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The Australian Paradox: Politics of an Energy Transition

Lindsay H. Bushing
University of Central Florida

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THE AUSTRALIAN PARADOX:
POLITICS OF AN ENERGY TRANSITION

by

LINDSAY HANNAH BUSHING
B.A. University of Central Florida, 2021

A thesis submitted in fulfillment of the requirements of Honors in the Major
for the degree of Bachelor of Arts
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ABSTRACT

The 1973 oil shock was the first energy crisis modern industrialized economies experienced. The disruption exposed the limitations of energy systems that rely on fossil fuels, creating a demand for experimentation of energy alternatives. In their book, *Renewables: The Politics of a Global Energy Transition*, Michaël Aklin, and Johannes Urpelainen provide a framework to analyze this transitional period for selected countries, as well as the events that provoke the need for change in the form of the 1970s external shocks in oil prices. In this paper, for the first time, Aklin & Urpelainen's framework will be applied to Australia to help explain the "Australian Paradox." The Australian Paradox refers to the misalignment of Australia's climate change policy and exposure to climate change disruption. Though Australia is particularly vulnerable to climate change in several ways, the country is noted among rich industrialized nations for having done very little to promote alternative energies and reduce its carbon footprint. While the oil crises of the 1970s have catalyzed a search for alternative energy sources in some countries, it created a business opportunity for Australia in the form of expanding coal and gas exports, thereby further committing the country to carbon-based energies. I conclude by reflecting on whether other forms of energy shocks could lead Australia into taking a more aggressive approach to climate change in the near future.

DEDICATION

“It is in our hands to make a difference.” – Nelson Mandela

To Mom and Dad, Grandma and Grandpa, and my best friend Alyson,

Thank you for pushing me to always be my best, for unconditional love and support, and for changing my perspective of the world. Because of you, I know I am capable of anything.

To young people around the world,

“Look deep into nature, and then you will understand everything better.” – Albert Einstein
We must appreciate nature and our place within, working to ensure a sustainable and healthy future for us all.

ACKNOWLEDGEMENTS

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CHAPTER 1: THE FRAMEWORK OF ANALYSIS

This examination of Australia is a case study and will utilize the framework of analysis presented in the book *Renewables: The Politics of a Global Energy Transition* by Michaël Aklin and Johannes Urpelainen. Aklin and Urpelainen's framework presents critical social, political, and economic features that characterize an actor's ability to produce a meaningful energy transition. The Australian Paradox refers to the misalignment of Australia's alternative energy policies, their economy, and the environmental wellbeing of their nation. Climate change is found to be the primary pressure on the Australian environment, its effects exacerbating other environmental pressures like bushfires, bleaching of coral reefs, invasive species, land development, and destruction of natural habitats. Despite knowledge of Australia's environmental vulnerability, the government continually supports the fossil fuel industry under the guise of "economic prosperity."

In this case, the framework will, for the first time, be applied to Australia and used to analyze the historical politics of its energy industry. The first feature in the framework is the idea of "stable equilibrium." Stable equilibrium occurs when the collective participation and abidance to the "status quo" ensures an equilibrium for the state. For Australia and several countries around the world, stable equilibrium in terms of economy and energy is reliant on the fossil fuel industry. Under general circumstances, Australia could not survive without fossil fuels, a transition away is viewed as a threat to the state's prosperity and homeostatic nature. To aid the feature of equilibrium, Aklin and Urpelainen introduce the concept of carbon lock-in, first termed by Gregory Unruh in his *Understanding Carbon lock-in* (2000).

Aklin and Urpelainen utilize carbon lock-in to explain why stable equilibrium occurs and its importance in understanding the overall struggle of an energy transition. The energy sectors that support modern industrial economies reflect their deep ties to and dependency on the fossil fuel industry. Fossil fuels share of the energy sector is extremely large in most western industrialized economies and is therefore surrounded by a political, social, and economic infrastructure that supports the industries. This infrastructure helps to ensure that fossil fuel businesses maintain this large share, forcing modern industrial economies to slip into a *carbon lock-in*.

A carbon lock-in arises "through a combination of systematic forces that perpetuate fossil-fuel-based infrastructures despite their known environmental externalities and the apparent existence of cost-neutral, or even cost-effective, remedies" (Unruh 2000). Carbon lock-in makes it extremely difficult for cleaner energy alternatives to emerge and result in a transition away from fossil fuels. The systematic pressure from the outside perpetuates the superiority of fossil fuels to renewable energy alternatives because the industry is central in the modern social, political, and economic fabric of industrial economies.

Traditional energy systems have been around longer allowing them time to accumulate political capital economic favor (Aklin & Urpelainen 2018). The intense political and economic ties sustain the carbon lock-in and, subsequently, the notion of stable equilibrium. Carbon lock-in allows for stable equilibrium to remain intact, while the introduction of energy alternatives can potentially threaten this established equilibrium. If the energy sector begins to transition, steep social, economic, and political ramifications will threaten the equilibrium. Because of this contingency, a society in carbon lock-in cannot survive without the fossil fuel industry.

Disruption to the equilibrium would require lots of time and support to make an effective change, and most stakeholders are unwilling to face uncertainty during transformation if their current system is fruitful. Cross-sections between stakeholders (who would-be citizens, government officials, industry) strengthen the equilibrium. The only chance for alternatives in this system is if the demand for them begins to grow.

The second feature of this framework is the political difficulty of systematic change. While energy alternatives are more diversified in ownership and production, traditional energy systems are incredibly centralized. A few companies within the industry have, over time, accumulated a lot of political capital and clout through their tenure. Ties between the owners of production and those who manage society help strengthen the system against overall change. Even if influential social entrepreneurs sporadically decided that the state desperately needed to escape its carbon lock-in, they would face explosive backlash and resistance to their efforts. There are incumbent interests that draw large profits from the production and use of fossil fuels, and when their interest is opposed by government, political tensions, and pushback rise, sometimes resulting in escalated physical conflict. Breaking a carbon lock-in is not an easy task. Until expectations for fossil fuel production and use by governments, investors, and decision-makers transition, there is minimal opportunity for a systematic overhaul—influential actors have too much stake in the production and utilization of fossil fuels. These features inform the framework and provide the structure to evaluate countries and their energy systems. Because of these features, there is only one factor impact a carbon lock-in—an external shock.

External Shocks

An external shock is a significant, abrupt event that reveals the weakness of the current policy and is not a direct product of a government's policy (Aklin & Urpelainen 2018, p. 48). External shocks do just as they suggest—they shock the system in place and create a social, political, and economic demand for policies that decrease a nation's overall dependence on fossil fuels. Without an external shock, carbon locked-in economies are not conducive to the growth of alternative energy sources. In some circumstances, stakeholders choose to respond to a shock by looking for alternatives and investing in renewables; others do not. In these systems, the growing popularity and transition to alternatives will eventually garner backlash from those in the opposition. In countries that observe progress in their initial transition, the opposition will attempt to politicize renewables, challenging the economic, technical, and social validity of renewable energy. Only an external shock, such as a steep rise in price, as in the 1970's, or a dramatic accident can shake up this self-reinforcing system. The power sector of renewable energy, wind and solar, has made the most progress in total usage on a global scale, but an overall increase in renewables is not entirely indicative of an even distribution across the globe. In 2019, approximately 11 percent of the world's primary energy was produced from renewable sources (Our World in Data 2020). France derives over 70 percent of their energy used in electricity generation from nuclear power (EIA 2016). In Germany, as of 2020 more than 46.5 percent of their power consumption is fed by renewables as well, primarily wind power (Reuters). Countries with higher renewable consumption skew the global renewable growth rate.

The first part of Aklin and Urpelainen's framework focuses on the preamble of an alternative energy transition. However, the secondary portion of the framework deals with the

circumstances once an energy transition begins to occur. As renewable alternatives gain traction, so does their subjectivity to political backlash. Not only is the initial breakthrough of energy transition a difficult feat, but the continued support and growth of the transition is an ongoing battle. In countries that yield initial success in their transition they will ultimately face politicization from the fossil fuel industry and its allies.

Politicization and social pushback are the next component in Aklin and Urpelainen's framework. The outlook and political strength of renewable energy alternatives are highly subjected to public opinion, partisan ideology, and the political and economic "clout" of leading industries as decision makers. Because of this subjectivity, many circumstances must be met for a transition to be politically successful and become well-established. A country is only suitable for change if the circumstances allow: "environmentalists, clean technology entrepreneurs, and green parties can only succeed if political institutions give them access, public opinion is favorable, and the alliance of fossil fuel producers and heavy industry is vulnerable to political challenge" ((Aklin & Urpelainen 2018, p. 13). The next goal of a transition is a political-economic lock-in of renewable energy, but this is contingent on multiple other factors.

Politicization and Opposition

The concepts of politicization and public opinion are painstakingly crucial to any chance the energy sector has in making a transition. While external shocks are undoubtedly the essential factor in escaping carbon lock-in and facilitating the search for alternatives, it does not create an immediate threat to the owners of production and political constituencies who reap the benefits of a nation's dependence on fossil fuels. In a circumstance like this, these constituencies do not

believe that wave of experimental and alternative energy systems will threaten the interests of incumbents and critical consumers. While renewable energy may be intriguing to a single-family household, the intrigue is not the same for a car manufacturing plant, and the industry owners understand this concept. In most cases, after an external shock, traditional energy producers are not profoundly concerned.

The initial external shock will create waves of ramifications, but after the initial shock of the event, society moves on, concerns itself with other things, and alternative energy begins to face its secondary challenges. Because the initial difficulties and consequences of the external shock have passed, the funds and support towards renewable energy become questionable to bystanders with other interests and political conflict. Under these circumstances, the political formulation and future of alternative energy lie with its impending politicization. For Aklin and Urpelainen, politicization emerges from opponents and supporters of renewable energy alternatives, comprised of partisan politics/actors, interest groups, and overall public opinion. These variables make up the "political economy," which ultimately determines the long-term consequences of the external shock.

The most important outcome of the political economy within this framework is the disinterest and opposition to energy alternatives. Because this framework focuses on understanding the hurdles alternative energy faces in Australia, politicization is measured and discussed in terms of the opposition rather than the amount of support. This approach will make further sense in the case study when examining Australia's responses to external shocks and attitude towards alternative renewable energies.

Politicization will occur in two stages. The first stage involves a comparison of the price differential between renewable energy sources and traditional ones. When opposition to renewables remains low, the political debate is targeted and specific, focusing on the initial and prolonged cost of implemental policies. When the opposition is high, conflict grows, and the entire foundation of renewable energy policy and its monetary risks are challenged. As time distances itself from the initial shock, renewables grow into the mainstream, and their argument against the continued use of fossil fuels begins to gain credibility.

The traction that renewable systems have gained brings on the second stage of politicization. At this point, advocates for renewable systems believe they have gained enough credibility for renewables to move from the experimental mainstream towards large-scale production and implementation. Support for the movement threatens the stability and equilibrium of the system for the opposition, mobilizing them as well. Opponents search for negative externalities and further call into question the overall rationality of investing in renewable energy. The phenomena of politicization will only occur in a state that initially responded to the external shock with hopes of an energy transition and not in a circumstance where the shock was not felt, or little was done to mitigate the consequences. Ultimately, public opinion, a partisan ideology, is encompassed by politicization and is the motivating factor for subsequent actions taken to politicize the issue.

CHAPTER 2: AUSTRALIA'S PARADOX

Australia's environment is a land of extremes. Natural phenomena like droughts, bushfires, heatwaves, and floods have been a natural part of the environment. These events are normal to Australia; however, their magnitude, frequency and intensity have begun to increase because of global warming and climate change. The Australian Paradox refers to the misalignment of Australia's renewable energy policies, the foundation of their economy, and the environmental wellbeing of their nation. Because of the peculiarities of Australia's overall ecology, climate change is the direct pressure on the Australian environment. Despite knowledge of Australia's environmental vulnerability, the government will not break away from the industry they are "locked-in" to.

An Ecological Look at Australia

Climate Change is the "long-term change in the average weather patterns that have come to define Earth's local, regional, and global climates" (Nasa 2020). Climate change acts on a large scale, impacting several vectors of the Earth's overall natural climate. Global warming is often synonymous with climate change, and while it is a contributing factor to climate change, they are not the same concept. Global warming is the "long-term heating of Earth's climate system, observed since the pre-industrial period due to human activities" (Nasa 2020). Global warming is a variable that pushes forward climate change, but other factors such as pollution, deforestation, and population growth help to push forward the climate agenda. In the case of Australia, both global warming and climate change are of concern. These forces acting together drives ecological transformation and long-term destruction.

Australia is mostly a desert and semi-arid climate, with coasts having a temperate, subtropical climate. The country is relatively isolated in the South-Pacific and experiences low and variable rainfall, meaning the aridity of its climate makes any climatic change more influential to the environment. Most environmental issues result from human modification, manipulation, resource use, and disposal (Hobday & McDonald 2014, p. 1). Human activity has driven drought, deforestation, pollution, population growth and development, and habitat destruction, affecting the ecological health and biodiversity of the environment. Even seemingly menial human behavior such as pesticide use, and irrigation have extreme unintended consequences for the environment. Climate change is of concern because it takes all of the consequences of these environmental issues and compounds them, magnifying their impact and destructive force (Hobday & McDonald 2014, p. 1).

Environmental Consequences of Climate Change

While bushfires are a seasonal occurrence in Australia, the magnitude of its more recent bushfires—2018, 2019, 2020—was extreme, and global warming is a direct instigator of their severity. The National Oceanic and Atmospheric Administration (NOAA) reports that there has been a 2-degree Celsius increase (as of 2020) in the Earth's global average surface temperature since 1880-1900 (Lindsey & Dahlman 2021). While this number may seem insignificant to some, the amount of accumulated heat that is required to increase the global temperature by that margin is staggering. Earth's oceans have an immense heat absorption capacity and act as a regulator for global temperature. For the global temperature to have increased by such a margin in a relatively short amount of time, the accumulated heat produced by human action is of

astronomical proportion. Therefore, the ocean's heat capacity is becoming less capable of regulating the earth's overall temperature, leading to continual and increasingly rapid global temperature rise. The NOAA reports that the average yearly rate of increase since 1981 has been 0.32 degrees Fahrenheit, more than double the statistic from 1880-1980 (0.13 degrees Fahrenheit). Not only has the average rate of increase more than doubled within the last three decades, but 9 of the ten warmest years in recorded history have taken place since 2005 (Lindsey & Dahlman 2021). As of 2020, the NOAA's model projected that the average global surface temperature would be almost a degree (0.9 degrees Fahrenheit) warmer than the average between 1985 and 2005. Not only is the global temperature continually warming, but that rate of its increase is speeding up as well. It is predicted that by 2030, the "thermal inertia" of Earth's oceans will begin to be entirely overcome by residual heat coming from the continuous accumulation of greenhouse gases, promising an additional several degrees increases in average global temperature if left unchecked (Lindsey & Dahlman 2021).

RECENT TEMPERATURE TRENDS (1990-2019)

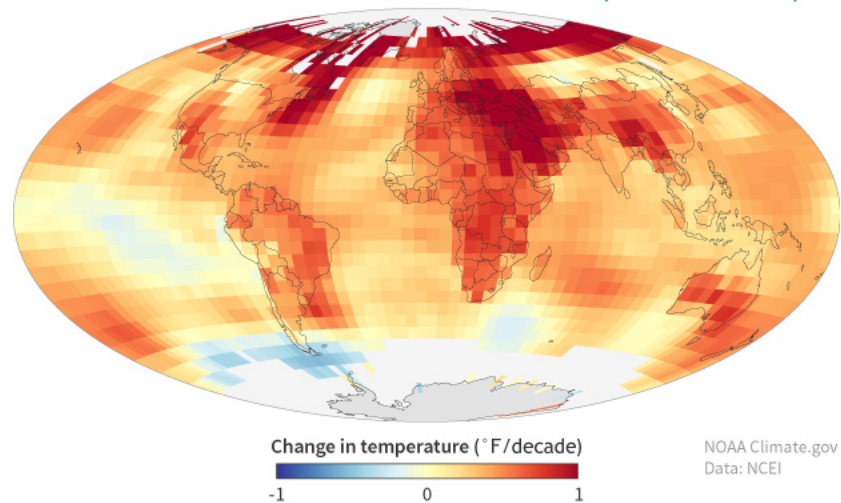


Figure 2.1: *Recent Temperature Trends 1990-2019* (Source: NOAA).

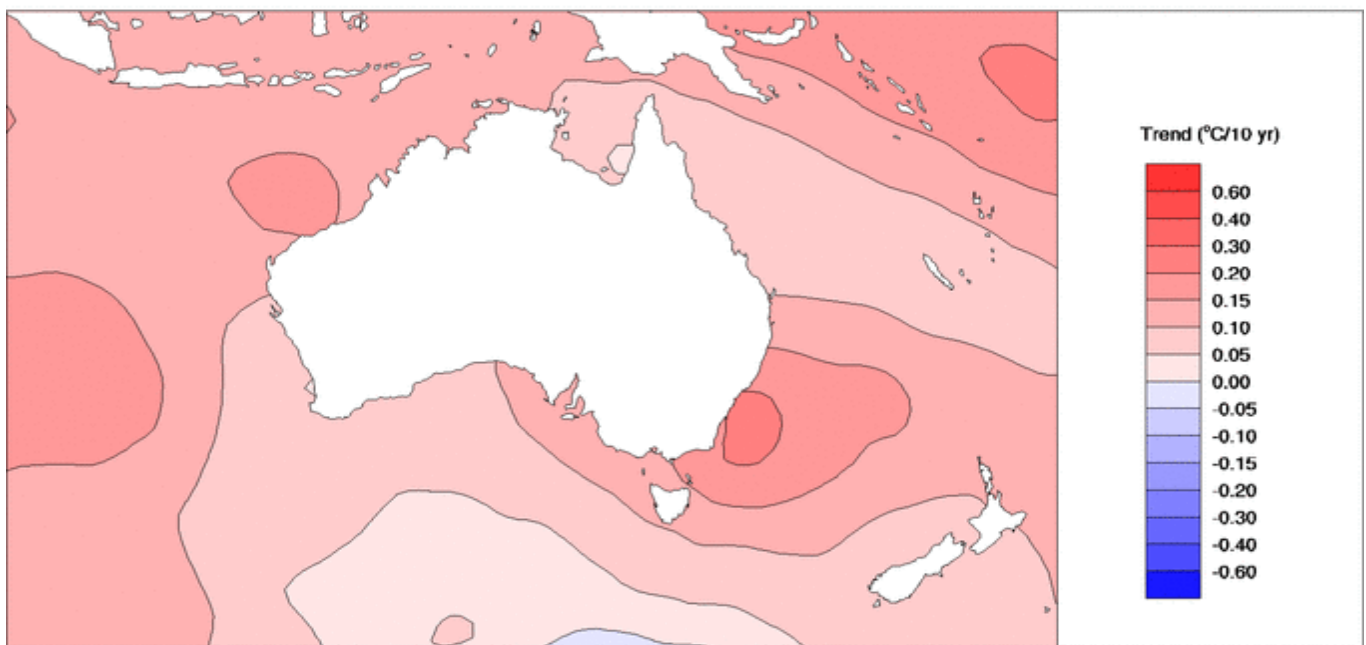
Statistically, warming of the global climate has not been entirely uniform; there is good evidence supporting the idea that more places on earth are warming rather than cooling, and the presence of global warming is very distinguishable in vulnerable areas and hot spots like that of Australia. In 2019, record high temperatures were recorded in Australia, Asia, central Europe, southern Africa, North America, New Zealand, and South America (Lindsey & Dahlman 2021). For Australia and arid climate that on its own (without the effect of global warming) experiences intense drought and bushfire, the effects of global warming on the homeostasis of its environment have been incredibly noticeable. Figure 1.1 above gives a clearer picture of Australia's temperature increase relative to the rest of the world within the past two decades. The darker shades of red and orange represent Australia's southeast coast (New South Wales and Victoria) and the west coast (Western Australia), which experienced the worst 2019-2020 bushfire season.

Drought is a natural element of Australia's climate; however, the dry seasons have become more noticeably extensive since the beginning of 2017. The Australian Government Bureau of Meteorology conducted an analysis stating that "Australia has experienced a prolonged period of below-average rainfall spanning several years" and that the beginning of 2021 has presented "deficiencies that are largely unchanged than the previous 8-month period. Rainfall deficiencies have contracted in southern parts of southeast Queensland and

Northern New South Wales" (2021). In their overall climate change analysis about Australia, the Bureau of Meteorology reported a 16 percent decline in average rainfall from April-October since 1970 and an even steeper 20 percent decrease in the months of May-July (2020). To further solidify the idea of drought, the Bureau reports that Australia's climate has increased in 1 temperature by 1.44 +/- 0.24 degrees Celsius since the early 1900s, outright stating that this has “lead to an increase in the frequency of extreme heat events” (2020). Figure 2.2 represents Australia’s average rise in air and sea temperature over the last century, solidify the idea of global warming's direct impact on the continent's environment.

In Australia, fruitful wet seasons fuel growth, and when the dry, hot summers come around, the vegetation and foliage that was prospering in the wet season becomes

Trend in Australian region sea surface temperatures: annual 1970-2020



© Commonwealth of Australia 2021, Bureau of Meteorology

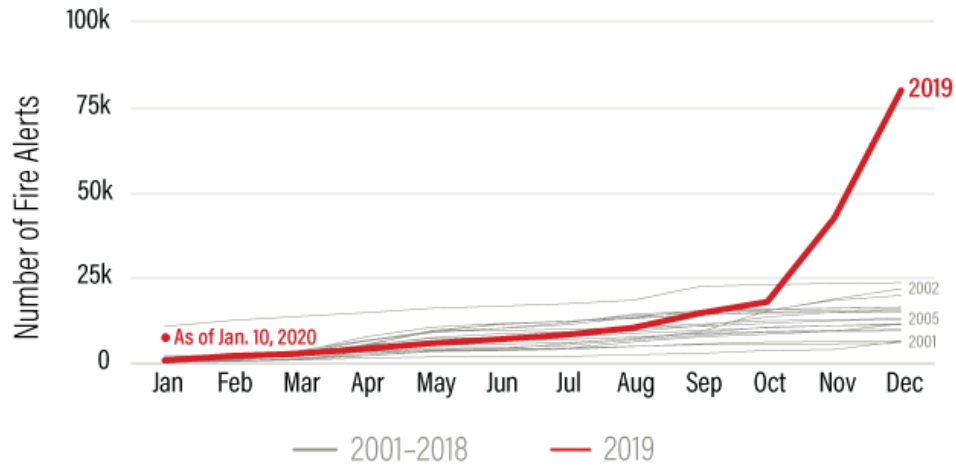
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Figure 2.2: *Trend in Australian Region Sea Surface Temperatures: Annual 1970-2020*. (Source: Australia Government Bureau of Meteorology).

extremely dry, making it an easy fuel to ignite bushfires. In the Australian summer, drought is inevitable. However, it is made increasingly worse due to the rise in average global temperature. The result of drought is immense ignition for bushfires to start. In southeastern Australia, where bushfires are considered to be some of the worst, the region's climate is noticeably affected by global warming and climate change. This once temperate climate is predicted to become increasingly hot and dry, priming the region for extensive fire throughout the increasingly drought-riddled dry season (Bathols, et al., 2007).

Dense areas of dry vegetation are perfect sites for a bushfire to ignite. While bushfires can ignite from a multitude of variables, lightning is often a standard igniter. Cigarette buds or unsupervised/managed-to-burn trash or waste can also result in expansive fires. The unprecedented dryness, heat, and wind Australia experienced in 2019-2020 combined to create perfect conditions, carrying fires over incredible distances (Munroe and Taylor 2020). Figure 2.3 was produced by the World Resources Institute and shows the steep rise in fire alerts in 2019 compared to that of prior years. Figure 2.4 shows the distribution of major fires in the country.

Fire Alerts in New South Wales, Australia 2001 - 2020



Source: Global Forest Watch Fires.
20200109

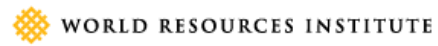


Figure 2.3: *Fire Alerts in New South Wales 2001-2020.* (Source: World Resources Institute 2020).

Major bushfires in Australia

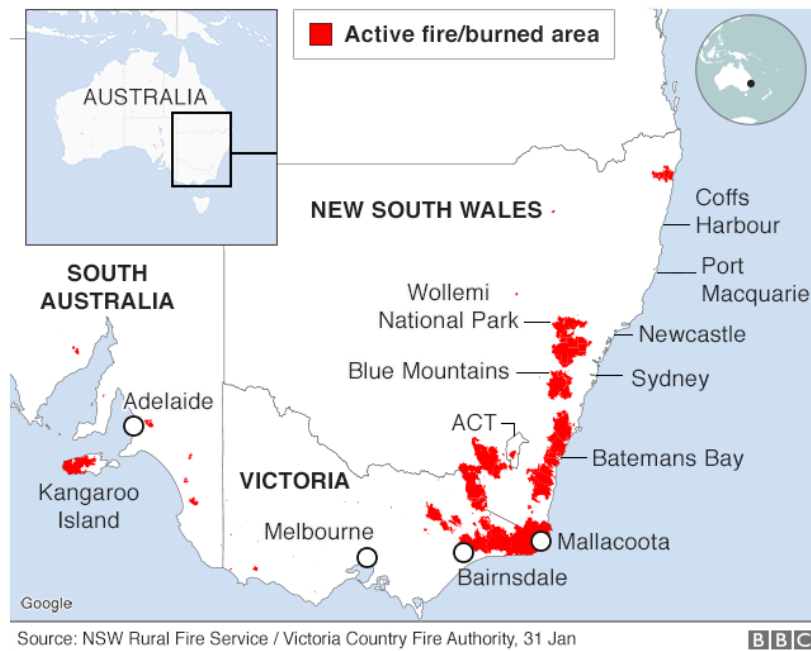
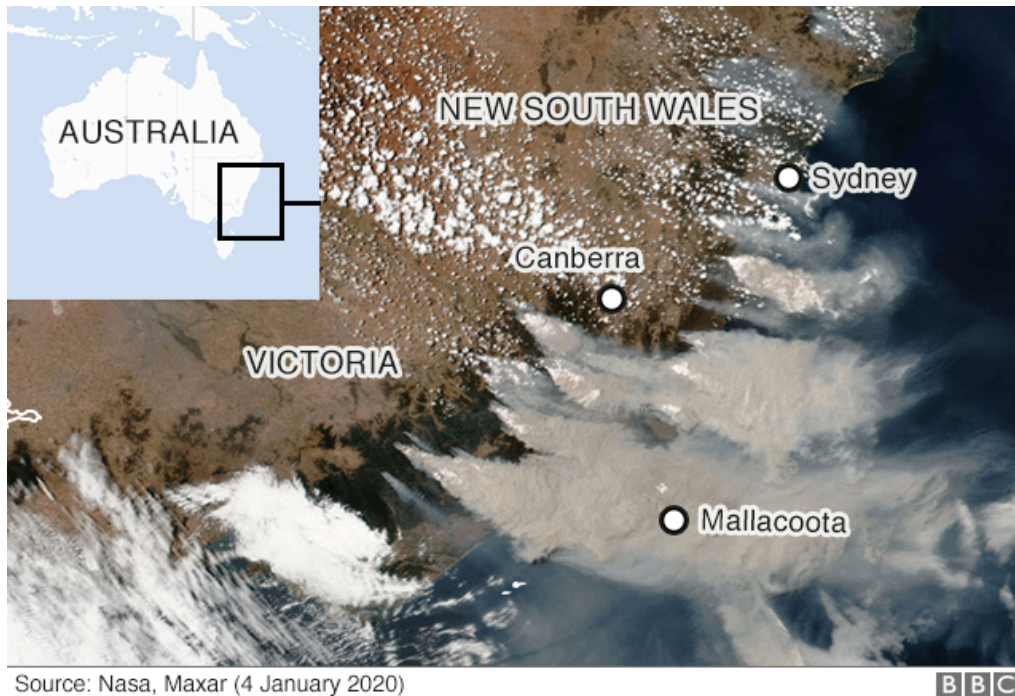


Figure 2.4: *Distribution of Major Bushfires in Australia.* (Source: NSW Rural Fire Service 2020).

BBC News reported that in January of 2020, more than 11 million hectares (27.2 million acres) of Australia had burned. By March of 2020, ABC Science reported a total of 12.6 million hectares had burnt, the numbers still rising (Lyons & Werner 2020). ABC also reported that more than 5.4 million hectares of land had burnt in New South Wales alone. For reference, in an "average" fire season, the typical burn rate of New South Wales is 300,000 hectares—the increase has been astronomical and unprecedented (Lyons & Werner 2020). The fires were massive and covered so much land that between September 2019 and the end of February 2020, more than 434 million tons of carbon dioxide was emitted into the atmosphere.

In comparison, industry in Australia has an average carbon emission of 532 million tons (2018-2019). This means that in 6 months, the bushfires release more than 3/4^{ths} of Australia's industrial carbon emissions for an entire year (Lyons & Werner 2020). Additionally, the World Wildlife Fund predicts that nearly 3 billion animals were either harmed or killed by the bushfires (2020). A loss of this much life can have a disastrous effect on the ecosystem, and its recovery will not be easy. Figure 2.5 is a photograph from Nasa via BBC News, cataloging just how visible the smoke from the extensive fire is within the upper atmosphere. Not only are the fires destructive to Australia's ecology, environment, and biodiversity, but they feed climate change as well with the immense emission of greenhouse gases. Australia is stuck within a negative feedback loop.



Source: Nasa, Maxar (4 January 2020)

Figure 2.5: *Bushfire Smoke Visible from Space*. (Source: BBC News).

While bushfires may be one of the most significant consequences of climate change in Australia, it is certainly not the only one. Another unprecedented ecological consequence presented by climate change is the bleaching of Australia's Great Barrier Reef. Corals are marine invertebrates that live in colonies of identical polyps. Corals have a symbiotic relationship with *Zooxanthellae*, a group of tiny marine algae that live in the corals and give them their color. *Zooxanthellae* are extremely thermally sensitive, meaning they are susceptible to even the slightest change in temperature (ARC Center of Excellence 2021). As change results in an increase in the average global temperature, this also includes the ocean's temperatures. Climate change has increased tropical sea surface temperature by 0.4-0.5 degrees Celsius since the beginning of the 20th century, and over time the *Zooxanthellae* die when the water temperature has changed too much too quickly for them to adapt. When the *Zooxanthellae* die, the coral loses

its color, exposing the transparent coral skeleton beneath. While the coral is not yet dead, if the poor conditions continue to pull away from homeostasis, the coral will eventually die because it cannot survive long-term without the Zooxanthellae. The destruction of coral ecosystems and the environment they provide is dangerous. If reefs begin to bleach completely, fish and other organisms will begin to leave; eventually, the entire ecosystem that the reef provided will be gone.

Coral bleaching weakens the overall infrastructure of the reef's ecosystem; paired with an additional consequence of climate change— ocean acidification—the ecosystem only weakens. Ocean acidification results from the oceans absorbing over 30 percent of excess carbon dioxide produced by humans since the end of the 18th century (Great Barrier Reef Foundation 2020). The excess carbon dioxide the oceans have absorbed has changed the oceans' chemistry, decreasing the homeostatic pH level and making the oceans more acidic. Corals that are already experiencing destruction due to warming water temperature are more vulnerable to the acidification of the water, contributing to bleaching and unhealthy reefs. Poor water quality makes it difficult for young corals sustained growth and development, further limiting the recovery potential of reefs subjected to warmer water temperature (Great Barrier Reef Foundation 2020). Ocean acidification affects many other ecosystems and organisms as well. Organisms do not have time to adapt to the temperature appropriately, and acidity changes in their environment, and the health of species and population numbers represent this.

In the past five years, the Great Barrier Reef has experienced three mass bleaching events, the latest being the largest on record. Terry Hughes of the ARC Center of Excellence for Coral Reef Studies at James Cook University conducted an aerial analysis of the Reef, stating

that bleaching has reached all three sectors of the massive Reef for the first time. The 2016 bleaching killed more than half of coastal corals in the northern sector of the Great Barrier Reef, and the second bleaching event in 2017 solidified these corals' inability to recover. In 2020, the bleaching spread farther south into the central and southern sectors. Hughes found that coastal reefs in all three sectors—stretching over 1,500 miles—have been severely affected by bleaching (Regan 2020). Hughes states that bleaching is occurring much faster than was previously predicted, and climate change resulting from human greenhouse gas emissions is to blame. Figures 2.6 and 2.7 represent the expanse of bleaching and the state of the Great Barrier Reef after the 2016 and 2017 events.



Figure 2.6: *Aerial survey of Great Barrier Reef and distribution of coral bleaching.* (Source: ARC Center of Excellence).

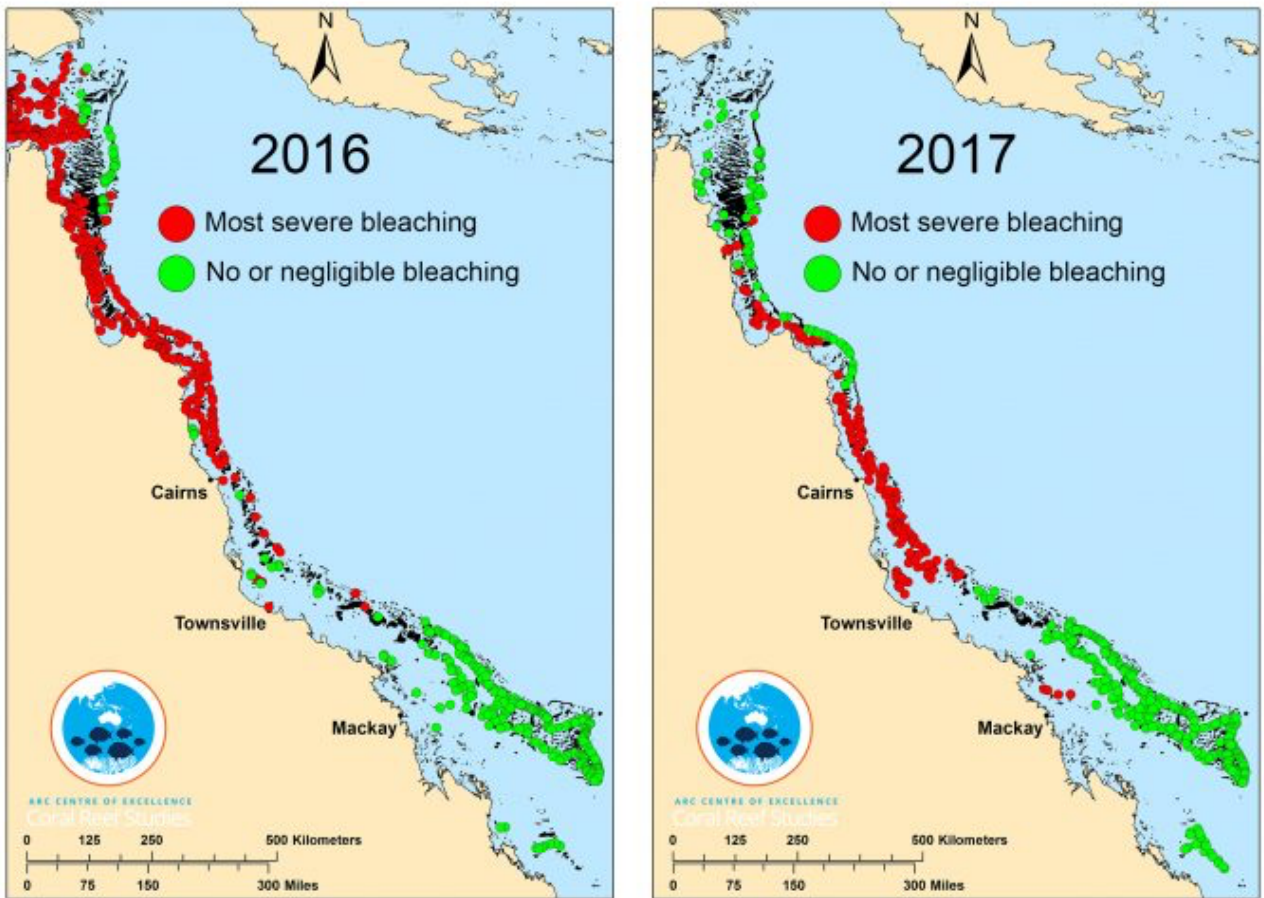


Figure 2.7: *Bleaching events of 2016 and 2017.* (Source: ARC Center of Excellence)

Australia’s environment and weather is naturally extreme, so the effects of climate change on its only enhance its vulnerability and the power of its destructive forces. To make these matters worse, Australia is one of the lowest-performing countries of 57 in the 2020 Climate Change Performance Index (Martin, 2019). The Climate Change Performance Index (CCPI) “evaluates and compares the climate protection performance of 57 countries and the European Union (EU), which collectively account for more than 90 percent of global greenhouse gas emissions” (CCPI 2021). The CCPI’s assessment of a countries performance is based on quantitatively data via the International Energy Agency (IEA), the PRIMAP historical dataset, the

Food and Agriculture Organization (FAO), GHG (greenhouse gases) inventories, and national climate policy frameworks (CCPI 2021). Figure 2.8 below further breaks down the components that go into determining a countries performance.

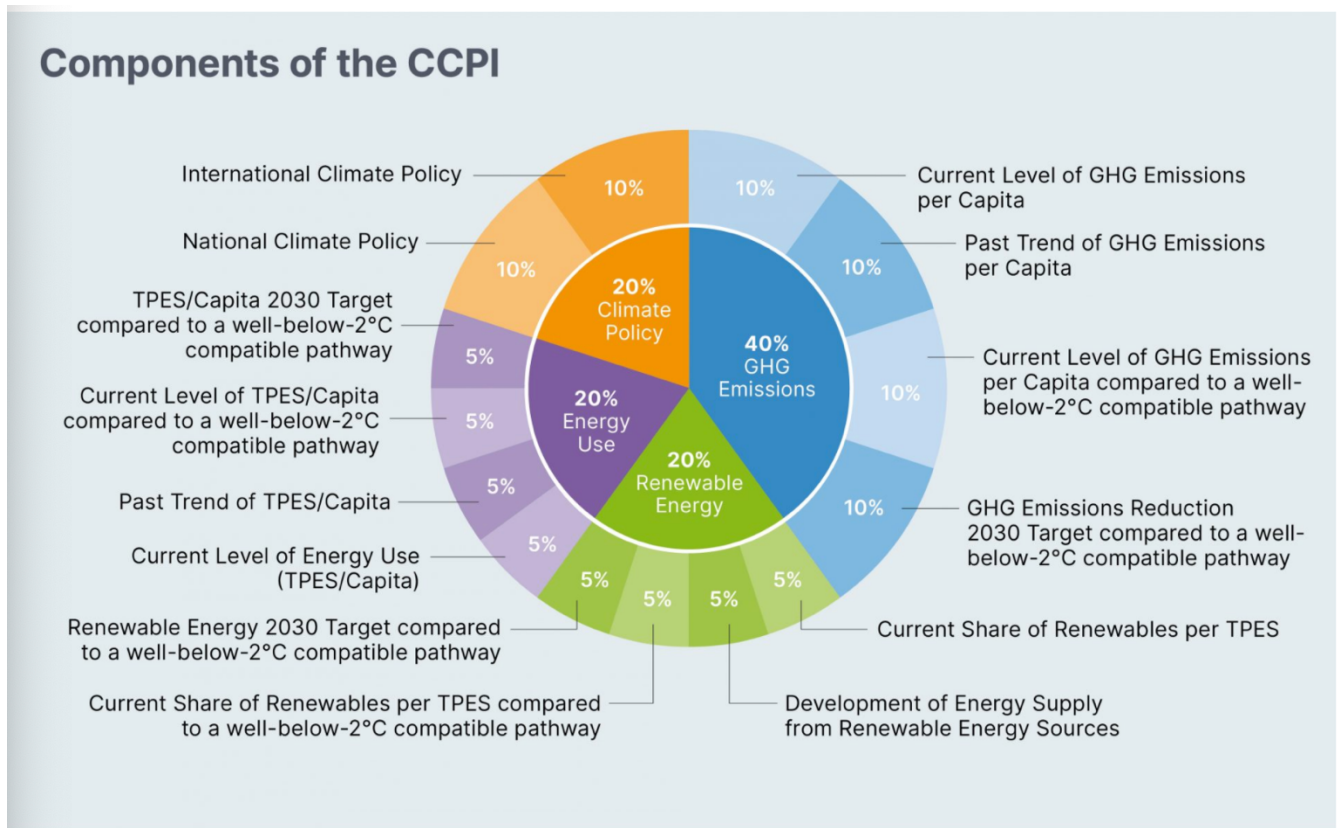


Figure 2.8: *Components of the CCPI*. (Source: Climate Change Performance Index.org)

Australia ranks 54th on the CCPI country scorecard, out of a total of 57 countries. The country earns *very low* ratings in the GHG emissions, energy use, and climate policy, and a *low* rating in terms of renewable energy (CCPI 2021). “Local experts” [sic] also give emphasis to Australia’s lack of climate performances and international climate policy efforts, giving them country a *very low* rating for these factors. Finally, the CCPI report also draws attention to Australia’s *regressive* role on climate change internationally, noting that the country ceased its

contributions to the Green Climate Fund, as well as “*hampering*” the negotiations of the UN Climate Change Conference (COP25) in 2019, ensuring the use of Kyoto carry-overs for the country to achieve its NDC (nationally determined contributions) emission targets (CCPI 2021). It is evident that Australian energy policy reinforces the states' political and economic beliefs rather than heeding the international efforts against climate change. Politicization is an ongoing battle for climate activists in Australia, and the government continually lends its support to unsustainable energy.

CHAPTER 3: HISTORY OF FOSSIL FUELS

Fossil fuels have been the dominant source of energy production for the past two-and-a-half centuries. Fossil-fuel-driven energy systems got their jump-start from commodification of coal. The invention of the coal-driven, steam-powered engine by James Watts made the industrial revolution possible. Replacing water as a power source, the steam engine was now more efficient and productive, growing in manufacturing and production and leading to factories and more effective mass production (Kool 2020). Coal worked its way into people's homes, becoming a much more powerful heating alternative to traditional burning wood because of its energy potential. In the later 1880's, coal also fueled the newly discovered electricity around the world. Today coal comprises 27 percent of total energy consumption around the world (Rapier 2020)

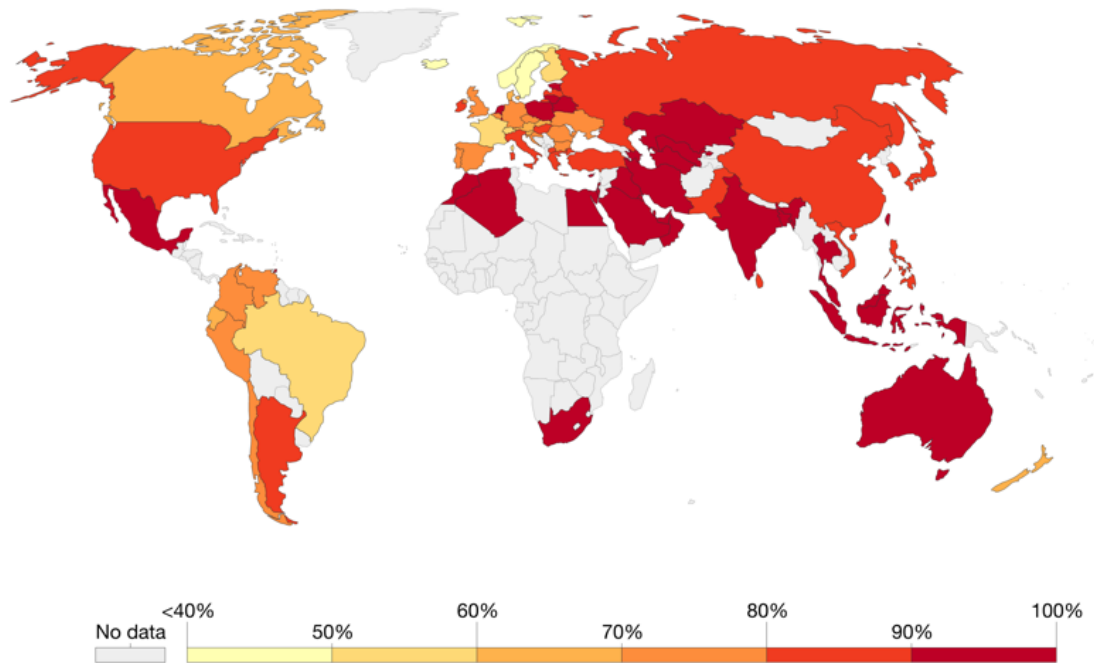
The Industrial Revolution saw the development of coal as an energy producer, but oil and petroleum developed as well. The first commercial oil well was dug in 1859. Before this, oil was most used in kerosene for lighting. Kerosene lamps spread in popularity, creating somewhat of an "oil rush," contributing to the commercialization of oil wells and rigs. What drastically changed the oil industry and solidified it as a powerful tool in energy production was the advent of the internal combustion engine and subsequent Ford Model T (Union of Concerned Scientists 2006). Henry Ford's Model T ran on gasoline and was widely available due to the growing phenomena of mass production, creating intense demand for its energy source: gasoline, a fuel derived from crude oil. Today, oil is the most intensely used energy source, comprising about 32 percent of all energy consumption, much of that due to the transportation industry (Rapier 2020). For about a century, the oil price remained staggeringly low; it was no more than \$10 USD for a

barrel at points. These low prices enabled industrialized countries to develop an intense dependency on oil for everything—it was seen as an infinite resource worth the investment. When the oil shock of 1973 occurred, industrial economies that relied on the stability of the oil market came to a crashing reality (Aklin & Urpelainen 2018, p. 92).

Natural gas is the final popular nonrenewable fossil fuel energy source. Natural gas first become commercialized around the same time as coal and oil (1785). However, it was almost exclusively used in powering light until the end of the 19th century (American Public Gas Association 2020). The invention of the Bunsen Burner in 1885 helped expand the application of natural gas, now capable of being utilized in the heating of homes, cooking, and appliances like water heaters, gas stoves, and boilers. Today natural gas is still widely used by residential and commercial consumers and accounts for 24 percent of all energy consumption in the world (Rapier 2020).

As society and technology continually developed, so did the power of fossil fuels. Energy became cheaper and drove industrial development. From the beginning of the industrial revolution until the early 1970's, the fossil fuel industry grew at an unprecedented and virtually unopposed rate. The oil crisis of the 1970's was the first real struggle the fossil fuel industry encountered. In 1971, before the first crisis, the share of primary energy from fossil fuels was 95.13% in the United States and 94.52% in Australia (Richie and Roser, 2020). Virtually all primary energy production came from fossil fuels. Figure 3.1 below represents the global share of primary energy from fossil fuels per country as of 2019.

Share of primary energy from fossil fuels, 2019



Source: Our World in Data based on BP Statistical Review of World Energy (2020)

OurWorldInData.org/energy • CC BY

Note: Primary energy is calculated using the 'substitution method' which takes account of the inefficiencies energy production from fossil fuels.

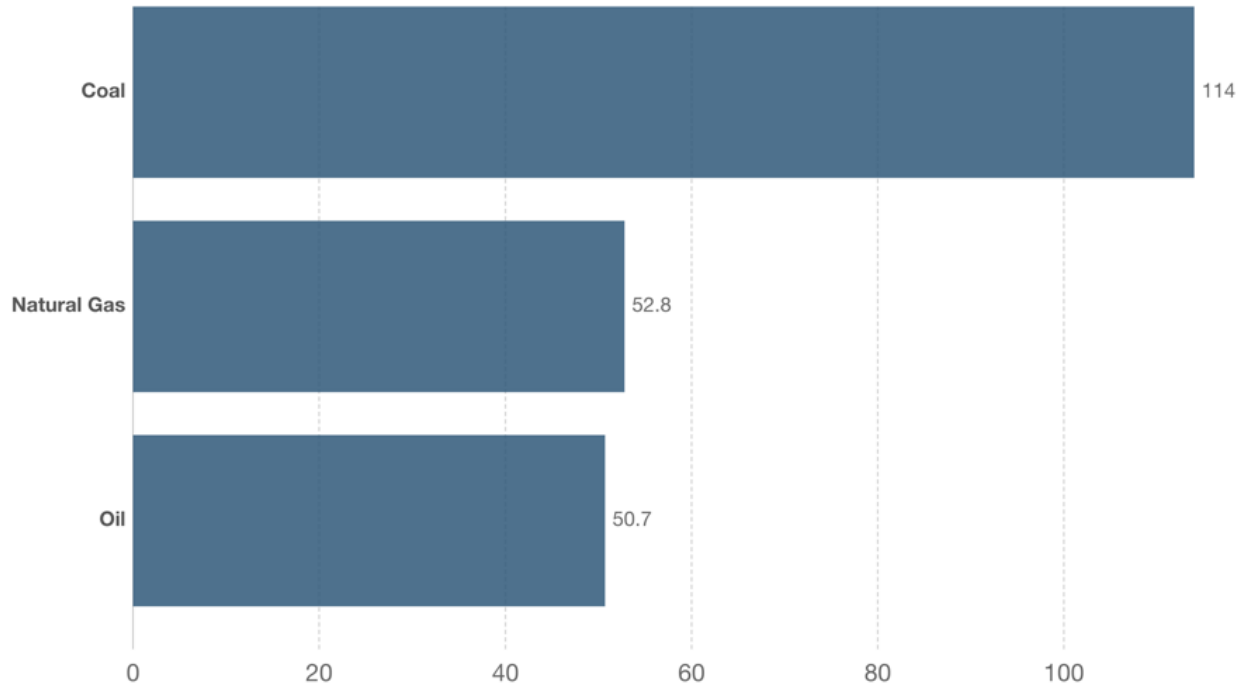
Figure 3.1: *The world: Share of primary energy production from fossil fuels (2019)*. (Source: Our World in Data).

While fossil fuels are widely used and extraordinarily responsible for most of the energy consumption in the world, they are incredibly destructive to the health of the environment and are nonrenewable, meaning, once we have used all the reserves, there is nothing left. Figure 3.2 below takes data from Our World in Data and estimates the number of years we have remaining of traditional fossil fuel reserves. Not only do fossil fuels create toxic environmental consequences as they release carbon dioxide (CO₂) into the air, but traditional fossil fuel sources quite literally cannot support energy systems forever.

Years of fossil fuel reserves left



Years of global coal, oil and natural gas left, reported as the reserves-to-product (R/P) ratio which measures the number of years of production left based on known reserves and annual production levels in 2015. Note that these values can change with time based on the discovery of new reserves, and changes in annual production



Source: BP Statistical Review of World Energy 2016

OurWorldInData.org/how-long-before-we-run-out-of-fossil-fuels/ • CC BY

Figure 3.2: *Years of fossil fuel reserves left.* (Source: Our World in Data).

Australia's Energy and Economic Profile: The 1960's and Early 70's

The ability to understand the consequences of the oil shock of 1973 and how subsequent global disruptions of supply have affected Australia compared to the likes of other nations, first requires an understanding of the state's energy profile and state of the economy leading up to these events.

Energy

Traditionally, Australia's domestic production of fossil fuels was relatively low—a single oil shale¹ deposit from New South Wales was the only prolific source of domestic petroleum, making the country dependent on the importation of refined products to meet their demand. In 1965, oil in the Bass Strait was discovered, instantly transforming Australia's energy industry. The oil found in the Strait allowed Australia to increase its energy self-sufficiency from 10 percent to more than 70 percent by the beginning of 1973 (Buchanan and Vivoda 2020). The Bass Strait is part of the larger Gippsland Basin and is one of Australia's most notable hydrocarbon geological areas. The Basin is in southeastern Australia (state of Victoria), having approximately two-thirds of the basin located offshore (Geoscience Australia 2020). Since significant production from the Strait began in 1970, crude oil became the fastest and most significant contributor to Australia's total value of mineral production. The Bass Strait to date has yielded over 90 percent of domestically produced crude oil. Not only did the Strait provide for extensive oil reserves and production, but the Bass Strait also saw a rise in the reserve of natural gas and black coal, later aiding Australia in becoming the world's leading energy exporters of both natural resources (Saddler Historical Statistics 2019).

In 1965, the Tariff Board of the Australian Government conducted public inquiries to determine a fair price for domestically produced crude oil. This inquiry stemmed from the government's efforts to incentivize the search for domestic oil reserves and encourage exploration companies to take the chance. While the government wanted a fair price to maximize their incentive, they also outlined their precautions to prevent or minimize petrol products having

¹ A sedimentary rock that is also a fossil fuel and can be burned for energy

increased costs for consumers and make sure Australian refineries were not competitively outpriced compared to other refineries. To further solidify the idea of self-sufficiency, the Tariff Board imposed an import duty of 0.8 Australian cents on crude oil and 2.4 Australian cents on motor-grade petrol products (Australian Bureau of Statistics 1974).

When the massive reserve was found in the Bass Strait on the Gippsland Shelf, the Australian government realized that the pricing infrastructure might result in Australian consumers paying more for domestic crude and petrol products than for the same products made from imported crude oil. After negotiations with the government, producers from the Gippsland Shelf agreed they would forgo the 67-cent incentive, with an additional \$0.05 decrease tacked to each barrel. In addition to this, from September of 1970 moving forward, all domestic crude oils began to be priced based on the "import parity" as it was priced in October of 1968, and the government would remain using this pricing structure for a minimum of five years (Australian Bureau of Statistics 1974). This implemented a protectionist infrastructure that is evident in multiple industrial sectors. By driving the Australian consumers to only "shop" domestically, Australia could increase near domestic self-sufficiency rapidly, and therefore in literal terms, were not short on oil. However, just because the energy crisis did not disrupt their physical oil supply, their economy completely was negatively impacted.

Economy

Before the late 1960's, Australia was riding the economic high of the post-World War II boom. In the post-war period, Australia's economy grew rapidly, but the high would not last for

long. The 15 years after 1964 were some of the worst the country had ever experienced, socially, politically, and economically.

A few years before 1973, the Australian government decided there was cause for reform, specifically in manufacturing. Australian manufacturing had become increasingly inefficient, unimaginative, and uncompetitive on the international market. Domestic industry relied on high import tariffs to keep afloat. There was little motivation to innovate and evolve because the high tariffs ensured there would be business; they acted as a safety net. Australian manufacturers were making products for the domestic market, not for international export. This policy was industrialization through import substitution on every level; the people and the government were purchasing Australian-made goods, somewhat ensuring the success of the domestic market (Brett 2020). Because of this protected manufacturing infrastructure, Australia essentially supported a dual-economic structure. On the one hand, they operated an export-oriented commodity sector, and on the other, a domestically centric manufacturing industry. The export commodity sector was exposed to a competitive and unforgiving international market, and because of this interaction, actors learned to be resilient and adaptive to compete, but domestic manufacturing was insulated, inefficient, and lacked innovation ((Brett 2020).

By the late 1950's and the early 1960's, Australian protectionism was at its peak. Import tariffs had strengthened in the 1930's as the government tried to manage the intruding effects of the Great Depression. In 1947 when the General Agreement on Tariffs and Trade was passed, which aimed at producing a freer system, Australia was surprisingly permitted to retain and even strengthen their protectionist policies because their exports were primarily based on agriculture, not manufacturing. This meant that Australia was further building up its protectionist walls while

the rest of the world was beginning to lower theirs (Brett 2020). Australian manufacturing became lazy with these protectionist policies, relying more on maintaining tariffs than good developing products and competitive advantage.

In 1964, the long withstanding protectionist policies became the subject of intense social and political speculation. In 1965, the Menzies administration commissioned a report on managing the Australian economy and its sustainability. Bert Kelly, an avid anti-tariff campaigner, notably stated, "how often have we been slapping protection around just to create employment, forgetting all the while that we were harming employment and development in other industries, damaging their export potential" (Brett 2020). While speculation of the protectionist policies slowly added to the conversation, the policies were still way too favorable to gain real political traction. Tariffs levels were set by the Tariff Board, a statutory authority, which advised on the appropriate levels of protection that they perceived as aiding in economic and efficient industries (Brett 2020). meaning they were usually based on precedent. During the 1960s, protectionist tariffs averaged anywhere from 46 percent to as high as 120 (Brett 2020).

As speculation continued to grow, in 1967, the Chairman of the Tariff Board, Alf Rattigan, recommended a systematic review of the protectionist policies, but due to intense lobbying from domestic manufacturing, the government rejected the recommendation. While lobby groups of farmers and commerce agents, along with economic writers and academics, supported the effort of Rattigan, nothing was done to reform the system until Gough Whitlam and the Labor party took over the office in 1972. In July of 1973, the Whitlam government announced that there would be a 25 percent reduction of all tariffs (Brett 2020). The restructuring of these protectionist policies abetted the economic downturn Australia experienced when the

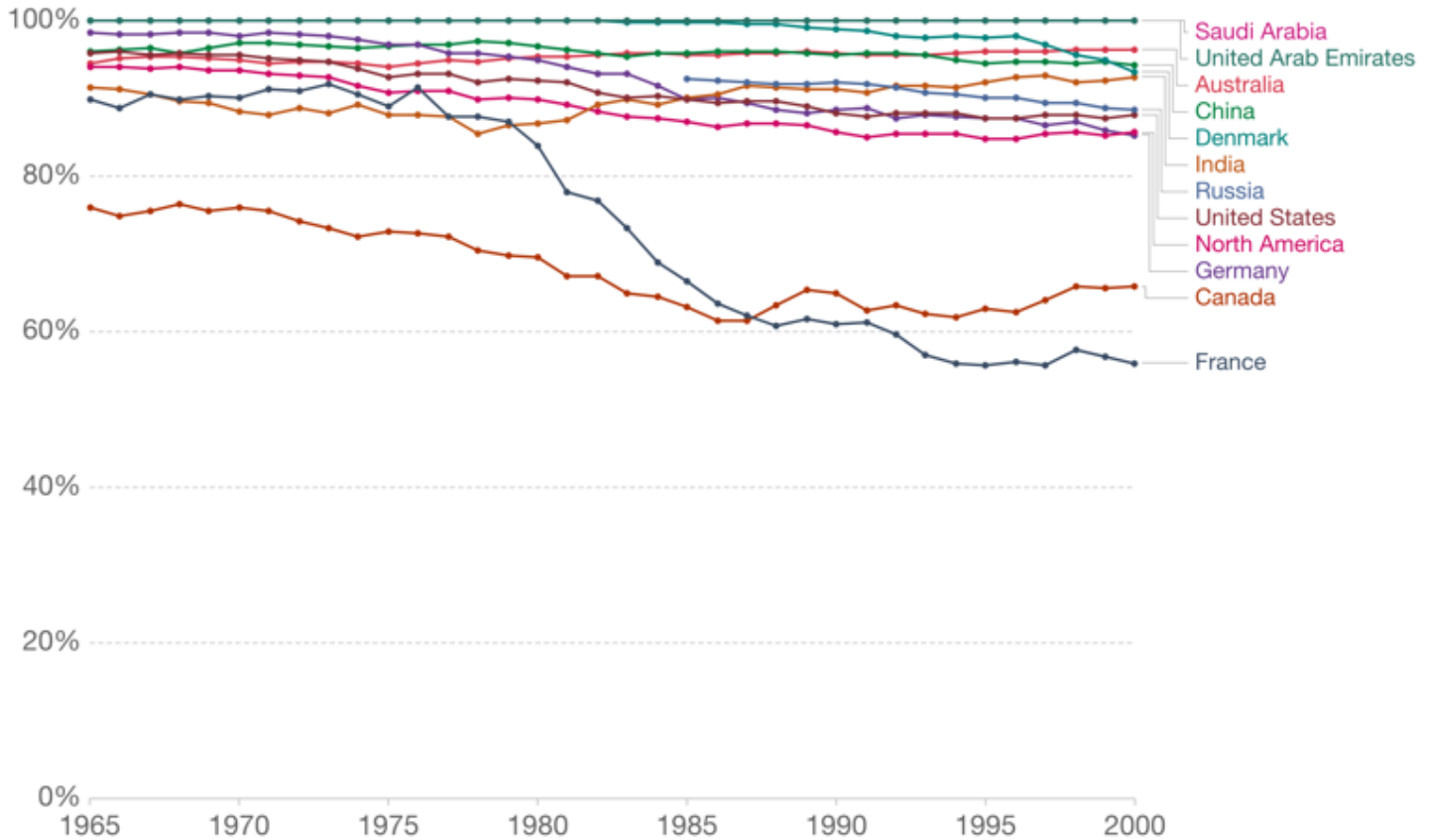
international market was shocked later that year, but these new policies also helped Australia create a business opportunity within the fossil fuel sector out of their relative "bad luck."

CHAPTER 4: EXTERNAL SHOCKS

Hugh Sadler, a professor at Australia National University, defines the term *energy security* as encompassing "all users of energy services, whether they be householders, small businesses, large industries, or people or material goods moving from one place to another, should have access to supplies of energy that are sufficient, reliable, and in the correct form to meet their needs at a price that reflects the full resource, environmental and social costs of doing so" (2009, 2). Energy security is essential to countries functionality but depending on the energy system put into place and the public and political support surrounding the system, it can be very vulnerable to outside forces. External shocks are the primary factors that can threaten countries' energy security. This threat influence states to undergo an energy transition—looking for alternatives to their endangered energy business (Aklin & Urpelainen 2018).

In 1971, before the first crisis, the share of primary energy from fossil fuels was 95.13% in the United States and 94.52% in Australia (Richie and Roser, 2020). The oil crises of the 1970's were the first detrimental external shocks that the fossil fuel industry and modern industrial economies suffered in terms of energy resources. For some, the shock created a demand for more sustainable energy alternatives, notably Denmark, Germany, and France. For others, there was a penetrative effect on their economies to explore other energy opportunity's but, because of domestic natural resources and intense politicization, these states found their alternatives still within fossil fuel resources (Aklin & Urpelainen 2018). While the fossil fuel industry did suffer somewhat of a decrease in some countries, overall, the share of primary energy from fossil fuels was still incredibly high (Figure 4.1).

Share of primary energy from fossil fuels



Source: Our World in Data based on BP Statistical Review of World Energy (2020) OurWorldInData.org/energy • CC BY
 Note: Primary energy is calculated using the 'substitution method' which takes account of the inefficiencies energy production from fossil fuels.

Figure 4.1: *Share of primary energy from fossil fuels.* (Source: Our World in Data).

The first of the two oil crises began in October of 1973 when OPEC (Organization of Arab Petroleum Exporting Countries) announced that it would no longer export to countries that supported Israel as a state, a consequence of the ongoing Yom Kippur War (Office of the Historian 2021). OPEC was created in 1960, shortly after the 1965 Suez Crisis and its facilitation of the globalization of oil markets. The founding members of OPEC include Venezuela, Iraq, Saudi Arabia, Iran, and Kuwait. The Yom Kippur war was an Arab-Israeli conflict that included a coalition of Arab states, led by Egypt and Syria, against Israel. In addition to this embargo,

OPEC used its power to adjust oil prices in the international market. Their attempts at previous negotiations had failed, so the ongoing conflict presented a prime opportunity to demand an increase in the price and availability. At the peak of the 1973 crisis, the price of a barrel of oil in the United States quadrupled, increasing by 255 percent. In Australia, price increases peaked at 22 percent (Acil Allen Consulting 2014). Because much of the world depended on OPEC countries for their oil, the price increase caused extensive inflation and high unemployment in many countries, stagnating global economic growth (Office of the Historian 2021). This was stagflation.

Simultaneously, the new Labor administration was cutting tariffs across the board by 25 percent for Australia. A decrease in tariffs meant that imports became cheaper and domestic manufacturing had to reorganize. 1973 was supposed to be the of Australia's "rebrand," but it was also the year of the most prolific energy crisis ever to strike western democratic industrialized economies. When the price of a barrel of oil more than quadrupled on the international market at the end of 1973, stagflation rolled into the Australian economy and broke the boundaries of prior economic theories in which these three phenomena (inflation, unemployment, and stagflation) were thought not to be able to exist concurrently.

For an export-driven economy, the significant disruption to trade had profound effects, even for countries like Australia who were relatively self-sufficient (about 70 percent) in domestic oil production and consumption. This meant that the state was not as reliant on imported oil as countries like Denmark, meaning that in times of crisis, oil was still accessible, and the country will still be able to function. When the global disruption occurred, domestic crude was producing over 20,668 million liters (ML) per year with more than 356,000 barrels

being produced per day. This increase in domestic production meant that imports were strikingly low, reaching a level of 9,397 ML per year—a stark decrease from that of 1970 (Saddler Historical Statistics 2019). For Australia, the oil crisis was more of an economic shock rather than an energy-centric one. The experienced economic decline was a combination of poor timing and delayed recognition of the severity of the crisis.

After many years of sustained growth, the domestic and international crises Australia faced were rapidly noticeable in the statistical growth of the economy. Until 1973, the average rate of growth for the Australian economy was 3.4 percent annually. From 1974-1979, the economy's average growth rate was a whole percentage point lower (2.4) than the prior four years. (Stevens 2008, 20) This trend continued into the beginning of the 1980's with a recession. Weak economic growth led to a higher unemployment rate, skyrocketing from a low of 2 percent to 5 percent from the early-to-mid 1970s, continually rising into the early 1980s. Finally, inflation ran rampant as well. From 1970-1979, the average annual rise in CPI was 10.7 percent. This means that within that period, the value of the Australian dollar depreciated by over 60 percent. One year, the peak inflation rate was 17.6 percent (Stevens 2008, p. 21).

While this may have been bleak circumstances for the future of Australian economic prosperity, in reality, the downfall of their economy and manufacturing infrastructure provided Australia with a blank slate. The external shock bludgeoned the already weakened economy, but it also allowed it to reshape and build a more robust economy whose exports were internationally in demand and competitive. While Australia experienced an external shock, their circumstance is unique. Rather than forcing the government away from the irrationality and unsustainability of

fossil fuels, the energy crises created a business opportunity for Australia within the existing fossil fuel industry—coal.

CHAPTER 5: COAL, THE NEXT FRONTIER

While an energy transition cannot occur without an external shock, an external shock is not enough to break the carbon lock-in on its own. It may seem strange that a country would look to a similar energy source as their alternative, but this choice was motivated by several factors. Within their framework, Aklin and Urpelainen explain that renewables are not the only option in the aftermath of an external shock: "It is also important to recall that renewable energy is not the only response to an external shock. Whether in addition or instead of renewables, a government could promote a certain fossil fuel, such as coal, as a substitute for oil or decide to go nuclear. The government could also invest in energy conservation and the exploration of fossil fuels" (Aklin & Urpelainen 2018, p. 51). In the case of Australia, this is exactly what happened.

Australia's decision in moving forward and pivoting their infrastructure after an economically draining 1973-1974 waws motivated by several different factors, including the political and economic clout that the leaders of these industries have developed over a long period, as well the richness of Australia's coal natural resources. Coal was an excellent transition opportunity and business investment in the eyes of the Australian government because Australia has immense natural reserves of it. Unlike Denmark, which was almost entirely reliant on imported oil and other fossil fuel deposits to run its energy industries and having no coal or oil reserves of their own, Australia has vast reserves both. So, when oil busted on the international market, Denmark had no other option than to look for an energy source more sustainable and favorable to the resources they do have (wind), and thus the country was more socially, politically, and economically open to a transition. In Australia, when oil prices rose, they were not left to the same detriment as the Danish. Australia has oil reserves and was relatively self-

sustaining, so there was no cause for the government or the people to turn their backs on fossil fuels.

Australia always been aware of its large coal deposits, using coal in domestic energy production for more than a century. However, the oil market crash allowed the country to turn coal into the crowning jewel of the Australian export industry and finally give the country its big break on the international market. The country has always had the resources to become a coal powerhouse; the oil crisis just provided them with the entry that they needed into the international market. Coal checked off boxes for the government. Coal was the solution to the lackluster woes of Australian manufacturing and prior protectionist policies, and it also satisfied stakeholders in that they had the opportunity to invest in and expand their businesses; they were diversifying. Just as Aklin and Urpelainen explain, moving forward, the government and private companies invested in the further exploration of coal resources and the development of an infrastructure that could bring their business to a competitive level on the international market (Aklin & Urpelainen 2018, p. 51).

Coal: The New Gold

For the fossil fuel tycoons of Australia, coal is as good as gold. In 2017, Prime Minister Scott Morrison (then Treasurer) attended a session in the House of Representatives with a lump of coal in hand. For Morrison, the coal acted as a symbol of how the government was “going to keep the lights on” and ensure a prosperous future for Australia. This stunt was meant to garner political favor for coal and the Liberal Party leading up to a contentious election. Morrison stated, "South Australia has just had a blackout and, if Bill Shorten becomes Prime Minister, all

the lights will go off around the country" (Murphy 2017). Bill Shorten was the head of the Labor Party, whom Morrison describes as “drunk on renewable energy, or suffering from coal-phobia, the fear of black rock” (Murphy 2017). If the actions of Morrison represent anything, it is the strength of the carbon lock-in and the vested interests of politicians and stakeholders alike. Coal was presented as essential in “keeping the power on” but was also essential in filling the pockets of those in the carbon club—politicians, entrepreneurs, conservative social figures, and industry heads. The question is, how did Australia end up here? Agents that prospered under the old carbon-based system have strong incentives to return to it, and as the effect of a shock begins to dissipate, it is easy to slip back into the old equilibrium—coal just made sense.

Australia’s coal boom was a stroke of luck. The boom was fueled by the oil shocks, providing the country with clientele. In the aftermath of 1973, Asian electricity producers searched, like many, for an alternative to oil. Countries like Japan, China, Korea, and Taiwan were industrializing and needed a reliable energy source to do so. Asia’s search for coal-fired power created a market for Australian thermal coal.

Reserve Portfolio

Australia mines two kinds of coal: black (thermal or coking coal) and brown (lignite). On mainland Australia, black coal resources are found in New South Wales, Queensland, South Australia, and Western Australia; but the most abundant deposits are found in New South Wales (23 percent of share) and Queensland (63 percent share). Figure 5.1 represents this

Source: Geoscience Australia, the Bureau of Resources and Energy Economics, the World Energy Council and the World Coal Association; Paramarginal and submarginal demonstrated resources are subeconomic at this time; Mt = million tonnes; n.a. = not applicable; (a) raw coal; (b) saleable coal.

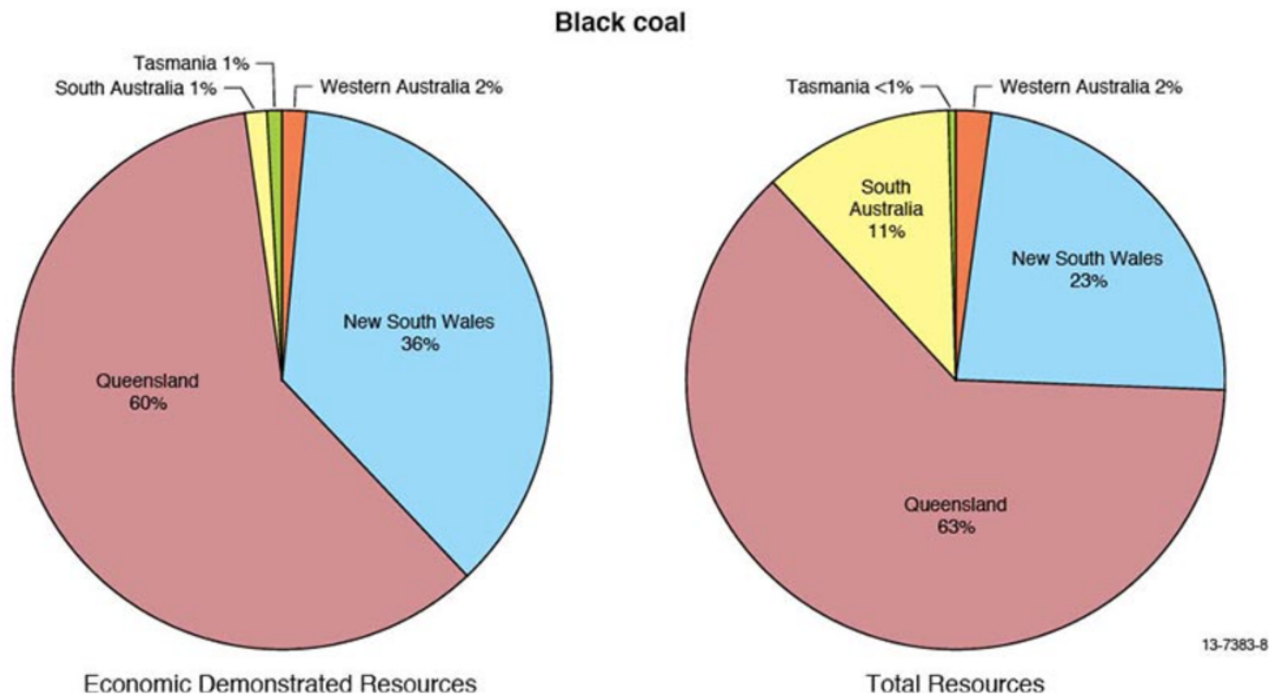


Figure 3.5 Percentages of Economic Demonstrated Resources and total resources of black coal held by the states and territories in Australia. Total resources comprise all Demonstrated and Inferred Resources. Numbers are rounded so might not add up to 100% exactly.

Source: Geoscience Australia.

Figure 5.1: *States where Black Coal is Mined.* (Source: Geoscience Australia).

below. These states are also the most prominent producers (Bureau of Resources and Energy Economics 2020). The states are renowned for their world-class deposits, reaching up to 330 meters thick (Geoscience Australia 2021). A majority (80 percent) of Australian coal is produced from open-cut mines. Open cut mining is the extraction of the mineral via removal from an open-air pit or a borrow. This contradicts traditional extractive methods in that it does not require tunneling into the earth (Chen et al., 2015). Open-pit mining is viable when the mineral deposits are found close to the earth's surface, rather than densely packed underground with hard rock, as it is in extractive mining.

Because it requires less effort to access, open-pit mining is cheaper than extractive methods, and many other countries only account for around 40 percent of their produced coal comes from open-pit mining (Geoscience Australia 2021). This means Australian coal is abundant and cheaply produced, competitive advantage on the export market. In 1986, a significant reassessment of the deposits in New South Wales resulted in a massive increase in black coal EDR.² in 1987 (Geoscience Australia 2021). Figure 5.2 takes a look at this below. The majority of coal produced in Australia is black coal. Black coal is also the primary coal of export, as brown coal is used primarily for domestic electricity generation.

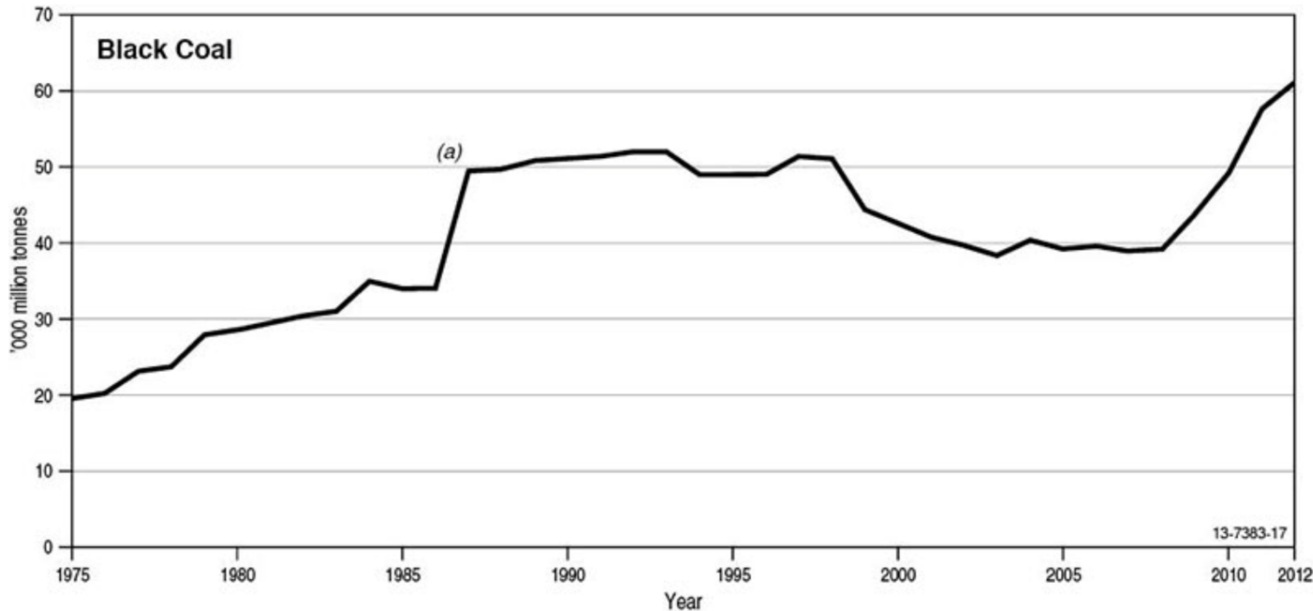


Figure 3.7 Trends in Economic Demonstrated Resources for black coal (recoverable) since 1975.

Source: Geoscience Australia.

Figure 5.2: *black Coal EDR*. (Source: Geoscience Australia).

² As defined by the Australian Bureau of Statistics: "EDR is a measure of the resources that are established, analytically demonstrated or assumed with reasonable certainty to be profitable for extraction or production under defined investment assumptions" (Market Index 2021).

Coal is the dirtiest and most polluting fossil fuel there is. Coal pollutes the air with carbon dioxide, nitrogen, and sulfur oxide. Carbon remains in the atmosphere and traps light and heat, warming the earth's surface over time. Nitrogen and sulfur oxide mix with water from the atmosphere, creating acid rain and negatively affecting surface waters, aquatic environments, animals, soils, forests, and vegetation (Union of Concerned Scientists 2017). Coal mining also produces methane, a gas even more harmful than carbon dioxide in concentrated amounts. Ecologically, surface mining alters the landscape and, therefore, the natural environment, often eliminating vegetative growth. Habitats are destroyed, and rich-soil profiles are depleted. Acidic water is also a byproduct of coal production and drainage, meaning that streams and rivers surrounding production mine areas are contaminated and acidic, making them uninhabitable and depleted in nutrients (Leigh University 2021).

Building Business

About 70 percent of the coal mined in Australia is exported, primarily to countries of East Asia. Between the early 1960s, the Four Asian Tigers³ (South Korea, Taiwan, Singapore, and Hong Kong) were rapidly industrializing, reaching exceptional growth rates of 7 plus percent a year. Within the same time frame, China also underwent an industrial revolution, and Japan was expanding its steel industry. Industrializing countries need access to cheap and relatively dependable energy sources to undergo a cost-effective and efficient development. So, when the

³ Known as the Four Asian Tigers, their economies developed into high-income economies specializing in specific competitive advantage areas

oil market was disrupted and prices skyrocketed, Asia needed a more reliable alternative, and Australia seized the opportunity.

In terms of export production, Australia produces thermal black coal and black coking coal. Importers of coking coal include India, Japan, and China, while China, South Korea, Japan, and Taiwan are significant importers of thermal coal (Geoscience Australia 2021). In 1980, on the international market, the commodity price of black coal was US\$52.00 per metric ton compared to that of a barrel of oil, costing at peak price US\$128.57 per barrel (Macrotrends 2021). For comparison: one barrel of oil produces 1,700 kilowatt-hours of energy⁴ while one metric ton of coal produces 1,927 kilo-watt hours of energy. For less than half the price of 1 barrel of oil, one metric ton of coal could produce more than double the amount of energy (Statista 2021).

For Australia, this was good business, and during the second oil shock in 1979, the steep price increase in oil (again) gave coal the competitive advantage. Not only was coal competitively priced now compared to oil, but it was in high demand by industrializing countries that were relatively close and had large populations. The coal boom took off, and Australia did not look back. Political and economic favor endowed the industry with finance and support, arguably more concretely solidifying the carbon-lock than relative oil-self-sufficiency and protectionist policies had. The state was beginning to make real money on the international market while still increasing its self-sufficiency. Great things were happening—for the Australian economy, coal just made sense.

⁴ Approximate measure because different oil grades have a variation in their energy equivalents

The Danish Case

While Australia turned its sight on another fossil fuel source to rectify issues stemming from the oil crises, the Danes underwent a renewable energy transition. If an external shock hits an economy under the right circumstances and with the right resources, the politics of energy transition can look incredibly different. In 1973, the Danish energy supply was efficient and well-functioning, however, they were heavily dependent on imported oil. At the peak of the crisis in 1973, around 90 percent of Denmark's primary energy consumption was in oil, and more than 90 percent of their oil was imported from the Middle East (Rüdiger 2014, p. 6). Before the crisis, a deep left-right divide clouded much of the government of Denmark's attention. A shock of this nature had never occurred before, so the idea and importance of energy security was on the backburner. With the crushing effects of the crisis on Denmark's industry and economy, a regulatory framework and national energy policy came to the forefront of the government's minds, wanting to ensure that the future of Denmark's energy security could be secured and guaranteed (Rüdiger 2014, p. 6).

Since 1973, Denmark's energy sector has been policy-driven to ensure sustainable and secure energy for all. To achieve this, Denmark looked to renewables. Wind energy has become a profitable industry for Denmark, and now over 30 percent of their consumed energy comes from renewable sources (2020). Germany and France have had similar trajectories to Denmark since 1973, with Germany taking on a transition to renewables while France developed nuclear energy. Denmark, Germany, and France took a welfare-state approach to resolve their issues (Rüdiger 2014, p. 6). They created a dynamic relationship between state and market, providing a new and clear trajectory for the market's destination and ensuring supply security and low prices.

Eventually, this leads to extensive government involvement and regulation of the energy sector, taking away much of outside energy companies' freedom and actions and focusing on being less dependent on imported energy. The government's motivating factors and actions resulted from the harsh struggle and economic strain Denmark felt due to the OPEC oil embargo. The crisis quite literally shocked the country and policymakers to realize that their current energy practices were extremely unsustainable and the need for change was uncontested (Rüdiger 2014, p. 6). This is how an external shock is theorized to function, pulling the countries system from its carbon lock-in. In the case of Australia, the economic impact of the OPEC embargo and the oil crisis was not strong, nor direct enough impact on the economy or the energy sector to spur dramatic negative change—Australia's circumstances were in favor of prolonged use of fossil fuels. If emission cut policies were hardly on the table for Big Coal, renewables were out of the question.

Alternative energy sources include renewables, but also other sources like nuclear power. For the Danes, wind power made sense to expand upon. Germany invested in hydroelectric power and solar which work well with the country's renewable resources. On the other hand, France turned nuclear, and most of the country's electricity now derives from nuclear power. While nuclear power is an energy alternative, it does have risks and potentially harmful consequences, like the effects of Chernobyl or Three-Mile Island. Ultimately, the energy alternative chosen is dependent on a country's natural resources, but also the willingness of the government. In the case of France, strategic choice (rather than access to natural resources) was the key force pointing the state in the direction of developing nuclear power. After the humiliation of their 1940 defeat, and to gain independence from the U.S. nuclear umbrella in the

context of the Cold War, France latched on to nuclear power for military purposes. From there, using nuclear power to produce electricity was a “natural development.”

CHAPTER 6: THE POLITICS OF ENERGY TRANSITION

The coal boom in Australia was headed up by industry leaders demonstrating statesmanship, intent upon developing profitable enterprises, but more ambitiously a solid foundation for long-term national prosperity (Pearse et al., 2013, p. X). Japan was restructuring its steel industry while other South and East Asian economies were industrializing and growing, so not only did Australia have an immediate business opportunity, but also one to establish long-term relationships with these markets and to develop the industry to satisfy their demands (Pearse et al., 2013, p. X).

Between 1973 and 1980, in the aftermath of an energy crisis and eventually a second, Australia was building its mining and export infrastructure. Mining infrastructure expanded through Queensland and New South Wales, and by 1980, the beginning of the long-term coal boom had commenced. Between 1980 and 2000, the global demand for coal rose by 1 percent annually, quadrupling to 4 percent annually from 2000 to 2009 (Pearse et al., 2013, p. 6). Contradictorily, in the 1980's, consequences of carbon emissions coming from coal consumption were beginning to be researched and addressed more seriously by scientists and some social critics—the environmental movement was beginning to take off on somewhat of a global scale (Pearse et al., 2013, p. 6). These two trends provoked an intense politicization of energy and action by politicians, the government, and interest groups alike (Pearse et al., 2013, p. 6).

Growing an Industry

The early development of Australia's coal industry stems back to the latter 1960's when the restructure and growth of Japan's steel industry was beginning. Before the Japanese steel

boom, Australian coal exports averaged 1.9 million tons, a modest amount (Pearse et al., 2013, p. 29). The steel boom prompted the arrival of overseas companies like Peabody, Utah, CRA, Mitsui, and BP. While the steel boom set the foundation for the coal industry, the oil shocks of the 1970's are what lit and fueled the coal boom (Pearse et al., 2013, p. 29). Asian electricity producers provided a market by switching from oil to coal-powered energy, and the development of steel mills in Taiwan and Korea also drove up demand, specifically in coking coal. Open-cut mining flourished, and in the process, millions of tons of overburden.⁵ was ripped away from the earth's surface to expose the coal seams (Pearse et al., 2013, p. 30). These practices expanded throughout the 1980s.

In 1960, Australia exported 1.6 million metric tons of black coal, valuing approximately \$13 million AUD. By 1980, Australia exported over 42 million metric tons, valuing at approximately \$1,684 million AUD. At the time, Japan was importing more than 69 percent of the coal exported from Australia (Australian Bureau of Statics 1982). Mining growth continued to expand throughout the 1980s in an unprecedented fashion, eventually reaching a decline in the export price of coal in the 1990's. In the 90's, the price of oil was finally beginning to settle, provoking some energy consumers to return to oil as their primary energy source. For a time, the future of the coal industry was worrisome and companies like Exxon sold their mines to companies like BHP, Rio Tinto, Xstrata, and Anglo American, later known as the *Big Four*⁶ (Pearse et al., 2013, p. 30). With oil returning to a relatively fair price, many companies jumped

⁵ Soil, trees, and rock (Pearse et al., 2013, p. 30)

⁶ Big Coal in Australia: BHP, Rio Tinto, Xstrata and Anglo American (Pearse et al., 2013, 30).

ship. However, the Big Four held on, and after this minor demand setback, the height of the Australian coal boom commenced.

Big Coal

By 2006, around five companies dominated the Australian mining industry. These companies produced over 74 percent of all saleably produced coal (Pearse et al., 2013, p. 30), and in 2003 the price of coal began to increase dramatically. Before the 2000s, coal export demand from Australia was primarily driven by Japan and a few other Asian economies. However, causing significant investment in the industry to expand its producing capacity (Reserve Bank of Australia 2019). Thermal coal demand increased due to the growth of the Chinese economy⁷. Moreover, the coking coal demand rose as Chinese steel production ramped up, supporting its rapid industrialization. In 2003, one metric ton of coal cost US\$25; by 2012, the price had risen to over US\$100 per metric ton (Pearse et al., 2013, p. 30). In the industry overall, by 2010-2011, new spending in the industry was up to US\$55 billion, jumping more than 53 percent from that of 2009-2010, and continually rising to US\$73.7 billion in 2011-2012 (Pearse et al., 2013,30). This was the height of coal sensationalism.

BHP Billiton, Rio Tinto, Xstrata, Anglo American, and Peabody control more than two-thirds of the black coal being mined in Australia. More than 250 million tons of coal are produced per annum between these companies (Pearse et al., 2013,61); mid-size and smaller companies produce the rest. Many of these companies have also had long and established

⁷ China is the largest global consumer of thermal coal, consuming around 3,200 million metric tons in 2018, triple it is 1990 consumption (Reserve Bank of Australia 2019).

histories in Australia, so the vested interest and political capital they have accumulated is insurmountable.

The BHP chairman, Harold Darling, wrote the first industrial policy adopted by the Menzies Liberal administration (Pearse et al., 2013, p. 61). Notably, BHP is also one of the biggest companies listed on the Australian Stock Exchange. With these five companies' long-term presence and sustained involvement in economic and political development, the coal exporting industry has become known as “quintessentially Australian” (Pearse et al., 2013, p. 61). This mentality and the economic and political power held by these companies permeates society and strengthens the carbon lock-in. Aklin and Uperlainen describe energy transitions as an inherently social issue, and for Australia, it is apparent that this was the case. Coal provides economic growth, jobs, and an identity for the Australian people—alternative energy faced great politicization and pushback. Why would the country move away from something so fruitful? Many political clashes resulted from this question.

Countdown to Kyoto

In 1997, the Kyoto Conference was convened to establish a target for lower levels of greenhouse gas emissions globally, with each participating country lowering their contributions to a specific level. In the months leading to the Kyoto Conference, the Countdown to Kyoto Canberra Conference took place. Its goal was to have Americans and Australians come together to torpedo the Kyoto Protocol. Hugh Morgan, the head of Western Mining company, a highly influential doyen of the Melbourne Liberal Party, on the Board of the Reserve Bank and had the favor of the prime minister, John Howard, lead the event for the Australian side, partnered with

Senator Malcolm Wallop and the conservative Frontiers of Freedom leading the American side (Wilkinson 2020, p. 2). Wallop arrived in Canberra with a group of renowned climate science skeptics who regularly advised the Senator. The conference's pitch was simple: the science that backed climate change was still up to dispute. There is no impending emergency, and the anticipated Kyoto Protocol would be economic suicide for industrialized nations (Wilkinson 2020, p. 2). As the event was about to commence, 20 Greenpeace activists jumped out of a van and ran into the auditorium, blowing whistles and screaming. They protested the conference, sitting in front of the stage, arms linked.

Countdown to Kyoto was the sign of a country who is gripped by a carbon lock-in. In 1992, when George H. W. Bush called for action to protect the planet, Australia's then-Labor government signed up to keep emissions at a level that would help prevent climate change. When the UNFCCC⁸ was approved by the US Senate in 1992, Australia was one of the first countries to ratify it. Small efforts to heed climate change warnings were met with explosive backlash from significant fossil fuel corporations, Exxon, Texaco Oil, Peabody Coal, Ford, BHP, and General Motors. These corporations had previously formed a lobby group, the Global Climate Coalition, to fight for their vested interest at the Rio Summit (Wilkinson 2020, p. 6). The lobby promoted climate science skeptics and politicians who questioned the cost of action. This lobby took up the cause against the UN convention and the Kyoto Protocol.

Incumbent argued the UN convention, stating that it was "unfair." The lobby could not agree with having the US, Australia, Japan, and Europe take responsibility for all the accumulated greenhouse gases that had already been released into the atmosphere. Countries that

⁸ UN Framework Convention on Climate Change

were considered to still be in the developing world were only asked to mitigate their contributions of emissions (Wilkinson 2020, p. 7). It was expected for industrialized countries to cut their emission levels back to their levels in 1990. With the Kyoto Conference approaching, and legally binding emission cut targets become part of the protocol's legislation, corporations and lobbies immediately warned of the consequences. The Global Climate lobby sponsored a multi-million-dollar slanderous campaign against the Kyoto Convention and its talks in the US. The slogan was: "It is Not Global, and It Will not Work" (Wilkinson 2020, p. 7). When Senator Wallop arrived in Canberra for Countdown to Kyoto, this message was echoed loudly.

In the final UN talk before Kyoto, Australia stood alone with Saudi Arabia and Russia against binding emission cuts on rich countries. Moving forward, the Howard government faced a dilemma. The IPCC⁹ stated that Australia was predicted to be one of the biggest losers when it came to the latter effects of climate change in the 21st century—all the way back in 1997 (Wilkinson 2020, p. 8). On the one hand, coal produced cheap electricity, supported the economy, and created jobs within the domestic market while the export industry earned a fortune internationally. On the other, coal threatened the eventual livelihood and health of the country and its environment. Australia was 12th in the world for greenhouse gas emissions, but per capita Australia ranked highest in carbon emissions produced (Wilkinson 2020, p. 9). Intense debate rang within the Howard government for 18 months over binding emissions reductions. As the number one coal exporter globally, legislation providing binding emission cut targets would destroy the mega export industry they had developed. During deliberation, the Howard Government received an anonymous submission to the cabinet, aptly describing the Howard

⁹ Intergovernmental Panel on Climate Change

Administration's situation. "Australia is particularly vulnerable to efforts to address climate change. Emissions reduction efforts by other Annex I countries will have a strong adverse impact on our terms of trade by reducing the price and demand for fossil fuels (particularly coal) and other emissions-intensive exports while increasing the price of imports in Australia" (Wilkinson 2020, p. 9).

A stakeholder who had a lot to lose in Kyoto and vehemently fought against the progressive climate-aware policy was Hugh Morgan. Morgan was the chief executive of the Western Mining Corporation, which owned mining, engineering, industrial and chemical plants producing and exporting fossil fuels. For Morgan, it was estimated that his company was looking to spend US\$100 million to meet the agreed-upon reductions if the Kyoto Protocol was pushed through (Wilkinson 2020, p. 9). Hugh Morgan and Rupert Murdoch were the most influential and connected businessmen within Australian Conservative politics (Wilkinson 2020, p. 10). Morgan had pull with the prime minister and an in with the Minerals Council and Business Council lobby groups—an optimal example of the political difficulty of a systematic change that Aklin and Urpelainen discuss. Incumbent interests (Morgan) profit from the continued extraction of fossil fuels. Thus, these initial efforts to slowly change the system are met with tough political opposition and conflict. As the challenge to the norm grows stronger—this would be the threat of legally binding emissions rather than ‘suggestions’—the vested interests that benefit from the initial system (fossil fuels) begin to oppose change directly. This struggle and tense dynamic can last for decades and through multiple administrations, constantly at the mercy of how global developments mold the costs of renewables and fossil fuels. This is precisely what has been happening in Australia for the last three decades.

The Australia Clause

In the months leading to Kyoto, the Howard administration toyed with several ideas: (1) putting a price on carbon pollution so there was an economic incentive to cut back, only reducing emissions if it would not cost the state or negatively impact the economy, (2) energy efficiency, (3) curbing emissions from land clearing and deforestation, and (4) the more radical idea of not signing up for Kyoto at all (Wilkinson 2020, p. 3). In the end, the *Australia Clause* won—a significant success for the Australian fossil fuel industry, but widely opening the country to international critique. On the last night of the conference, the Australia Clause was read into the protocol and resulted in intense outrage from Europe. The Australia Clause outlined that Australia would only have to reduce their emissions to 8 percent above the 1990 baseline. Other rich industrialized nations were against this as they had agreed to cut their emissions by at least 5 percent below the 1990 level, the European Union agreeing to a cut as high as 8 percent. This was a big win; Howard referring to it as a "splendid result" (Wilkinson 2020, p. 18). This clause was an exceptional deal for Australia because although it appeared as though they were putting in the effort and moving in the direction of emissions cuts, the fossil fuel business was still secretly winning. Australia was allowed to keep its baseline emissions, which provided a much less drastic emissions cut that could primarily be achieved by energy efficiency and reduction of land clearing—the coal industry would not have to make any profound changes.

Post-Kyoto

After Kyoto, individual governments needed to ratify the protocol to give it any legal substance or cause. For the lobbyists, stakeholders, and incumbents, this was a period of opportunity for them to start a powerful campaign in opposition to ratification. In early 2000 a climate science skeptic lobby known as *The Lavoisier Group* was formed. The lobby pushed forward the ideas of the “dramatic” consequences that the ratification of the Kyoto Protocol would inflict on the country. “The economic dislocation which must follow its implementation will be unprecedented in modern times., It will be equivalent to the famines of the early nineteenth century in its disruptive power” (Wilkinson 2020, p. 21). Simultaneously, similar steps were being taken within the United States to stall the ratification process. For the Howard government, if the US was stalling, they would remain inactive as well. In November of 2000, when the Kyoto Protocol’s most prominent advocate, Al Gore, was defeated in the United States Presidential race, climate skeptics embraced his defeat. With Gore gone, climate politics would not stand within conservative favor.

In March of 2001, Bush announced that the United States was pulling out of Kyoto and openly questioning the validity of climate science. Bush’s new EPA¹⁰ head attempted to move forward with one of the promised election initiatives—using federal law to legislate cutbacks on emissions produced by power plants. Immediately, the energy industry and right-wing republicans pushed back on this policy, and quickly Bush reversed the policy and announced that his administration would be supporting the coal industry and its consumers (Wilkinson 2020, p. 28). In September of 2001, when John Howard arrived in Washington, DC—US climate policy

¹⁰ Environmental Protection Agency

was in freefall. The United States had pulled out of Kyoto, but the Global Climate Coalition lobby broke up, and Bush needed an ally. A few days after Howard's arrival, two planes hit the World Trade Center, and Australia became one of America's most extensive supporters in the War on Terror.

Howard won the Coalition a third victory at the end of 2001, strengthening the parties power in parliament. Howard revamped the cabinet, relocating Robert Hill, the government's most vocal climate science defender, out of the Environmental sector and into Defense (Wilkinson 2020, p. 35). To fill Hill's position, Howard appointed David Kemp, a former director of the Victoria Liberal Party.¹¹ A staunch conservative and a climate skeptic, Kemp's political tactics in dealing with climate science focused on specific details and uncertainties (Wilkinson 2020, p. 35). In 2002, on World Environment Day, during sessions in Parliament, Howard finally stated how Australia would move forward without joining the Kyoto Protocol: "It is not in Australia's interests to ratify the Kyoto Protocol. For us to ratify the protocol would cost us jobs and damage our industry. That is why the Australian government will continue to oppose ratification" (Wilkinson 2020, p. 41)

It later came to light that the cabinet, after all this time, had still not come to a concrete solution regarding Kyoto, and the prime minister announced this decision on a whim. For the prime minister, leaving Bush without an ally was not an option, and because the United States had pulled out, Australia followed suit. For Europe, it was a shock to see Australia move in the direction of skepticism. In the five years following this decision, Australia was diplomatically marginalized. Australia and the United States were on the fringe of climate change and UN

¹¹The Victorian Liberal party is a deeply conservative Australian political party based in the state of Victoria

negotiations. While the country was under international scrutiny for its decisions, domestically, the decision was applauded by many, especially by those it favored. Morgan and other actors took this decision as an opportunity to scrutinize further and politicize climate science and the entire environmental movement against climate change. Howard publicly announced that he believed Howard had made the right call on Kyoto and an increasing number of liberals within the Howard administration could not help but follow his "wisdom" (Wilkinson 2020, p. 43).

2000's and Onwards

Since the final decision on Kyoto, Australian politics has been engaged in a long tug of war between the fossil fuel industry and climate science—the former incumbent always having the upper hand. In 2002 the Howard Government proposed the Beal Plan. The Beal Plan was a cap-and-trade scheme for reducing emission. While companies invested in permits, they could also invest their money in the develop of better energy efficiency or at cleaner alternatives. The heavy greenhouse gas emitters opposed the trading scheme and aggressively lobbied the Beal Plan (Wilkinson 2020, p. 47). In August of 2003, the Beal Plan died after deliberation in the cabinet, and Beal resigned from the government soon after. Environmental organizations within the country were livid with the decision, stating, "A minority of big, dirty polluters have won the day and put Australia's national interest at risk" (Wilkinson 2020, p. 51).

How Policy Gets Influenced: The Greenhouse Mafia

In 2007, Guy Pearse—former speechwriter for Robert Hill, the first environmental minister of the Howard administration—published *High and Dry*, a book examining the network

of ties between greenhouse gas industries and the Howard Administration. Pearse referred to the network as the *Greenhouse Mafia*, for their tactics and influence that penetrated the government. Howard's policies reflected the views of significant greenhouse companies and their executives, like Rio Tinto and Howard Morgan from Western Mining. For Howard, the greenhouse policy was not motivated by how it could affect the environment and impact climate change but instead on the idea that Australia's economic future relied on minerals, metals, and the energy sector.

While the Greenhouse Mafia is a more general term, at its core there are five lobby groups across the country with influence and connections, spanning the key corporations, industry associates, ministers, offices, government agencies, and economic consultancies that are influential in Big Coal. These lobbies aim to keep coal-friendly policies on Australia's political agenda and spend over US\$40 million a year serving the political interests of Big Coal (Pearse et al., 2013, p. 135). The MCA heads the Mafia.¹² The Minerals Council is packed with industry-leading companies like BHP Billiton, Rio Tinto, and Peabody Energy and has a budget of over US\$32 million annually (Pearse et al., 201, p. 135). The lobbies are able to become invisibly powerful because they hire former insiders who still have deep personal connections with decision-makers.

The AIGN¹³ was created as an informal industry "umbrella group" with the MCA, becoming the long-standing powerhouse on greenhouse policy. The AIGNs original intent was to help resolve policy disputes among industries and associations so it may be presented to the government as a united front, but big coal has warped its use. While membership appears to be

¹² Minerals Council of Australia

¹³ Australian Industry Greenhouse Network

open to all, the power of the organization has always laid with coal miners, power generators, and the mining industry overall (Pearse et al., 2013, p. 136). Over the past two decades, under the protection of anonymity, several network members have admitted to using personal connections as leverage to draft cabinet submissions, brief notes, and government greenhouse policy (Pearse et al., 2013, p. 135).

“Clean Coal”

In 2004, the Howard Administration set its sights towards aligning its actions with what was occurring in the United States. The White House was working on developing and using "breakthrough technologies" that would reduce polluting emissions (Wilkinson 2020, p. 52). This technological partnership brought together the heavy hitter gas-emitting countries from Asia-Pacific, and companies like ExxonMobil and Rio Tinto—Australia got to be a founding member. When announcing the partnership in 2004, Howard proclaimed its effectiveness and fair standards were superior to the Kyoto Protocol. "It demonstrates the firm commitment of Australia to reducing greenhouse gas emissions, according to an understanding that its fair in Australia and not something that will destroy Australian jobs and unfairly penalize Australian industries" (Wilkinson 2020, p. 53). Critics of the partnership, like US Republican senator John McCain believed that it was a "public-relations ploy," but Howard was in full support. The foremost breakthrough technology that both the US and Australia were intrigued by was the promise of "clean coal" (Wilkinson 2020, p. 53).

Breakthrough Technologies

The technical name of clean coal is “Carbon Capture and Storage,” or CCS (Wilkinson 2020, p. 53). CCS is proposed to capture carbon dioxide given off from coal-fired power plants and then bury the emissions 800 meters underground. In its model, clean coal technology theoretically reduced coal-fired greenhouse gas emissions, and several large companies like BHP and Rio Tinto promoted the "eco-friendly" technology. For John Howard, this was a technological solution to his problems, one he could have only dreamt of.

In February of 2004, Howard invited 13 of the most prominent greenhouse gas executives to help with the plan for a breakthrough high-tech solution. Sam Walsh, a Senior Executive for Rio Tinto, stated that Howard was excited about clean coal and pushed for the executives to develop other alternative ideas that would help dissuade calls of increasing the renewable energy target. In a report commissioned by the Prime Minister’s Science, Engineering, and Innovation Council¹⁴ head scientist Dr. Robin Batterham authored *Beyond Kyoto—Innovation and Adaptation*, pushing for clean coal heavily as a strategy. Batterham was also the chief technologist for Rio Tinto at the time but believed there was no conflict of interest between his two positions and, therefore, believe it would not affect his government position advising on greenhouse strategies (Wilkinson 2020, 53). The line between big coal and the government became increasingly blurry as coal production continued to dominate the Australian economy. In 2004, Howard won a fourth election, the government’s majority increased in the Senate, and a former Liberal Party director turned lobbyist became the new Environmental minister.

¹⁴ PMSEIC

While clean coal sounds like the perfect solution, but the technology is complex and costs a lot. It is noted that the carbon capture technology could function in some way to help reduce emissions, but there is little incentive for companies to invest in this technology when there is an absence of strict climate regulations and targeted emissions cuts. The cutting-edge technology of clean coal is also misleading. While the plant may produce less carbon dioxide, it is proven that even a “clean coal” power plant is still much dirtier strategy of producing electricity compared to that of nuclear, wind, solar, and even natural gas (Plumer 2017).

An Ongoing Battle

In the spring of 2006, the politics of climate change had turned on Howard; The Millennium Drought swept through the country. The drought was the worst ever to effect southeastern Australia, lasting from 2001-2009. About 68 percent of Australians believed that global warming was a pressing issue that immediately needed government attention (Wilkinson 2020, p. 60). Howard found himself at odds with top bankers, bureaucrats, state premiers, and voters. In April of 2006, the business community formally split over climate change. David Morgan, a climate "rebel," formed the Australian Business Roundtable on Climate Change. The Roundtable included prominent insurance executives, gas producer Origin Energy, and Gerry Hueston, the president of BP Australasia. These executives called for a framework to put a price on carbon pollution via tax or trading scheme. The lobby also argued for investments in clean energy technology and a revamp of their “outdated” electricity system. Rodger Beal, formerly of the Howard administration and the Beal plan, was the head developer of the scheme (Wilkinson 2020, p. 62).

In 2007, four months before the election, after much negotiation and reluctance, Howard announced his plan to price carbon pollution to save his party in the polls. Howard planned to implement a trading scheme, and big coal supported Howard's ideas because if the Labor Party won the election, it would likely implement more restricting policies. In reaction, the Labor party commissioned economist Ross Garnaut to conduct an inquiry into climate change and its science, and to roll out several promises for action on climate change, including the ratification of the Kyoto Protocol. While Howard may have agreed to a trading scheme, he would not budge on Kyoto, following in the stride of the United States' Bush. The end of 2007 was a turning point for Australia. Howard was ultimately defeated by Labor's Kevin Rudd, promising an initiative to ratify the protocol, and cut emissions by 60 percent by 2050 (Pietsch and McAllister, 2010). Australia now had a prime minister who warned about the risks of climate change and promised emissions cuts (Wilkinson 2020, p. 74).

The Modern Era

Australia's Government embraces and is more invested in short-term policies that prioritize exportation and over-extraction over the future of energy security or the state's environmental security and self-sufficiency. Currently, the Government does not support a proactive plan when it comes to more sustainable energy practices—a perspective that has been echoed by prior administrations.

Rudd's Labor government created the Carbon Pollution Reduction Scheme (CPRS) and a national Emissions Trading Scheme (ETS), outlining financial incentives to the people for working on reducing emissions (Akter et al., 2012). The government also offered "free carbon

pollution permits" to emission-intensive industries to lessen their expected disadvantage to international competitors. While a majority—58 percent—of the Australian population favored the ETS, a staggering 38 percent opposed the proposed policy; this is a significant minority. In 2000, the Bushfire CRC, the Australian Bureau of Meteorology, and the CSIRO Marine and Atmospheric Research team found that the number of “extreme” fire days would increase anywhere upwards of 15-65 percent. When ETS ratification presented itself, the scheme failed to pass in the Australian Senate three times between 2009 and 2010. However, by the latter part of November 2011, the ETS was passed, establishing a carbon tax to make the countries next step, the Carbon Pollution Reduction Scheme (CPRS), a more natural transition (Akter, 2012).

The trading scheme was to reach guided by an effort to reach the 2020 emissions reductions. It would begin with carbon being priced at \$25 a metric ton starting in 2010. Low-income households would be compensated for increased prices, also including a 3.9-billion-dollar cushion for power generators, allowing free permits to pollute for the next five years (Wilkinson 2020;110). The carbon tax received harsh public criticism and resulted in the outbreak of politically motivated protests and violence. Those who were immediately affected by the scheme created the most pushback and political noise; unfortunately for Rudd, this was Big Coal and its compatriots. Rupert Murdoch, the conservative media tycoon, had his newspapers react as the primary outlets for media slander towards the scheme. Murdoch's formidable publication, *The Australian*, ran front-page stories about Rudd's scheme shutting down industry, factories, communities, towns and ultimately destroying the Australian economy.

In May of 2009, Rudd announced a new target, cutting Australia's emissions 25 percent by 2020. Earlier in the year, on February 7, the temperature in Melbourne reached 46.8 degrees

Celsius and the worst bushfires on records burned through the state of Victoria. Furthermore, this day was referred to as “Black Saturday,” the fires raging for weeks after, burning more than 450,000 hectares of land. Rudd’s government was under attack on all fronts and needed allies. The new target aligned with actions called for by environmental groups, the Bali Summit (which Howard had attended), and climate scientists within the country.

Looking forward to the next round of negotiations for the agreement that would come into effect after Kyoto expired in 2020, Rudd knew Australia had to be involved and wanted to put up a good front. Rudd stated he wanted a “Copenhagen agreement consistent with Australia having the prospect of saving the Great Barrier Reef” (Wilkinson 2020, p. 125). Rudd’s target kept Australia in the UN Climate Talks, and it won support at home from the most influential environment groups on climate change: the Australian Conservation Foundation, the World Wildlife Fund, and the Climate Institute.

In October of 2009, the lobby campaigns in opposition to the emissions trading schemes erupted. The Australian Coal Association included Xstrata, Peabody, Anglo-America, Rio Tinto, and BHP and signed off on a multi-million-dollar campaign to derail the emissions trading scheme (Wilkinson 2020, p. 140). In December, the Copenhagen Conference was held and resulted in complete failure. Rudd returned home defeated. In April of 2010, Rudd had been delaying a final decision on the emissions trading scheme for several months—something he promised during the election. When pushed for a decision, Rudd ultimately decided that the country’s budget could not afford a \$9 billion systematic reconstruction, and the government would not be moving forward with the policy. Immediately, Rudd’s approval rating plummeted,

and the government's credibility on climate change was shattered. Rudd had defaulted on a promise that defined his tenure, and the public would not stand for it.

Australia's modern energy history is incredibly tumultuous. For much of its time, Australian energy politics has been dominated by Big Coal and its desires. Governmental officials' networks run deep into those of prominent coal executives, and many of Australia's policies and industrial ventures implicate this. When any environmentally conscious initiatives are put forward, stakeholders speak up, lobbies protest and attack, and for the most part, incumbent interests typically win or remain constant—the climate activists always made the concessions. When the country began to make progress (as per Rudd's optimistic election), fossil fuel executives would make the progress of getting anything done incredibly challenging, often rousing public opinion. Coal lobbies launched expensive political attacks and smear campaigns, while others used their political connections to block progress. Big coal always came back with the same attack strategy: any emissions cut, carbon tax, or policy that affects the current system would be an economic disaster for the Australian industry and would cost the Australian people their jobs. This attack continually garnered public support.

As of 2020, the Liberal Party holds power in parliament. Australia has not addressed how it will attain its targeted 2030 emissions reductions and continues to expand its fossil fuel industry by opening the controversial Bravus (formerly Adani) coal mine (Martin, 2019). The decision to move forward with Bravus coal mine has received a lot of controversial media coverage and has been highly opposed and publicly protested by environmentalists in the country for over a decade. Questions involving the mine's economic benefits, financial viability and environmental damage have been among the most prominent in the media lifespan (Hall 2020).

An aggressive *#StopAdani* campaign was formed by those in opposition to mine production, and the campaign politicizes that begging to use the mine will destroy ancestral lands, pollute, and toxify indigenous waters and cultures, increase shipping traffic through the Great Barrier Reef, and most striking of all, the mine is predicted to emit over 4.7 billion tons of carbon pollution during its projected 60-year lifespan (Hall 2020). Despite extensive backlash and public and political protests, the Australian government has wholeheartedly embraced beginning production of the mine, remaining adamant that they have addressed all areas of concern and are committed to the future excellence of Australia. Big coal stays winning.

Although there is strong opposition, as of 2019, prior liberal office holder Malcolm Turnbull has come forward, urging the government to increase its response to climate change (Marin, 2019). Framing the climate crisis as a "national security issue," Turnbull perceived the rampant bushfires as a threat to the security and wellbeing of Australia—an interesting caveat from his previous environmental stance. The current Australian Prime Minister (2021), Scott Morrison, has taken a step back from Turnbull's statement, decreasing the state's urgency of climate change action. In his reaction to the bushfires, Morrison and his administration heavily associated themselves with conservative, climate-denying media outlets and tried to provide a sharp deflection regarding climate change having a hand in the fires. Swarms of disinformation, blame-shifting, scientific ignorance, and disregard of expert opinion spearheaded the Prime Ministers' political responses to bushfire tragedy. In surveys conducted on the Australian public for the *Global Environmental Change Journal*, Sonia Akter, Jeff Bennett, and Michael B. Ward found that most of the population believes in climate change, which is a direct result from human action. However, Australian public opinion is unusual in that it is riddled with mitigation

skepticism (Akter et al., 2012). On average, only 50 percent of participants believed that climate mitigation would help decrease global emissions. This skepticism makes aggressive action more difficult. Although they may believe in climate change, skepticism does not create a sense of urgency.

CHAPTER 7: LOOKING FORWARD

Aklin and Urpelainen define external shocks as "a major abrupt event that reveals the weakness of current policy and is not the direct product of an own government policy" (2018, p. 12). Without an external shock to the current system, the carbon lock-in that defines industrial societies does allow room for alternative energy sources to flourish. The oil crises of the 1970s were the first dramatic external shocks to the energy supply that modern industrial economies had experienced. As is evident, Australia was impacted by these events as external shocks, but a renewable energy transition did not occur. While external shocks are necessary to set the correct preconditions that can allow for a transition, just because an external shock was experienced does not mean that a renewable transition will occur. Australia works well within Aklin and Urpelainen's framework—it portrays the realities of carbon lock-in and the prolonged political tug of war that both sides endure.

Armed with steep political and economic capital, incumbent interests, unruly lobbies, the promise of financial prosperity, and stakeholders with seemingly unlimited resources, the Australian fossil fuel industry puts up a good fight. At every opportunity to stray from the equilibrium or status quo, action is met with intense lobbying, protests, and in some cases, political violence. Climate science within the country is dubiously attacked and continuously under intense skepticism, and threats warning of Australia's volatility to climate change have notoriously been pushed aside by the Government, conservative entrepreneurs, and industry heads since the beginning of the 1980s. Even in 2020, as unprecedented wildfires burned the landscape and bleaching events in the Great Barrier Reef have become more common, the prime minister and the liberal party have no intention of slowing down.

The wildfires cause intensive ecological destruction and jeopardized many human lives, along with millions of native animals. The bushfires are reported to have scorched more than 46 million acres, killing upwards of 33 individuals, and killing or displacing over a billion animals on the continent, even driving several native species to the brink of extinction. Consequently, BBC World News reported that additional global environmental tolls could be taken, with "plumes" of black carbon traveling over 7,000 miles from Australia to mainland South America (BBC), and NASA reported that the bushfires had expelled more than 306 million tons of CO₂ into the atmosphere (2020). Australia's Bureau of Meteorology reported that bushfires could create their own weather, thunderstorms, and further fire outbreaks due to increased lightning strikes. New South Wales was the most heavily affected of the states, harboring most of the nation's deaths and the most prolonged presence of bushfires. New South Wales experienced the longest prolonged occurrence of bushfires in Australia's history, and the 2019-2020 fires ravaged more land areas in the state than any other in the past 25 years.

Not Planning for the Future

Modern Australian energy consumption is dominated by coal (40 percent), oil (34 percent), and gas (22 percent), with coal accounting for more than 75 percent of Australia's electricity generation and natural gas at around 16 percent (Australian Government 2020). Not only is Australia now predominately reliant on coal for energy, but it is also the world's largest exporter of coal and the largest exporter of liquified natural gas. At the same time, more than half of their liquid petroleum fuel needs are met from importation because their oil reserves have decreased so significantly (Australian Government 2020).

The sector of Australian energy system regulation that deals with oil production and imports/exports has been left ineffective and inefficient due to a culmination of decisions made after the oil shocks of 1973 and 1978. Australia does not have a correlative or sustainable supply and demand chain that could overcome a crisis. According to Samantha Hepburn from *The Conversation*, in 2018, Australia had no more than 22 days' worth of crude oil, 59 days of liquefied petroleum gas (LPG), 20 days of petrol, 19 days of aviation fuel, and 21 days of diesel in reserve." According to the International Energy Agency (2020), every nation needs to have at least 90 days' worth of oil stockpile for them to make it through a hard time or crisis, but Australia has not met this quota in years.

Australia is the only import-dependent nation within the IEA that has no rules about stockpile requirements. The country is, therefore, very vulnerable to fluctuations within the market. From the late 1970's to the early 1980's, the Australian system depleted its natural oil reserves significantly, now leaving the state with few backups and placing itself in a dangerous situation. In 2020, the newspaper *The Australian* reported that, not unlike in 2018, the state has no more than three weeks of petroleum supplies. Angus Taylor, Minister of Energy and Emissions Reductions, has stated that his resolve for this issue is to buy large quantities of crude oil and store them in the United States Petroleum Reserve (Buchanan and Vivoda 2020). The United States and Australia have even entered negotiations hoping to make this plan a reality (Downie 2020); but this plan cannot protect the country from an external oil shock or a shock to other energy sectors like natural gas or coal. Currently, a price response to oil shocks of any magnitude is now predicted to be larger than at the time of the first and second oil crises (Allen 2014). Over the years, the price elasticity of demand and supply for crude oil has declined

periodically. Additionally, import parity pricing now means that global price movements are fully applicable to Australian prices.

In an analysis of Australia's Renewable Energy Law: Carbon Lock-in or Clean Energy Transition, it is reported that of the thirty countries that comprise the International Energy Agency (IAE), Australia has the highest value share of fossil fuel energy production (Prest, 2018). Furthermore, Australia has not yet developed a pragmatic strategy to solve its issues. While they are one of the leading natural gas exporters in the world, the 2019 Australian Energy Update issued by the Government stated that they are also quantifiable consumers: "Oil, including crude oil, liquefied petroleum gas (LPG) and refined products, accounted for the largest share of energy consumption, at 39 percent in 2017–18" (2019, 8). Oil consumption increased 3 percent in 2017-2018 due to the "increased consumption of refined products, mostly for transport" (Australian Government 2019, 8).

Progress in Renewable Energy

In terms of renewable energy, as of 2019, 21 percent of Australia's total electricity generation was produced from renewable energy sources: wind power (7 percent), solar power (7 percent), and hydro power (5 percent). In 2019 as well, renewable energy sources accounted for 6 percent of the total Australian energy consumption (Department of Industry, Science, Energy and Resources 2021). While electricity generation from renewables has increased almost double within the last decade, combustion of biomass (firewood and bagasse¹⁵) remains over 45 percent

¹⁵ Remnant of sugar cane pulp left after crushing and processing. Can be used in energy production.

of all renewable energy consumption in Australia, meaning other technologies have stayed relatively underdeveloped (Department of Industry, Science, Energy and Resources 2021).

Some states are willing to forgo ahead with some of their proposed energy plans despite what Prime Minister Scott Morrison has to say. New South Wales has recently passed legislation, promising generation of an extra 12 gigawatts of renewable energy within the next decade, while Victoria has proposed a AUD\$1.6 billion investment in building renewable energy hubs around the state, and Queensland investing more than AUD\$500 million in renewable energy generation as well. Individually, states may work on their own green initiatives and policies, but again only functioning on a local level. National energy policy is left to the discretion of the federal government, and the fossil fuel industry knows this, which is why small local green initiatives are not much cause for concern.

Over the last decade, solar and wind power have been primarily responsible for the growth of renewables within the country, however on a relatively local scale—the national growth is minimal. Small-scale solar generation has grown over 44 percent within the last decade, while wind generation has grown an average of 15 percent per annum over the past decade as well (Department of Industry, Science, Energy and Resources 2021). The once exception to a fossil fuel dependent Australia is the island state of Tasmania. Tasmania is located 150 miles south of the mainland, separated by the Bass Strait, running *completely* on hydroelectric and wind power for electricity generation.

Tasmania

As of December 2020, the World Economic Forum stated that “Tasmania met 100% renewable target after the 29th wind turbine went online at Granville Harbor on the islands west coast...The Australia island state now runs on 100% renewable energy, having met its goal to be fully self-sufficient on green energy two years ahead of schedule” (Marchant 2020). Australia’s current Energy Minister, Guy Barnett, stated “We have reached 100% thanks to our commitment to realizing Tasmania’s renewable energy potential through our nation-leading energy policies and making Tasmania attractive for industry investment, which in turn is *creating jobs* across the state, particularly in our regions” (Marchant 2020); an interesting statement considering the pushback renewables receive on the mainland their jeopardization of Australian jobs and the economy.

Tasmania has long been the greenest Australian state, beginning operations in its first hydropower station, Duck Reach Power Station, in 1895. The islands power generation now comes predominately from hydro power (90 percent), with the remainder being produced via wind power (Marchant 2020). Despite the potential of renewable energy alternatives being exemplified before its very eyes, within its own country, there is a great divide between the energy systems and beliefs of mainland Australia compared to that of Tasmania.

Conclusion

The modern history of the Australian fossil fuel industry has been laid out: its successes, hardships, political and economic ties, opposition, and polluting effects. Australia’s carbon lock-in has not waived, and after the coal boom, its grip only became stronger. So, the question is

then, what kind of external shock could rock Australia so viciously and make its vulnerabilities so apparent that there is no other option than to invest in renewable energy. What kind of event could trigger such action? Technology remains developmentally fluid, and there are new fossil fuel extraction methods expanding the waning supply (fracking and tar sand extraction), but the truth is, all of these resources are still finite, carbon-intensive, and vulnerable to disruption. Here are a few scenarios.

Shock to Oil, Coal, and Gas

By now, it is evident that Australia's fossil fuel industry is resilient and will not back down from opposition. The weakness in its current methods is that the emphasis is placed on developing and ensuring the prosperity of the energy export business, leading the country to have underdeveloped plans for their domestic energy supply. The fact is, Australia has a minimal oil supply. During the 1970's, the countries domestic oil industry was increasing in great stride. Since then, Australia has profoundly depleted their oil reserves and are once again reliant on imported oil to predominantly power their transportation sector. Currently, Australia imports most of its oil from Singapore and the Asia-Pacific region. If these markets experienced an energy crisis or disruption in price, the Australian economy would feel the brute force of its effects. The transportation industry within the country is reliant on imported oil and petroleum products, and if the import stream is disrupted, the industry would be thrown into a scramble. Coal is not an optimal substitution for petroleum products to power modern vehicles.

A disruption to the Asia-Pacific oil supply would impact the entire international oil market. Prices would rise, and product availability would decrease. This is a significant issue for Australia, but its close ties with the United States could be yet another saving grace for their

fossil fuel industry. As of 2020, Australia struck up a deal with the United States, allowing them to begin stockpiling oil in the US Strategic Petroleum Reserve for Australian usage. Australia proposed spending \$60 million to build an emergency stockpile while also taking advantage of the lowest oil prices in 21 years (Paul 2020). US crude was trading for \$11 USD a barrel, allowing Australia to stash more than 5 million barrels for an emergency stockpile. While this deal has not become official, it does outline Australia's understanding of the potential of another energy crisis. Instead of investing in alternative energy and developing those resources, Australia remains guided by its carbon lock-in. While the United States in some way may be able to assist Australia in a time of crisis, eventually, the stockpile will deplete, and the international market and economy will still have been affected. If the transportation sector succumbs to a shock, renewables may have an opportunity for development.

Australia's domestic oil production to net consumption ratio skyrocketed from 70 percent of the energy sector production in 1973 to 98 percent in 1984 (Acil Allen 2014). However, this production increase didn't last long, and it became an unsustainable practice. This decline in production can be due to the rise in demand for domestic oil, leading to the over-production and eventual depletion of the countries already-limited oil resources. Australia's domestic oil consumption thus declined to 44 percent of the state's domestic energy production by 2012, all the while transitioning to increasing consumption and reliance on natural gas and coal (Acil Allen 2014).

Australia is currently the world's largest exporter of both coal and liquefied natural gas. This means their reserves run deep, and a shock to these two resources on the export market will not directly affect the Australian energy supply because the country is self-sufficient. However,

this does not mean their export industries will not bear the consequences. When oil prices rise, other commodity prices also rise, which means initially, natural gas and coal prices may increase, affecting the demand for exports. In addition to this, if there is another energy crisis, the volatility of the fossil fuel industry may become more eminent, leading more countries to explore alternative and renewable energy sources, and lessening the demand for Australia's export market. The most apparent issue for Australia's natural gas and coal industries is that these energy sources are non-renewable—once the resource has been depleted, supply at reasonable prices disappear, and ultimately the search for energy sources will continue. Australia mines over 500 million metric tons of coal on average per annum and is financially reliant on coal as a pillar export industry (World-O-Meter 2016). While there are always new developments in technology that allow previously unreachable or undefinable resources to be processed, there is still only a finite number of resources, and as these resources are used, there is nothing to replenish them.

Australia has based so much of its modern economic success and development on the prolonged success of big coal, but what happens when the mines are depleted? While coal and gas may be their current answer, eventually the country will be forced to search for an alternative, in some ways, creating their own energy crisis. Australian mining policies are not sustainable and do not account for the future. Australia is concerned with short-term policies that will ensure quick cash in the present, but the industry does little long-term planning to ensure a sustainable future. Australia is so reliant on natural gas and coal for their domestic power that if a shock or shortage of either occurred, a large portion of electricity generation would be disrupted. Shocks to these resources would have significant physical and economic effects on the country's industries, domestically and internationally.

Climate Change as an External Shock

While disruptions to traditional fossil fuel energy sources are the most apparent external shocks that Australia could potentially experience, it is essential to consider climate change as a possible external shock as well. At some point, will the consequences of climate change outweigh the pros of intense fossil fuel consumption? Since the 1980's various climate scientists and social critics have warned that Australia would be among the most vulnerable countries to the climatic effects of climate change. Most of the country is hot and arid, and critical habitats are subtropical oases; these environments are incredibly delicate and rely on a predictable homeostatic nature and cycle. As more greenhouse gases are released into the atmosphere, the earth warms, the ocean warms, sea level rises, and weather patterns become more unpredictable and extreme. These delicate environments cannot stand the volatility of a rapidly changing ecosystem, and eventually the consequences of this will become increasingly evident. Therefore, is there an environmental event or consequence drastic enough for the government and the people to recognize the weaknesses of their system and their environment and ultimately search for an alternative energy source?

Australia is already dealing with the preliminary consequences of climate change. As summers become hotter and drier, the landscape becomes more akin to tinder. Wildfires have increased their size, volume, and power, destroying millions of hectares of land and wildlife as well as numerous built structures in the process. As temperatures rise in the atmosphere, they do in the ocean as well. Pollutants are also absorbed within the ocean, eventually changing the temperature, acidity, and oxygen levels, causing corals to begin the process of bleaching in mass quantities. Coral reefs are vital ecosystems for Australia, and if the great barrier reef continues to

bleach in mass quantities, the reef could eventually die and jeopardize Australia's coastal ecosystem. The loss of habitat knocks the environment out of homeostasis, and the consequences could be unprecedented. Natural food resources could decline, and people experience severe food price increase and famine for some—the consequences are numerous. For Australia, could these kinds of external shocks finally break them loose of their carbon lock-in, or will the country continue to maintain that the cost of externalities is worth economic success?

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