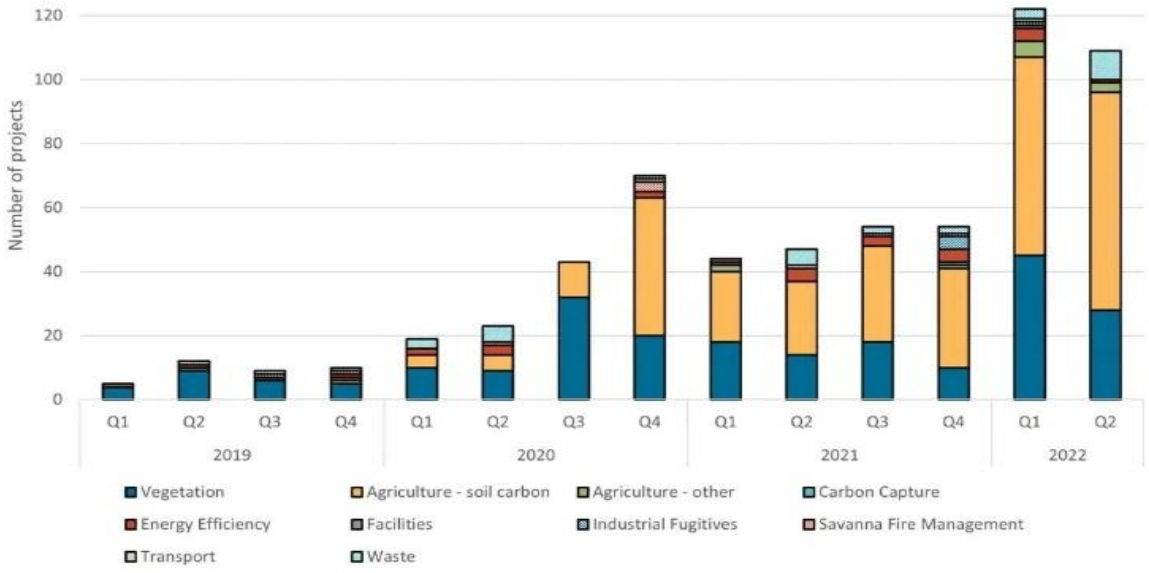
As shown in Figure 17, the certification process for a business includes several steps. Businesses and organisations have to calculate their emissions, take actions to reduce them, buy carbon credits for the remaining emissions to reach carbon neutrality, and report their annual emissions (Climate Active, 2019).

Renewable Energy Target (RET) scheme

The RET scheme offers financial incentives to encourage emissions reduction from the electricity sector (Australian Office of Financial Management, 2022; Department of Climate Change, 2022). It includes:

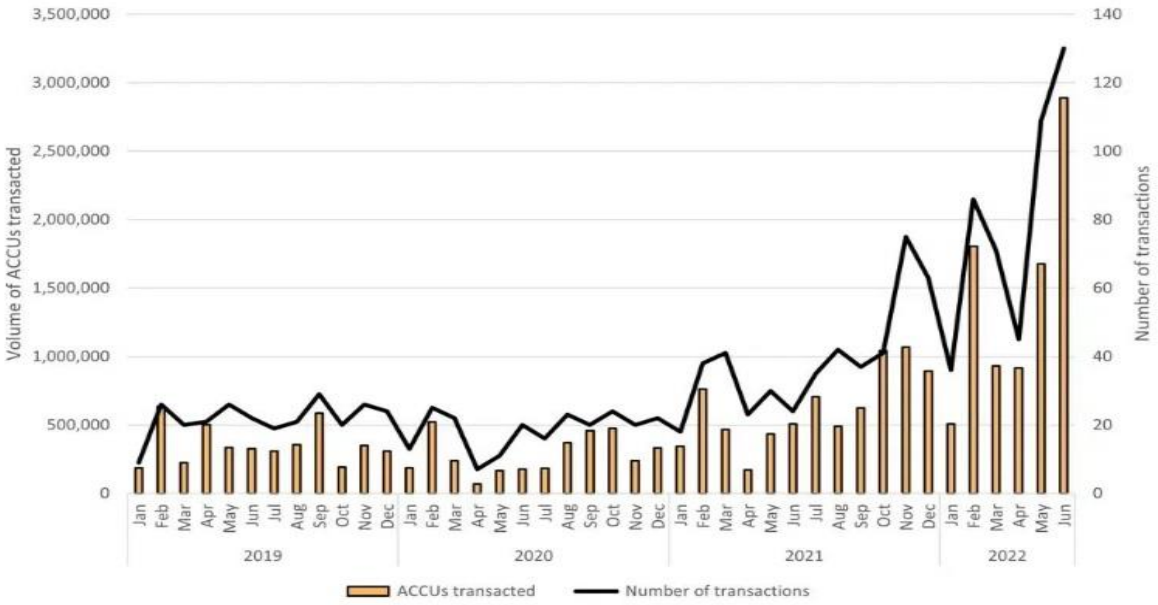
- The Large-scale Renewable Energy Target (LRET) and
- The Small-scale Renewable Energy Scheme (SRES)

Figure 4. ERF projects registered between 2019 and Q2 of 2022



Source: (Jennifer, 2022)

Figure 5. Volume of ACCUs traded between 20019 and 2022



Source: (Jennifer, 2022)

Figure 17. Climate Active certification process

Source: (Climate Active, 2019)

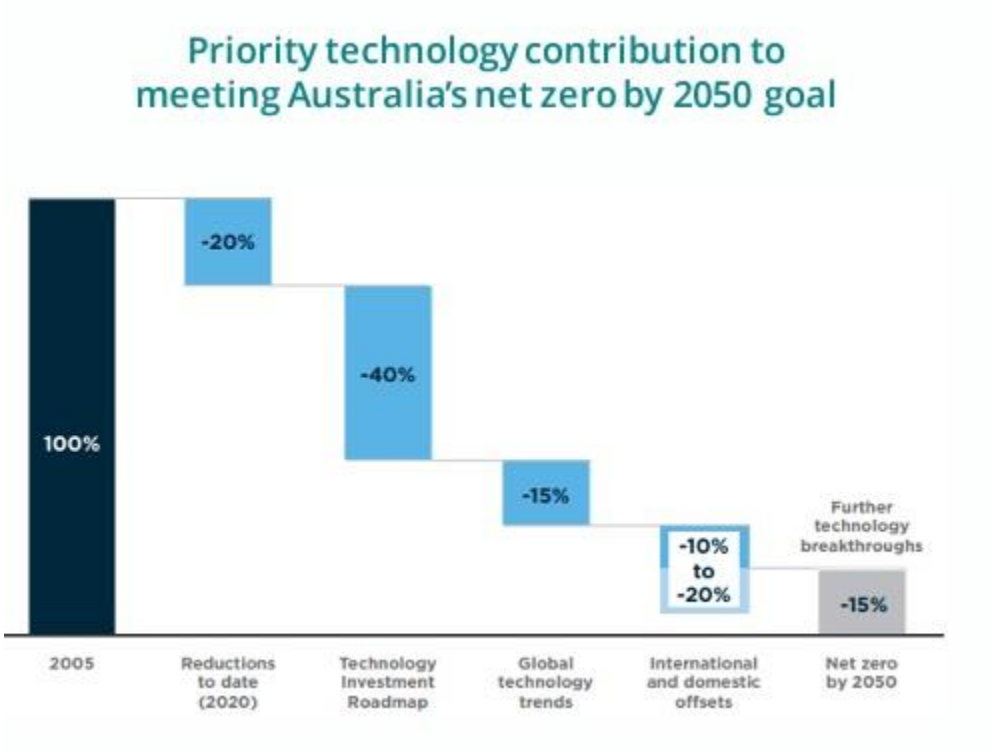
Discussion: Climate Policy for Australia

In the Australian Economy

Australia's government aims to achieve its net-zero worldwide commitment by 2050 and is relying on the role of priority technologies in reducing emissions (Figure 18). It also recognises the need for additional innovative technologies to achieve its target by 2050 (Australian Office of Financial Management, 2022). Therefore, within its National Determined Contribution review in 2021, Australia included several funded plans to support the development of low-emissions technologies.

As of January 2022, Australia's emissions were forecast to decrease to 26 per cent below 2005 levels by 2030. This forecast puts Australia in a better position for meeting climate targets than many other developed countries. Incentives offered by the Australian Government to support the development of the renewable energy sector have reduced emissions from the energy sector, which was the primary source of emissions in Australia. The rate of use of renewable energy was also forecast to increase by 30 per cent above 2020 levels by 2030 (Australian Office of Financial Management, 2022).

Figure 18. Priority technology's role in reducing emissions



Source: (Australian Office of Financial Management, 2022)

In the Agricultural Sector: History

The current climate strategies have created new sources of revenue for Australian farmers. Some landowners, supported by governmental and non-governmental organisations such as the MLA and the CSIRO, have turned from usual farming businesses to natural capital businesses. These new businesses afforded significant incomes to landholders and attracted local and international high-emitter firms to invest in the environment to offset their emissions. However, environmental groups criticised the scheme for granting ACCUs to big emitters, such as coal and energy companies, to pollute more instead of conferring them on projects leading to emissions reduction.

The Government reviewed the strategy and issued an ACCU review paper in August 2023 to respond to the criticism and doubts about the strategy's efficiency. It was proposed that the Government prepare legislation allowing all ACCU-related activities to be available for public scrutiny. It also proposed giving the Government the right to purchase ACCUs from a department unrelated to the Carbon Emissions Reduction Department to avoid conflicts of interest (Department of Climate Change, Energy, the Environment and Water, 2023b).

In some parts of Australia, particularly in northern Australia, carbon farming may be contributing to increased land prices where carbon storage projects are executed. With the increase in global pressure to reduce emissions and mitigate climate change, environmental market investments are becoming a part of the scene. For example, the Queensland Investment Corporation (QIC), the investment manager of the Queensland Government's Land Restoration Fund, invested in the most significant pastoral land of Stuart's Creek, delivering tremendous natural capital outcomes (Carbon Market Institute, 2021).

Agricultural land, with carbon farming potential in addition to agricultural opportunities, is often touted as the future of agriculture due to the diversity of ecosystems in Australia. Natural capital investments could have a role in offsetting emissions from large gas and coal companies in Australia. At the same time, these firms continue their contribution to national economic growth. However, more studies must be done around natural capital assets as a path to achieve emissions reduction and biodiversity protection. Small landholders must gain the expertise, and be able to afford the funds required, to invest in innovative technologies to sequester carbon efficiently. There could be some opportunities for some farmers to enter environmental markets in the long run if the costs involved go down and the Government:

- issues legislations and policies that make it easier to access ACCUs; and
- issues certifications that recognise landowners' efforts in the carbon market and grant them revenues, such as the Australian Biodiversity Certificates scheme proposed by the Australian Government in August 2022 (Department of Climate Change, Energy, the Environment and Water, 2024).

Over a decade ago, based on a historical review of Australia's climate strategies, Garnaut (2011) outlined the importance of including the agricultural sector in climate mitigation strategies to:

- help Australia reach its international climate commitments by reducing and offsetting carbon emissions from different sectors and
- let the agricultural sector benefit from incentives offered in return for carbon sequestration capacity.

Those arguments remain valid today, but the current policies and incentives are arguably insufficient to encourage farmers to invest in innovative technologies and collaborate with supply chain stakeholders to deliver sustainable outcomes (KPMG, 2019). However, financial costs are usually the main barrier to farmers' adoption of new technologies and carbon farming programs, especially for small and medium landowners (Fleming *et al.*, 2019).

Conclusion

Freebairn (2009) explained the market and social solutions for pollution reduction and argued that a government can choose one or a combination of environmental regulation approaches to reduce pollution emissions. The costs of applying the intervention are then mainly transferred to consumers.

Different ways that climate policies have been designed and applied in different countries have been explored in this paper. The aim was to find lessons for Australia to achieve its global commitment to reaching net zero emissions by 2050.

One of the critical results shown in this paper was that command-and-control abatement strategies encourage the development of innovations but offer low incentives to continue reducing emissions once the level set by the policy is reached. In contrast, market-based policies are most efficient. To achieve implementation, however, a combination of approaches to generate emissions reduction is usually required.

Another general finding was that these schemes must be routinely monitored, evaluated and improved over time as circumstances change. For example, Europe implemented an ETS in 2005 and improved it through the years to include a CPF and cancellation of excess allocations to reduce market distortions.

Regarding lessons from specific countries, the ETSs implemented in the United States were in regional areas or for specific industries. The RGGI was first implemented in 2009 to reduce carbon emissions from the power sector. Revenues were returned to firms to encourage the development of low-emissions technologies and consumers. It was very effective, reducing 60 per cent of emissions between 2009 and 2021. California has also implemented a cap-and-trade in 2012 on high emitters of pollution emissions. A CPF was then applied to allowances. However, this intervention had a minor impact on emissions reduction due to the simultaneous presence of other carbon pricing policies on the electricity sector and the allocation of low incentives to the industry and transport sector. On the federal level, the carbon schemes implemented since 1990 failed due to opposition by interest groups.

The European Union's ETS needs help to solve climate change. It must be coupled with national policies tailored to each country's situation to reduce emissions effectively. Taking Finland and Sweden as case studies, although each is part of the European Union, and although both countries have similar social and climatic conditions, they have different environmental conditions. Finland prioritised its economic growth over its environmental conditions. Its climate policy was only cost-efficient once linked to the European Union bubble. However, the cost-effectiveness of the Swedish policy was due to the refund of the tax revenue to the taxpayers.

China learned to set an efficient national ETS from the seven pilot schemes implemented in its regional areas. It implemented its national carbon tax in 2021 and issued an MRV to track the emissions reduction process.

The lesson from the New Zealand ETS was from the de-linking experience and the inclusion of the forestry and agricultural sectors in the ETS. The quality and quantity of units supplied from international markets significantly set the emissions price, especially in small domestic markets such as New Zealand. In small markets, the uncapped supply of international units could lead to the volatility of international emissions prices. The large volume of stockpiles in high-emissions sectors would cause a decrease in carbon prices and harm the transition of businesses to a low-carbon-emissions economy, consequently increasing New Zealand's emissions. Forestry is the second distinctive point in the NZ ETS and could be relied on as a source of allowances.

Australia adopted the ERF in 2015, with ACCUs granted to firms for reducing their emissions, which could then be traded. Australia also had a Climate Active Program that issued certifications for carbon-neutral firms and offered funds for the energy sector to adopt environmental strategies that reduce emissions.

Since agriculture is one of the significant polluting sectors in Australia, strategies applied in this sector to reduce emissions can significantly impact the national progress in meeting the Paris Agreement and the Sustainable Development Goals (SDGs).

From the different experiences explored in this paper, countries can be separated into two groups. China, Sweden, France, New Zealand, and Japan have national carbon tax policies similar to those of Germany and Denmark (Ike, 2020). The United States, Canada, and Australia have experienced delays, instability, and setbacks in their domestic climate change policy.

Another lesson for Australia's climate strategy, taken from the European Union ETS, would be that the implementation of a high CPF coupled with a cap-and-trade policy, and the creation of an MSR with the cancellation of allowances, would reduce market instability and encourage the adoption of emission-

reduction approaches by high-emitting firms. High-rate taxes encouraged emitters to lower emissions and provide revenues to fund other schemes. Tax revenues could be reused to fund environmental schemes and reduce other tax distortions (Sumner *et al*., 2011). The Australian climate approach also lacks incentives to encourage polluters to invest in costly technologies and climate strategies, such as refunding revenues in the Swedish Nitrogen Oxide emissions reduction scheme and the RGGI in the United States.

Finally, market-based and regulatory approaches tailored to each country's needs and sector characteristics are needed to reach the global climate target.

A national climate policy has a significant role in achieving net-zero emissions, and tailored approaches to each economic sector are also crucial to reducing interest groups' opposition. Natural capital investments could be one of the cost-efficient approaches that could significantly offset emissions from large gas and coal companies. Investing in natural capital builds soil carbon while reducing carbon emissions from agricultural industries. It offers landowners new opportunities to benefit from a new market and high land prices. Finally, returning revenues to taxpayers and low-income households reduces the policy rejection. Further studies in this emerging natural capital market are required, in addition to certifications and legislation, to monitor and evaluate the outcomes of emissions abatement. More research is needed to develop cheaper, affordable technologies for small and medium landholders.

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