

Coal in a renewable energy transition

Final report for the project:

‘Enabling broader low-emissions advocacy coalitions
in the NSW coal-related sectors’

Project Number: RDE493-33

Dr Alfonso Martínez Arranz, University of Melbourne

Lead Chief Investigator

Dr Hedda Haugen Askland, University of Newcastle

Co-Investigator

Dr Stephanie Hardacre, University of Newcastle

Research Assistant

Mr Thomas Scelsi, University of Melbourne

Research Assistant

Dr Barrie Shannon, University of Newcastle

Research Assistant

8 November 2022

Acknowledgements

This work was funded by the Department of Regional New South Wales through the Coal Innovation NSW Fund, which is administered by the Minister for Regional NSW, Industry and Trade. It has also benefited from funding from the University of Melbourne and the University of Newcastle.

Any views expressed herein do not necessarily reflect the views of Coal Innovation NSW, the Department of Regional NSW, the Minister for Regional New South Wales, Industry and Trade, or the NSW Government.

We would like to thank Yasmin Box and Ivy Scurr for their earlier work on this project, the Melbourne Data Analytics Platform for technical support, as well as Sandra Kentish and Peter Cook for their thorough comments on earlier versions of this manuscript.

Executive summary

Climate and energy politics have been divisive in Australia, but there is no certainty as to where exactly the dividing lines run. Social science research has long identified energy as a key area of social contest. Academic literature on this topic has so far focused on the support – or lack thereof – of specific energy technologies by communities or expert debates on policy. This project marries the community-level concerns of public acceptance research with the policy studies concepts of ‘advocacy coalitions’ in order to present a whole-of-society understanding of key forces shaping the energy debate. Through the project, we seek to identify so-called discourse coalitions that generate a shared way of talking and thinking about energy politics.

The key questions addressed through this project are as follows:

- What are the main ‘discourse coalitions’ shaping the Australian energy debate?
- What are the core and peripheral beliefs associated with each coalition and who can be considered their key opinion leaders (KOLs)?
- What ‘sustainable energy futures’ might be supported by these coalitions?
- What energy future garners the broadest support across coalitions?

The project relied on a range of sources of information that cover different populations and historical periods. The empirical focus of the project is New South Wales (NSW), but we positioned this debate within its broader Australian context. We adopted a case-study approach with an online data-mining component consisting of social network and content analyses of social-media data (Twitter) and content analysis of newspaper and Hansard data. This was followed by a survey of a representative sample of the NSW population and an interactive exchange in a (Delphi-style) forum among coalition representatives identified in the survey. Finally, we carried out interviews and tested a communication strategy through community forums in three regional case-study areas: Illawarra and Hunter regions and the Far West, which correspond to three ‘energy hot-spots’ in NSW. The Hunter and Illawarra are marked by economies that have traditionally relied heavily on coal. The Far West was the region originally mooted for ventures involving carbon capture and storage (CCS), while also possessing large renewable energy potential.

Our Hansard analysis demonstrated that the current attention to coal issues is unprecedented in the Australian Parliament since the 1940s and 1950s when labour relations and supply issues were prominent in the coal sector. Then, bipartisan agreement led to the creation and continued operation of a Joint Coal Board (JCB) with the support of industry and unions. The JCB stimulated technological change, increased profits and wages, and set the scene for the export success of Australian coal from the 1970s onwards. In turn, our look at newspapers showed the continued regional importance of coal. However, it is notable that the coverage is focused on controversial issues (like opposition to mine extensions), that the importance of coal relative to other technologies is diminishing, and that an international outlook is becoming more common. In both Hansard and news sources, the importance of Australia-wide and NSW-specific environmental matters has clearly increased.

Based on the Twitter and survey data, we identified the following five main coalitions. In parentheses is the percentage of survey respondents in each, omitting the 11.2% with totally indifferent views. The descriptions below are backed by structured interviews, and the Delphi and community forums.

- **‘Renewable energy sources (RES) fans’ (22.5%)** are extremely supportive of renewables and renewables-related technologies (for example, batteries or high-voltage transmission), and very limited support for CCS and nuclear, particularly low for coal-related CCS. They have the highest ‘nature-centric’ scores and are very concerned with the ‘climate emergency’, advocating decisive government action to move away from fossil fuels, including stopping coal exports, towards small-scale energy and local control. They tend to lean towards individual political activism; hence, KOLs for this group include NGOs [redacted example in accordance with NSW Gov requirements], the most active Labor and Greens politicians, [redacted: left-leaning journalists], and international celebrities [redacted example].
- **‘Pro RES’ (24.7%)** support renewables, albeit less enthusiastically than RES fans, and show only limited support for CCS and nuclear. They express significant environmental concerns,

are more conciliatory and explicitly ask for expert involvement and bipartisanship in the measures adopted. On exports of coal, they are concerned about stopping the large revenue streams for companies and governments. Affordability is an important concern but less so. They are arguably a 'centrist' grouping that is likely to follow Labor politicians. [redacted: left-leaning] journalists are likely to feature prominently as KOLs, while pro-renewables Liberal politicians, as well as the occasional tech entrepreneur, may also have an influence.

- **'Tech fans' (12.3%)** display enthusiasm for most technologies, are more knowledgeable about them and best educated. They are focused on the possibilities for improved living conditions and equity through technological change and tend to have a global outlook. They are a relatively niche group whose KOLs are most likely to be big tech entrepreneurs and commentators, as well as science organisations like the CSIRO.
- **'Broad choice' (22.4%)** moderately support all technologies. Their main concern is that Australia's economy must be protected, so they are positive about introducing renewables if that helps with local affordability, air quality and emissions. They are, however, wary of letting go of fossil fuels for export revenues. This coalition's KOLs include both Labor politicians and a broader range of Liberal politicians, and both [redacted: right and left-leaning] journalists. However, rather than the occasional tech evangelist, this group may trust leaders in farming and other fields less directly associated with renewables.
- **'Sceptics' (6.9%)** are far more positive about supporting nuclear and coal-related technologies, but mostly seem wary of supporting renewables. They are deeply concerned that renewables threaten the grid's stability, which stems from a belief that nature is outside our control and influence. This dovetails with their deep scepticism that there is anything to do about climate change or outright denial that it is happening. Pride in the history and heritage of Australian coal, as well as nationalism, are likely contributing factors. KOLs include One Nation politicians, and contrarians who question mainstream views on climate, COVID and other topics.

All coalitions except the Sceptics see a renewables-focused energy future, with slight variations on the type and level of backup that these renewables will require. RES fans are inclined to support local battery solutions and Broad choice advocates hold the view that some percentage of coal and gas will need to remain. Sceptics would, in stark contrast, prefer to continue with fossil fuels. Thus, the domestic preferences of the vast majority of people align with the current plans of the NSW Government and the energy market operator: a renewables-focused grid with a significant amount of storage and only residual black-coal generation within the next 15–20 years.

Restricting coal exports is currently not widely supported, and Sceptics clearly oppose it. However, as climate change becomes more obvious and the Australian grid decarbonises, opinions are likely to resemble views on the domestic use of coal. It can be anticipated that in the next 15-20 years there will be a growing demand for any coal exports to be justified in climate-mitigation terms; for example, guaranteeing steel production for a range of sustainable products with coking coal.

Recommendations

The recommendations to the Coal Innovation NSW Fund from this project are structured around the need to re-engage disenchanted stakeholders and better advertise how coal-related technologies, such as coking coal and carbon capture and storage (CCS), could support a transition to renewables in the short term and a low-carbon future in the long term. In summary, the recommendations are as follows:

1. Rebuild trust with local communities and include a wide diversity of voices in consultations
2. Educate communities and KOLs on technologies related to coal, notably CCS.
3. Clarify the role of coking coal in any sustainable energy future.
4. Emphasise the long-term, international and generic significance of CCS research beyond coal-fired power, which may be funded by Australia.
5. Invest in a platform to build future consensus, cooperation and collaboration.

Lay Summary

Climate change is happening, and it is mainly caused by the expansive use of coal, gas and oil for energy since the industrial revolution. To minimise climate risks, such as higher frequency of droughts and floods, the future of energy must be different. However, the details of this potential energy future can be controversial. People may think one technology is clean, while another is cheap and yet another dangerous. One technology may get them a job or be a good investment for them, while another will benefit their competitors. Research has often focused on opinions about one energy technology in one group of people or location. In contrast, this project gathered opinions about *all* major energy technologies across diverse regions and groups of people in New South Wales (NSW), Australia. We have sought to know *what* energy technologies people support, *why* these technologies, and *who* they may look to for inspiration in their position. Our goal through this project is to understand what type of energy future is supported by a large majority of people, and why this is supported over others, so that we may be able to reach it with the most benefit to all.

The project has used a variety of online and on-the-ground sources, with a focus on three ‘energy hotspots’ in NSW: the Hunter, the Illawarra, and the Far West. First, we looked at historical records of parliamentary debates going back to 1901 to explore the historical developments of energy policy and debate. Second, we analysed news to set the more recent context. Third, we looked at Twitter to better grasp the way influential individuals see energy futures, and how they are connected to one another. Fourth, we conducted a large survey among adults in NSW to better gauge what are average and what are fringe views. Fifth, we invited a selected group of people identified through the social media and survey analysis with diverse opinions to an online forum (a ‘Delphi forum’) to exchange views and answer our own questions. Sixth, we visited the Hunter, Illawarra and Far West and interviewed a selected sample of local residents. Finally, we invited people from those regions to attend a community forum and focused discussion online.

Our results show that we can divide people into five ‘coalitions’ judging by their support for different types of energy technologies and their reasons behind this support:

- **‘Renewable energy sources (RES) fans’ (22.5%)** support renewables and have a low support for coal and nuclear. They show deep concern about nature and climate change and think immediate action is required. They look up to activist NGOs, Green or Labor politicians and international celebrities like [redacted example].
- **‘Pro RES’ (24.7%)** are similar to RES fans but less enthusiastic and more conciliatory. They explicitly ask for expert involvement and bipartisanship in the measures adopted. They are likely to follow Labor politicians, [redacted: left-leaning] journalists or pro-RES Liberals.
- **‘Tech fans’ (12.3%)** display enthusiasm for most technologies, are more knowledgeable about them and best educated. They are a relatively niche group who follow big tech entrepreneurs and commentators, as well as science organisations like the CSIRO.
- **‘Broad choice’ (22.4%)** are moderately supportive of all technologies. Their main concern is that Australia’s economy must be protected. This coalition follows both Labor politicians and a broader range of Liberal politicians.
- **‘Sceptics’ (6.9%)** include people who are more positive about nuclear and coal-related technologies compared to the others. However, they are mostly opposed to RES. They often deny the reality of climate change and follow far right politicians.

Apart from the Sceptics, people prefer a renewables-centred energy future. Disagreements centred on the level of ‘help’ that renewables require from other technologies and the speed with which they can take over. This roughly coincides with the latest expert projections for the Australian electricity grid where coal and gas contributions will be minimal. Opinions are less definitive in relation to reducing Australia’s coal exports. Nonetheless, as the Australian grid decarbonises, popular opinion on exports will likely align with the general preferences for energy technologies and there will be a growing demand for any coal exports to be justified in climate-mitigation terms.

Our recommendations include rebuilding trust with communities and improving education on the role coal plays in supporting a renewable energy future, for example in steelmaking. We also recommend improving education about technologies like carbon capture and storage, particularly in these supporting roles rather than as a way to prolong local coal-fired power. Lastly, we argue for a platform that will promote agreement between different interest groups.

Table of Contents

Acknowledgements	2
Executive summary	i
Recommendations	ii
Lay Summary	iii
Table of Contents	iv
List of Tables	v
List of Figures	v
List of Abbreviations	viii
1 Introduction	1
1.1 Background to the topic	2
1.2 The report	3
2 Previous work: Technologies and policy coalitions	4
2.1 Social acceptance of energy technologies	4
2.2 From advocacy coalitions to discourse coalitions	5
3 Project aim, objectives, milestones and performance measures	7
3.1 Project aims and objectives	7
3.2 Milestones and performance measures	7
4 Project materials and case-study, multi-method approach	11
4.1 Online location	11
4.2 Geographical locations	12
4.3 Methodology	15
5 Hansard and news	16
5.1 Method: content analysis	16
5.2 Results for Hansard	18
5.3 Results for news	23
6 Twitter	28
6.1 Method: Social network analysis	28
6.2 Results	29
7 Survey	37
7.1 Method	37
7.2 Results	40
8 Delphi forum	50
8.1 Method	50
8.2 Results	51
9 Interviews	53
9.1 Method: semi-structured interviews	54
9.2 Results	55
10 Community forums	61
10.1 Method	61
10.2 Results	63
11 Discussion	65

11.1	Beliefs and key opinion leaders	65
11.2	Sustainable energy futures	68
11.3	Enabling broader coalitions	72
12	Conclusion	75
13	Recommendations	76
14	References	78
15	Appendices	83
15.1	Staff	83
15.2	Publications	83
15.3	Technical summaries	83
	SIGN OFF	84

List of Tables

Table 1:	Project milestones	7
Table 2:	Milestone description and performance measures	8
Table 3:	Modelled topics from the Hansard dataset with their top 10 terms, automated labels and expert labels	17
Table 4:	Numeric distribution of responses to survey. Each location excludes all others (for example, Major rural does not include rural locations in the Hunter)	38
Table 5:	Representative storyline by coalition on coal-related tweets	35
Table 6:	Strong language use by coalition	36
Table 7:	The median or most common values for the most relevant variables for each coalition	45
Table 8:	Distribution of members of each coalition, with largest percentage highlighted (percentages as depicted due to rounding)	46
Table 9:	Summary of responses questions on the desired speed of transition	53

List of Figures

Figure 1:	Overview of key literature on social acceptance of energy. Size of circles indicates citations and field size is denoted by coloured area. Figure is modified from Gaede and Rowlands (2018). 1 = wind power, 2 = renewable energy willingness to pay, 3 = household behaviour, 4 = CCS, 5 = nuclear, 6 = community renewable, 7 = hydrogen vehicles	4
Figure 2:	Sample schematic of the relationship between coalitions, themes and the raw data analysed in the project	6
Figure 3:	Illustration of the locations of the three case study areas of the present study. Boundaries follow the NSW local government areas these regions are generally considered to encompass.	12
Figure 4:	Satellite view of the Hunter Valley region with local government area boundaries and some major towns. Green circles indicate clusters of towns that could not be depicted individually.	13
Figure 5:	Satellite view of the Illawarra region with local government area boundaries and some major towns. Green circles indicate clusters of towns that could not be depicted individually.	14

Figure 6: Satellite view of the Far West region with local government area boundaries and some major towns.....	15
Figure 7: Representation of a social network with a 'central' node highlighted in red. Adapted from Wikimedia.....	29
Figure 8: Data analysis process for topic modelling with and without automated topic labelling. For simplicity, the inference step (4) does not represent the incorporation of non-topic data	18
Figure 9: Spatial distribution of respondents to survey over a map of NSW. Note that the boundaries of LGAs and postcodes do not match perfectly.	38
Figure 10: Level of discussion of coal-related issues in the Australian Parliament and our division into eras. The value 1 corresponds to the largest total amount of discussion in 2012 with the remainder scaled relative to it.	19
Figure 11: Categories of topics averaged by legislature period. Coloured bands represent periods of Labor (red) and Liberal (blue) governments. Y axis shows the relative prevalence of the topic.	20
Figure 12: Production of Australian coal and breakdown of black coal production and the share of exports (of both coking and thermal coal) 1901–2020 (in million metric tonnes, left axis) (ABS 2021; DISER, 2021a, 2021b), number of coal workers (in red, in thousands, right axis) (ABS 2021), and period of mechanisation sponsoring by the Joint Coal Board (Eyre, 1988).....	21
Figure 13: Environmental impacts and climate change topics prevalence distribution (y-axis), showing the Greens a clear driver of discussions. As in Figure 11, background colour bands indicate government in power. Party colours in lines as per Figure 11.....	22
Figure 14: Overall occurrences by quarter of sets of technology terms in the two subdivisions of the news dataset	23
Figure 15: Occurrences as in Figure 14 but divided by the number of standardised articles in each quarter	24
Figure 16: Selected topics in news-coal dataset.....	25
Figure 17: Trends in type of coverage in the news-coal dataset	25
Figure 18: Trends in type of coverage of the news-solar dataset.....	26
Figure 19: Types of CCS application mentioned in newspapers (empty fields mean no mentions in that month)	27
Figure 20: Types of hydrogen pathways mentioned in newspapers (empty fields mean no mentions in that month)	28
Figure 21: Basic numbers for each Coalition identified with leading eigenvector algorithm.....	30
Figure 22: Technologies mentioned in each coalition as a proportion of all sentences (counted once per tweet)	34
Figure 23: Mentions of various technologies by month in the period July 2020–July 2021 (counted once per tweet). See Figure 22 for colour legend.....	35
Figure 24: Average support for specific energy technologies as a difference from the average support across all technologies.....	41
Figure 25: Graphical display of estimates (points) and their confidence intervals (lines) for all major variables in the ordinary least squares (OLS) regression model for a selection of renewable and non-	

renewable–related technologies. The ‘condition’ variable and its interactions with ‘our_regions’ are omitted as their estimates were imprecise (large confidence intervals).	41
Figure 26: Marginal effects of nature-centric attitudes (NEP score) on support for a selection of technologies with estimates at different levels of expressed concern for ‘economy’. All other variables held at their mean. All axes in this figure are on a 5-point scale (1 = lowest level, 5 = highest level)..	42
Figure 27: Marginal effects of NEP scale on support for a selection of technologies with estimates at different levels of perceived levels of ‘participation’ in the decision-making process. All other variables held at their mean. The axes scales are as in the previous figure.	43
Figure 28: Histograms depicting each coalition’s level of support for each technology. All items are on a 5-point scale (1 = lowest level of support, 5 = highest level of support).	46
Figure 29: Plots depicting each coalition’s knowledge of and level of support for each technology	47
Figure 30: Bar chart depicting preferred pathway choices of each coalition represented as a function of negative emissions technology penetration	48
Figure 31: Histograms depicting each coalition’s views on the need to stop coal exports for various reasons (Strongly disagree = 1, Strongly agree = 5, DK = ‘don’t know’)	49
Figure 32: Australian Energy Market Operator’s 2036-2037 forecast for NSW generation capacity as presented in the NSW Electricity Infrastructure Roadmap (DPIE, 2020: Figure 4)	71
Figure 33: Australian coal export scenarios by the Reserve Bank of Australia (RBA 2021).	71
Figure 34: Qualitative spatial representation of the positioning of each Twitter coalition regarding attitude towards the conversation and support for fossil fuels. Size represents breadth of opinions rather than number of constituents	73
Figure 35: Qualitative spatial representation of the positioning of each survey-based coalition as in Figure 33. Grey shapes in background stand in for those in Figure 33. The dot-dashed square indicates roughly the area with greatest agreement	73

List of Abbreviations

ACM = Australian Community Media
AEMO = Australian Energy Market Operator
API = application programming interface
ATIR = Australian Technology Investment Roadmap
BECCS = bioenergy with carbon capture and storage
CCS = carbon capture and storage
CPRS = Carbon Pollution Reduction Scheme
CSG = coal seam gas
CSIRO = Commonwealth Scientific and Industrial Research Organisation
DPE = Department of Planning and Environment
DPIE = Department of Planning, Industry and Environment
DTM = dynamic topic modelling
GHG = greenhouse gas
GRDC = Grains Research and Development Corporation
GRP = gross regional product
HELE = high efficiency low-emissions coal
HVDC = high-voltage direct current
IEA = International Energy Agency
IPCC = Intergovernmental Panel on Climate Change
JCB = Joint Coal Board
KOL = key opinion leader
LCA = latent class analysis
LDA = latent Dirichlet allocation
LGA = local government area
LNG = liquified natural gas
NEM = National Energy Market
NEP = new environmental paradigm
NGO = non-governmental organisation
NLP = natural language processing
OLS = ordinary least squares
RES = renewable energy sources
REZ = renewable energy zones
SNA = social network analysis
TAFE = technical and further education

1 Introduction

Climate change and energy are two highly divisive issues in Australian politics. However, little is known about the exact nature and boundaries of the divisions that shape these debates. As Australia responds to the unfolding climate crisis and commits to reducing carbon emissions, questions about diverse energy sources are becoming more important. Meeting the needs of the future requires present-day investment and commitment to transitioning towards sustainable low-emissions technologies. But what does this energy future look like, and how can support for a new energy future be harnessed across all levels of society? What place will fossil fuels have in this future through emissions reduction technologies such as carbon capture and storage (CCS)?

This project explores these broad questions through investigating community attitudes to Australia's energy needs. Social perceptions of and public attitudes towards energy technologies are a key factor affecting decision-making on energy development, consumption and policy (Batel et al., 2013; Groves, 2017; Scheer et al., 2017). As Li et al. (2019, p. 1) argue, 'social perception concerning various energy issues deeply affects our energy future', and, as a result, 'public advocacy and opposition largely decide the fate of, and influence the passage and success of, energy policies'. Social scientists have long recognised the importance of popular imagination, as well as the specialised role of certain actors in envisioning alternative futures that society works towards. (Groves, 2017). However, research into future energy visions remains scarce and existing scholarship has emphasised the social acceptance or rejection of distinct energy sources, rather than their combination.

In democratic countries such as Australia, decisive changes require large coalitions among political parties, businesses, activists, media agencies and local communities, which are assumed to be coordinated by a set of beliefs or discourses – that is, the way people think and talk about an issue. Hence, we know that people work for policy change through coalitions-building, but how these coalitions are constituted in the sphere of energy policy and the substance of their respective beliefs or discourses, as well as their interconnections, remain unknown.

Employing the theoretical framework of 'advocacy coalitions' developed by Paul Sabatier (1988), this project seeks to identify how people cluster around different energy futures. The concept of 'advocacy coalitions' refers to alliances of people around a shared policy goal; people in an advocacy coalition will share similar ideologies and world views (some 'core' and some 'peripheral' beliefs) and seek to advance policy in support of their view.

Through a mixed-methods approach that combines online data mining as well as qualitative and quantitative methods, we analysed the public discussion of energy technology in Australia and NSW. In this report, we aim to reveal how these energy futures relate to one another, the advocacy coalitions around them, and their key champions. We seek to identify the distinct 'beliefs' or 'discourses' that guide the narrative lines of each future and coalition, and the broadest agreement that can be attained to build strong, resilient and sustainable communities in coal-related sectors in NSW.

Specifically, the project aims to answer the following three research questions:

- What are the core and peripheral beliefs associated with each coalition and who can be considered their key opinion leaders (KOLs)?
- What 'sustainable energy futures' might be supported by these coalitions?
- What energy future garners the broadest support across coalitions?

The project can be read as a response to the scale of the climate-change challenge, which has prompted calls for national mobilisation and unity (Delina & Diesendorf, 2013). We seek to identify what type of energy future is most likely to cut across any potential polarisation to deliver a broader coalition that will ensure best results for NSW and for Australia.

1.1 Background to the topic

In the Australian climate change debate, opinions have often become highly driven by partisanship (Tranter, 2013). This polarisation is often observed or assumed in debates regarding the future of energy generation, particularly the continued role of fossil fuels, and the speed and ability of renewables to take a leading part in energy transition (Hart, 2012; Jang, 2015; McKinnon, 2016). Scholarship on polarisation explains that opposing ideologies are further exacerbated by ‘echo chambers’, or spaces where people only hear the opinions of those they agree with (Barberá, 2015; Boutyline & Willer, 2017; Wagner & Ylä-Anttila, 2018; Williams et al., 2015; Landoli et al., 2013). Echo chambers within the energy debate are generally understood to be located at the conservative/right and progressive/left ends of the political spectrum, with one supporting fossil fuels and the other supporting renewables (respectively). A general claim is that conservatives are less likely to venture outside of their echo chamber (cf. Barberá 2015; Tsai et al., 2020). Arguably, this polarisation and the phenomenon of echo chambers hamper proper policy development and technology deployment. Polarisation is, however, not a simple matter of either-or (*bipolar* concern), and echo chambers do not seem to appear everywhere (De Francisci Morales et al., 2021). In Australia, conflicting views and actions can be seen in both the right-leaning Liberal and the left-leaning Labor parties, which together represent a vast majority of the Australian electorate (Hudson, 2017). A short overview of the back-and-forth on energy policy in the country illustrates this point.

1.1.1 Political context: Polarisation on climate and energy issues?

Liberal Prime Minister John Howard was elected in 1996, in time to negotiate and sign the first major global agreement on greenhouse gas emissions reductions: the 1997 Kyoto Protocol. However, in coordination with then US President George Bush, Howard rejected Kyoto as flawed and did not ratify it. In 2007, the Labor Party was elected on a platform explicitly including the ratification of the Kyoto Protocol and with promises of a Carbon Pollution Reduction Scheme (CPRS). When in power, Labor struggled to implement the CPRS and other measures that would affect the fossil fuel industry. It confronted both a fluctuating position from the Liberal-National Coalition in the opposition, as well as dissension in its own ranks (Lapham & Palmer, 2020). The Australian Greens, which held the balance of power in the Senate at this time, also refused to support the package because of what they argued was an insufficient and watered-down policy. The CPRS eventually passed in 2012 but was swiftly repealed the year after when the Coalition regained power and Tony Abbott became Prime Minister. By this stage, the CPRS had also caused disruption within the conservative ranks with Abbott replacing the previous Liberal leader Malcolm Turnbull, in part because of his perceived closeness to Labor’s, and even the Greens’, position in negotiating the details of the CPRS (Hudson, 2017).

The Coalition has retained the federal government since 2013. Over the past nine years, climate change and energy policies have continued to be highly contested. There has been two leadership challenges and subsequent changes of Prime Minister that reflect this contestation: Tony Abbott was succeeded in September 2015 by Malcolm Turnbull, who lost the role to the Scott Morrison in August 2018. Inconsistency in political approaches to energy sources and climate change is also apparent at the state level, where both Liberal and Labor governments have approved controversial new coal mines while setting ambitious renewables targets (Stutzer et al., 2021).

A divided energy-policy debate is not unique to Australia. Other major fossil-fuel producers, notably the US and Canada, are confronted with similar conundrums despite commitments to Paris Agreement goals. The US case has been abundantly discussed and seems to offer an obvious example of polarisation. For example, news coverage of climate change in the US increasingly cites political rather than scientific commentators. The terms of the discourse are coloured by whether the commentator is Republican or Democrat, with both major parties adopting increasingly irreconcilable positions (Chinn et al., 2020). European attitudes are rather different, with conservative governments frequently endorsing or even championing climate-change initiatives. In Germany, for example, a broad consensus has existed since 2000 in terms of a fossil and nuclear phase-out with contention remaining only on the details and speed of fossil-fuel phase-out (Strunz, 2014). Similarly, in the UK, climate policy has become a point of general agreement with only a small, albeit vocal, minority in discord (Lockwood, 2013).

Overall, it remains an open question to determine to what extent the opinions on energy and climate issues are always irreconcilably opposed, as in the US Republican–Democrat divide, or if there is a multipolar field of opinion composed of more than two main groupings. Since these groupings are

often attached to energy technologies, which combinations of technologies are most favoured? How can support for or rejection of energy futures, in different technological settings, be understood across all levels of society and between various stakeholders? Where do current technologies such as coal fit in those energy futures? These are the questions we aim to address in this report.

This project responds to the need to achieve broad consensus if we are to meet the challenges presented by the momentous transformations underway in our society. Guided by a well-supported theoretical framework that explains political action as being channelled by advocacy coalitions, we seek to ascertain the potential for broader coalitions to appear. With this in mind, we first describe support for different technologies and the distribution of beliefs around them. Armed with this knowledge, we can then explore where and how the space for broader coalitions in coal-related sectors might exist.

1.2 The report

This report outlines the key findings of the project and offers a set of recommendations. The report is divided into 13 parts:

- Following this introduction (**Section 1**), **Section 2** will further outline the theoretical framework for the project and previous work on the acceptance of technologies and policy coalitions.
- **Section 3** establishes the project aims, objectives and milestones.
- **Section 4** discusses the project case-study and multi-method approach. The case-study areas are the online space, the Hunter Valley, the Illawarra, and the Far West. The project focuses on NSW, but we recognise that the regional debate sits within a national context and is reactive to both national and global events. The online case study seeks to capture the national and global forces that shape the regional debate. The three case-study areas have been chosen because of their history as mining regions and their position as sites for renewable energy intervention.
- **Sections 5-10** describe each main method and the results most associated with it. Computer-assisted content analysis was carried out for Hansard, newspaper articles (Section 5), as well as Twitter data (Section 6), for which we also did social network analysis. In addition, we conducted a survey (Section 7), a Delphi forum (Section 8), semi-structured interviews (Section 9) and community forums/focus group (Section 10). Each method constituted a distinct project stage, although the online component continued in the background. We started with the aim of getting a broad overview of the field of study by conducting the data mining online (social network analysis and content analysis) and survey. Subsequent to initial analysis, we sought to go deeper into the various issues identified through a qualitative approach, with the Delphi forum and semi-structured interviews adding more detail and richness to the initial findings. The final stage was the community forums/focus group with the objective of dissemination of results and gathering feedback on them.
- **Section 11** offers a discussion of the results. We show how the different advocacy coalitions that we identify are marked by their support or rejection of particular energy technologies and that with the exception of one coalition, which represents some 6–10% of the population, all agree on renewables having a very large role to play. The opinions are more divided on the role of coal-related technologies, including CCS.
- **Section 12** presents the key conclusions and answers to the research questions.
- **Section 13** offers a set of recommendations.

2 Previous work: Technologies and policy coalitions

The topic of energy futures brings together micro and macro levels of society. This is a domain in which local lives and global forces intersect into a combination of local communities, energy infrastructure and projects, economic interests, and geopolitical struggles (Loloum et al., 2021). Within the social sciences there has been a growing concern with energy as a field of inquiry, often linked with debates around social and environmental impact, climate change, and energy transition (for example, Carley et al., 2018). Within anthropology, the growing attention to energy has provided critical explorations into the different ways that people perceive and use the fundamental resource of energy. Current literature takes two particular approaches: one that focuses on corporate and state power, and another that centres on advocacy for energy transition (High & Smith, 2019). This body of research has presented insight into distinct ethical questions and perspectives, showcasing deep dilemmas that concern the question of how to reconcile global sustainability with, as Eriksen (2016, p. 33) puts it, ‘common dreams and notions of the good life’. This body of work has showcased how progress as economic growth is connected to energy, and, in many ways, to coal use.

This project considers existing scholarship on the public acceptance of multiple energy technologies. However, its larger scale leads us to adopt understandings of broader ‘coalition’ frameworks, such as the advocacy coalition developed by Paul Sabatier in the later 1980s. ‘Advocacy coalitions’ are alliances of people around a shared policy goal; people in an advocacy coalition will share similar ideologies and seek to advance policy in support of their view. We complement this approach by focusing on the key storylines, or discursive patterns, that facilitate the linkage between disparate people and organisations. In democratic countries such as Australia, decisive changes require large coalitions across political parties, business, activists, media, and local communities, all of whom are coordinated through sets of beliefs that are communicated verbally, i.e., ‘discursively’.

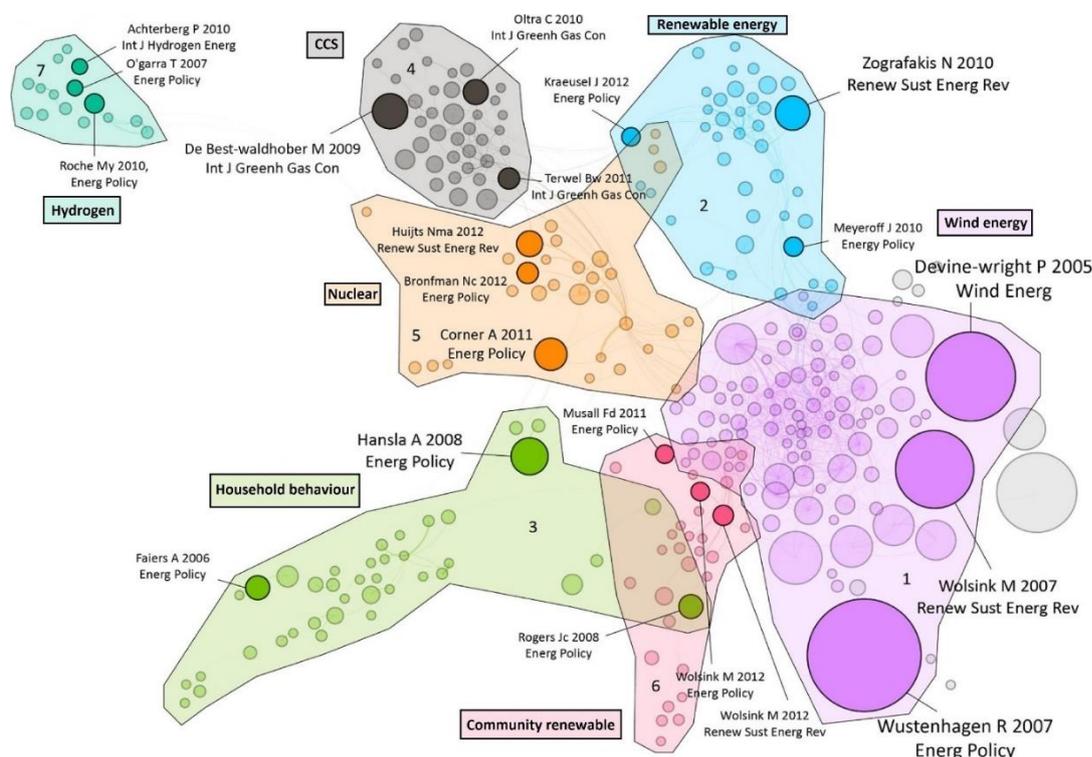


Figure 1: Overview of key literature on social acceptance of energy. Size of circles indicates citations and field size is denoted by coloured area. Figure is modified from Gaede and Rowlands (2018). 1 = wind power, 2 = renewable energy willingness to pay, 3 = household behaviour, 4 = CCS, 5 = nuclear, 6 = community renewable, 7 = hydrogen vehicles

2.1 Social acceptance of energy technologies

The literature of public acceptance is, in the aggregate very much concerned with renewable energy (Gaede & Rowlands, 2018; Wüstenhagen et al., 2007). Figure 1 by Gaede and Rowlands (2018) shows an overview of the key literature on social acceptance of energy technology. Circles represent

publications, and their size indicates the number of citations these publications have received, highlighting major publications. Publications are grouped by their citation proximity, and the coloured shapes thus denote consistent areas of research, their linkages and overlaps. Figure 1 indicates that the energy technology that has received most scholarly attention is wind specifically and renewable technologies more generally.

2.1.1 Coal-related technologies acceptance: carbon capture and storage

However, the above does not mean that the coverage of other technologies has been limited. In terms of coal-related technologies, CCS has had a healthy coverage of many aspects of its “public acceptance”. Nielsen et al. (2022) reviewed studies on community acceptance of CCS between 2009 and 2021 and found three main areas of “contestation”: firstly, on the implications of “acceptance by stakeholders” (proponent and affected population), secondly, on the representation of communities in the decision-making, and, thirdly, on the impacts of CCS and how these were represented by local communities, politicians and scientists.

The first two dimensions arguably boil down to concrete issues of *trust*. For example, Terwel et al. (2011) have shown that people trust NGO stakeholders more than industry stakeholders; and Einsiedel et al. (2013) showed that trust in industry and government and perception of fairness in the process was important aspects of support.

The last dimension of impacts in Nielsen’s review has more concrete manifestations in the “*not in my backyard*” dynamics reported from places as diverse as nuclear-powered Switzerland (Wallquist et al., 2012), coal-rich China (Guo et al. 2019) or oil-rich Texas (Moon et al. 2020). But it is not only people’s own backyards, but rather a general perception of their perceived impact on people’s ideal of nature (Wolske et al. 2019). In this note, Arning et al. (2019) found that utilisation of is perceived as less risky than storage.

Nonetheless, a persistent finding is that, particularly on a national scale, people know little about the technology per se, including in Australia (Ashworth et al., 2015; 2019), where there has been significant public investment on CCS and high-profile projects like the Gorgon project. This indicates that most studies on acceptance of CCS, many of them consciously so (van Rijnsoever et al., 2014, 2015), are generating the opinions on-the-go.

We argue that this type of social acceptance research (which tends to focus on whether one technology is accepted or not) works best from a local-community acceptance perspective. However, at the scale of a state within a federation, such as NSW, simultaneous consideration of a full range of technologies is required (van Rijnsoever et al., 2015) and a different approach to understanding the why of support (beyond the characteristics of the technology itself). As noted by Whitmarsh et al. (2019), when studying the framing effects on public support for CCS, ‘targeting CCS information to audience values is likely to be more effective than untargeted communication’. Our project focuses on trying to understand those audience values rather than exclusively trying

Van Rijnsoever et al. (2015) note that while ‘preferences for technologies are likely to vary between agents [that is, individuals], relatively homogeneous groupings of people can often be identified based on observed or unobserved characteristics’. For the purposes of this project, we argue that these preferences are indeed established on a larger scale, at the level of ‘coalitions’, which are influenced by both local issues and broader socioeconomic and political trends. Hence, the priority is in identifying and understanding such coalitions.

2.2 From advocacy coalitions to discourse coalitions

In the traditional view, advocacy coalitions consist of ‘actors from a variety of institutions who share a set of policy beliefs within a policy subsystem’ (Sabatier & Weible, 2007). The policy subsystem that we focus on in this project is the one underpinning climate and energy policy. In line with Sabatier’s (1988) analytical framework, we identify two types of beliefs:

- (a) **Core beliefs** reflect fundamental assumptions about human nature and civilisation that are deep and normative, clearly differentiating one coalition’s attitudes and choices from another. These will be resistant to change.

- (b) **Peripheral beliefs** cover 'negotiable' elements that are not essential to understand the position of the coalition in the specific subfield.

The advocacy coalitions framework focuses on institutionally empowered individuals, such as 'elected and agency officials, interest group leaders or researchers' who share a particular belief system and 'who show a non-trivial degree of coordinated activity over time' (Sabatier, 1988, p. 139). But this leaves out many elements of society that can influence the belief formation of those individuals. In addition, the relevant degree of 'coordinated activity' is hard to pinpoint. Arguably, publicly expressing an opinion on an energy technology ('I love coal/solar/wind') and casting an anonymous vote in favour of a candidate that backs this belief is non-trivial coordination. The defining feature of members of sustainable energy advocacy coalitions is that, when presented with the opportunity, they will support a similar energy future that uses some technologies and not others. They will base this support on certain beliefs that stem from more general 'themes'. While social media provides an important window into 'advocacy coalitions' of influential people, we are interested in advocacy relationships that are formed within broader society.

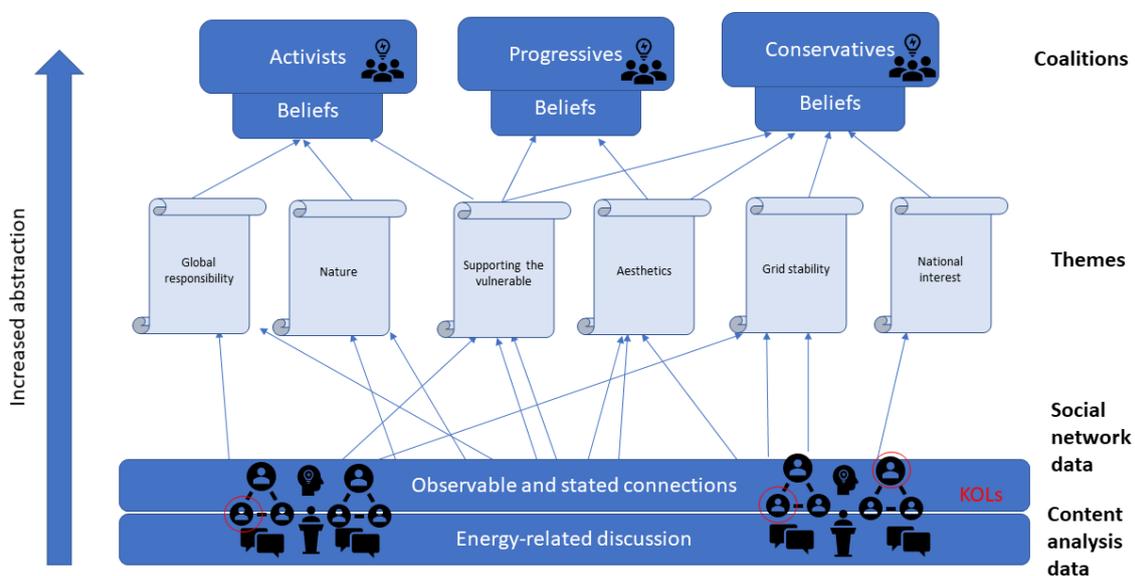


Figure 2: Sample schematic of the relationship between coalitions, themes and the raw data analysed in the project

Another appropriate way to describe the sustainable energy coalitions that we are interested in is as 'discourse coalitions' (Hajer, 1995). Many coalitions on social media and elsewhere are linked together by the way they understand and discuss a topic, rather than by sharing the closer coordination of action often implied by the term 'coalition'. With regard to attitudes towards energy and climate issues, these are coalitions that 'develop and sustain a particular discourse, a particular way of talking and thinking about environmental politics'. Importantly, the members of these coalitions may never have met, 'let alone follow a carefully laid out and agreed upon strategy' (Hajer, 1995, p. 13). In line with this, the goal of this project is to identify and understand the discourse coalitions in the energy debate, in which different types of people group together around certain beliefs.

An important element of advocacy coalitions is 'policy brokers', which, in the social media and other contexts, are often described as 'key opinion leaders' (KOLs) (Ritter & Bammer, 2010). They represent central nodes within the coalition for knowledge exchange and are essential to achieve the necessary majorities that push policy forward. This exchange of information operates in a discursive fashion in the sense that KOLs must use language and build 'storylines' to communicate their beliefs (Cotton et al., 2014; Leifeld, 2013).

3 Project aim, objectives, milestones and performance measures

This section outlines the project aims, objectives, milestones and performance measures as set out in the funding agreement.

3.1 Project aims and objectives

The stated aim of this project is to understand who forms the ‘advocacy coalitions’ that operate in the NSW low-carbon-technologies space, what their ‘belief systems’ are, and who can be considered their ‘key opinion leaders’ (KOLs). The study seeks to learn from interactions between KOLs in order to help improve communication strategies and to help engender new coalition-building.

The aims translate into the following objectives:

1. map diverse energy advocacy coalitions and gain a deeper understanding of who constitutes them and what beliefs people associate with them and who usually represents and disseminates those beliefs
2. better understand the support for combinations of energy technologies that could be deployed for a transition to sustainability (‘sustainable energy futures’)
3. ascertain the sustainable energy future with the broadest potential support base.

This research project seeks to better understand the mechanics of ‘advocacy coalitions’ for low-carbon technologies in coal and coal-related sectors (notably mining, electricity and steelmaking) to show how they may best be harnessed by policy-makers. Policy proponents can leverage this knowledge for better targeting of funding and resources for low-emissions coal technologies, most notably carbon capture and storage (CCS).

3.2 Milestones and performance measures

Table 1 is adapted from the signed Funding Deed’s Attachment 4 and outlines the project milestones. This table accompanied all quarterly reports. In Table 2 we explain each milestone in greater detail and summarise the performance measures associated with them.

Table 1: Project milestones

ID	Milestone	Start date	Reporting
M1	Research design and ethics application	Q1, 2020	Q1, 2020
M2	Social network analysis	Q1, 2020	Q2, 2020
M3	Content analysis	Q2, 2020	Q3, 2020
M4	On-the-ground data collection	Q3, 2020	Q4, 2020
	Stage-gate assessment		
M5	Identification of KOLs	Q1, 2021	Q1, 2021
M6	Delphi forum	Q2, 2021	Q2, 2021

M7	Building of communication strategy	Q3, 2021	Q3, 2021
M8	Evaluation of communication strategy	Q4, 2021	Q4, 2021

Table 2: Milestone description and performance measures

ID	Status (%)	Relevance to project and performance measures <i>Description of achievement of performance measures</i> Key takeaways (where applicable)
M1	100%	<p>This step was condensed in the ethics application, which contained a guiding document for terms of reference and methodology, including the specific survey sites at the data collection and evaluation stages. It was informed and validated by a workshop with the research team and representatives from relevant departments. This document identifies all relevant actors, events, topics and terminology relevant to the NSW coal industry to enable proper setup of data-mining tools. This identification of terms of reference was updated throughout the project as required.</p> <p><i>Human ethics approval obtained 3 June 2020. Modifications and annual progress report approved 4 May 2021.</i></p>
M2	100%	<p>A relational database of contributors to the debate on social media, reinforced with input from other sources (for example, parliamentary and planning process submissions). This database identifies connections between key actors and their role as opinion leaders, conveyors of opinion, or other roles. It will be updated throughout the life of the project through an automated system, but a first version will be reported at the end of Q2. Automated analysis is expected to explore in the order of 1 million two-way connections (in Australia and overseas), although the highly relevant participants highlighted in the database will be in the hundreds, mostly targeting NSW and Australian participants.</p> <p><i>Exploration of millions of two-way connections in social media (in Australia and overseas), highlighting some 10,049 Twitter users.</i></p> <p>The users and their relationships are what defines the 5 main groups that we found in the Twitter data, providing a first approximation to the kinds of groupings that will be fleshed out in subsequent steps. Note that the data collection continued in the background and the best results would only be apparent in those later steps. However, the ultimate goal is to see what technologies each of those groups is likely to support and what that means for coal-related technologies.</p>
M3	100%	<p>A compilation of narratives (also known as 'discourses') present in the discussion around coal-related technologies. These narratives capture the key topics and attitudes in this discussion compiled from NLP and content analysis. The automated analysis will parse in the order of 100,000 relevant tweets and hundreds of reports and official documentation. The researchers will verify the output from these automated tasks by looking at hundreds of selected tweets and key documents.</p> <p><i>NLP tools like topic modelling were employed on various sources: (a) tens of millions of relevant tweets, with at least 670,000 of these identified as produced by highly followed users, and (b) tens of thousands of relevant Hansard documents as well as hundreds of newspaper articles provided historical and contemporary context. Additional checks were carried out qualitatively to ensure a good comprehension of the issues at hand.</i></p> <p>The content of Hansard documents, news articles and tweets, provided, respectively, the historical context to our study, its contemporary context, and the specific argumentation of each of the five main groups identified in the previous step. The final step in particular allows us (particularly after contrasting against subsequent steps) to name and situate in the different Twitter coalitions (Progressive, Grassroots, Conservative, Science and Tech, Green), their core and peripheral beliefs.</p>

M4	100%	<p>Relying on preliminary data and drawing on existing expertise, custom surveys will be carried out among residents in 3 study areas of interest in NSW (Hunter, Illawarra, Far West), with the potential of also carrying out a control survey in Inner Sydney, which nonetheless may already be well represented in online data. The adequate number of surveys and delivery method will depend on the population size and characteristics of the specific study area. For any population above ~10,000, the basic target is to collect ~150–200 responses per area, as this sample size is robust at the standard 95% confidence level for a comfortable 8% confidence interval. Smaller sample sizes may be robust in more remote locations with smaller population (this may apply notably in the Far West). This survey on general attitudes will be combined with ~5–20 interviews with more engaged community members per study area.</p> <p><i>Survey with close to 2002 responses received with at least 250 responses per area. Far West expanded to include all of remote rural NSW.. Twenty interviews in each main region: Hunter, Illawarra and Far West.</i></p> <p>Given that Twitter is not necessarily a representative sample, we utilise the survey results, notably the explicit support for different combinations of technologies, to identify coalitions that correspond to the wider public's understanding of technologies (RES fans, Pro RES, Tech fans, Broad choice, Sceptics). These are, of course, connected to the Twitter ones but not always one-to-one. The interviews further flesh out the meaning of various choices and often the misunderstandings behind certain preferences (e.g. regarding CCS).</p>
Stage gate	100%	<p>A graph map of coalitions and, if applicable, sub-coalitions, with historical and contemporary information. This map is an initial graphical representation of the social network analysis, which will be matched with the content analysis and on-the-ground evidence to start an explanation of the characteristics of existing coalitions.</p> <p><i>Preliminary representation of 5 coalitions stemming from survey analysis supported by Twitter analysis delivered as part of the Stage Gate report.</i></p>
M5	100%	<p>A list of key opinion leaders in each coalition (and sub-coalitions). This involves further processing of the map and interpretation of surrounding information (graph theory provides various potential measures of centrality or importance of nodes).</p> <p><i>Key opinion leaders identified from an updated version of the Twitter data through a combination of centrality measures; 'most representative' individuals among survey respondents; and the analysis of preliminary results from the interviews.</i></p> <p>Even in deidentified and deindividualized form, the characteristics of key opinion leaders give us a better understanding of the nuances of each coalition. Support for renewables has different implications when it is done by people following a technology enthusiast or those following an environmental activist.</p>
M6	100%	<p>Minutes of a Delphi-style forum between a minimum of 15 participants representing at least 3 basic positive, neutral and negative groupings. Grouping will be adapted depending on previous findings. This forum consists of interactions between KOLs from different coalitions who don't know the identity of other participants. These cleaned-up minutes will inform the subsequent strategy.</p> <p><i>Minutes of the 15 participants representing the 5 main coalitions identified in the survey were collected and summarised in the relevant Quarterly Report and in the Appendix.</i></p> <p>These interactions among these 15 participants allowed us to see the extent and nature of (dis)agreement on topics such as tolerance for continued use of fossil fuels or protecting the national economy. It also provided a forum to observe how members of various coalitions respond to various conundrums, e.g. inevitability of continued mining/fossil fuel use or evidence of climate change for others.</p>
M7	100%	<p>A document outlining the strategy. This document describes the materials (for example, fact sheets) and the target coalition members (and/or KOLs) to whom it will be distributed.</p> <p><i>Communication strategy for online-based engagement with local residents in the form of 'community forums', adapted to the needs of 'COVIDSafe' delivery in light of the Delta and Omicron-related restrictions in late 2021.</i></p> <p>This document represented an early distillation of the findings of the research, e.g. the deep-seated mistrust of solutions involving coal or CCS for a majority, as well as the doubts about the future overall.</p>

M8	100%	<p>Responses from a focus group or survey in the various areas targeted for the on-the-ground data collection (3–4 surveys/focus groups). This compilation is evaluated against the original (Q3 2020) and evolving content analysis.</p> <p><i>Three community forums were held through Zoom webinars in each community (Hunter, Illawarra and Far West) with between 5 and 20 attendees.</i></p> <p>In these sessions, we provided attendees with an introduction to the research and then invited them to take part in interactive workshops based on the communication strategy. In these workshops, we tackled many of the issues that had been (protecting the vulnerable, the role of various technologies). It was an opportunity to get a sense of the impact of messages regarding technologies like CCS, as well as the balance of environmental protection, job security, and other preoccupations.</p>
-----------	------	---

4 Project materials and case-study, multi-method approach

Primary and secondary data collected through both digital and traditional research methods form the project materials. We adopted a case-study approach with an online component and three local case-study areas. Below we introduce and justify the materials by location, followed by a brief introduction of the multiplicity of methods, which will be discussed alongside the element in which it was applied in subsequent sections.

4.1 Online location

Much socio-political interaction at any geographical scale is either carried out online or can be accessed there. This provides national and international context for the local case studies across different timeframes and angles. Hansard was used for the very long-term overview and the large-scale context. Online newspapers were used for the traditional-media angle over the last decade. Twitter was used for the social-media aspect, focused on the period during which the study was carried out.

All online data materials were accessed from and stored in secure servers in the Melbourne Research Cloud. This remote and distributed storage ensures data privacy and protection. These records will be kept for another five years in the backup infrastructure known as Mediaflux and will be accessible to the Lead CI or his supervisors at the University of Melbourne. These same servers provided the high-performance computing power for the analysis.

4.1.1 Hansard

The Hansard is a system of records of all interactions in the Australian Parliament, which includes the Senate, House of Representatives, the Federation Chamber, and parliamentary committees. These debates are released by the Parliament of Australia under a [Creative Commons License](#).

Our dataset is composed of all Hansard documents from 1 January 1901 to 31 December 2020 that contain the word 'coal'. The Hansard records the full text of interventions, their date, and the name and party of the speaker as well as other metadata. Most of the party allegiances are captured in the original dataset. We query the Wikidata API for the remainder and to check for errors. Our analyses focus on interactions in the Senate and House of Representatives. Given the long timeframe available from Hansard discussions, we use this data source to situate our findings in a longer historical context.

4.1.2 News media

We have collected energy-related articles from eight newspapers based in the regional areas of NSW of particular interest to our study, including the *Illawarra Mercury*, the *Newcastle Herald* and the *Western Advocate*. In addition, we use *The Guardian*, which provides a valuable contrast with its global reach and well-known anti-coal editorial stance. The NSW regional newspapers belong to the Australian Community Media (ACM) group, which publishes over 160 regional newspapers. ACM newspapers provide an easy-to-use search function for efficient data mining, and the *Guardian* provides a fully-fledged programming interface, which means data can be directly queried. In both cases, we use energy-related phrases such as 'coal', 'solar power' and 'oil and gas'. Each phrase pertains as unambiguously as possible to a particular energy technology. We considered other national newspapers for analysis, most notably *The Australian*; however, we could not easily access the data from these sources in a similar format and timeframe, so comparisons were not possible.

4.1.3 Twitter

As per Twitter's existing terms of service and privacy policy, tweets by anyone on the platform are in the public domain. We use the R programming-language package `rtweet` to query the [Twitter API](#). The API has different types of 'endpoints' that allow us to gather two main types of data: 'tweets and user information' and 'user connections'. All 'tweets and users' endpoints provide up to 90 fields, including a unique numeric user ID, screen name (for example, 'ScottMorrisonMP'), the text of the tweet, the detected language, the time of its creation, the number of retweets, the location, as well as any of these fields for the retweeted tweet. These 'tweets and users' endpoints accept text queries, which consist of space-separated strings like 'coal fossil fuel solar', returning any tweet mentioning

any of those four terms. As per the project goals, we focus on 'coal-related sectors', which means we largely excluding transport unless closely e.g. as in 'oil and gas' industry but not 'petrol'. Appendix 'Twitter' provides the query strings used for each endpoint.

4.2 Geographical locations

The three regions are characterised by economies that are important to present and future strategies for energy generation in NSW. The first two regions encompass economies that have traditionally relied heavily on coal and that today are facing unique tensions related to transitioning. In the Far West, the question of future energy technologies has emerged as part of large renewable energy projects and also, importantly for this project, as the region originally mooted for ventures involving carbon capture and storage. Below we present some basic facts and statistics on each region collected for this project on NSW government and council websites and Australian Bureau of Statistics (ABS) data.

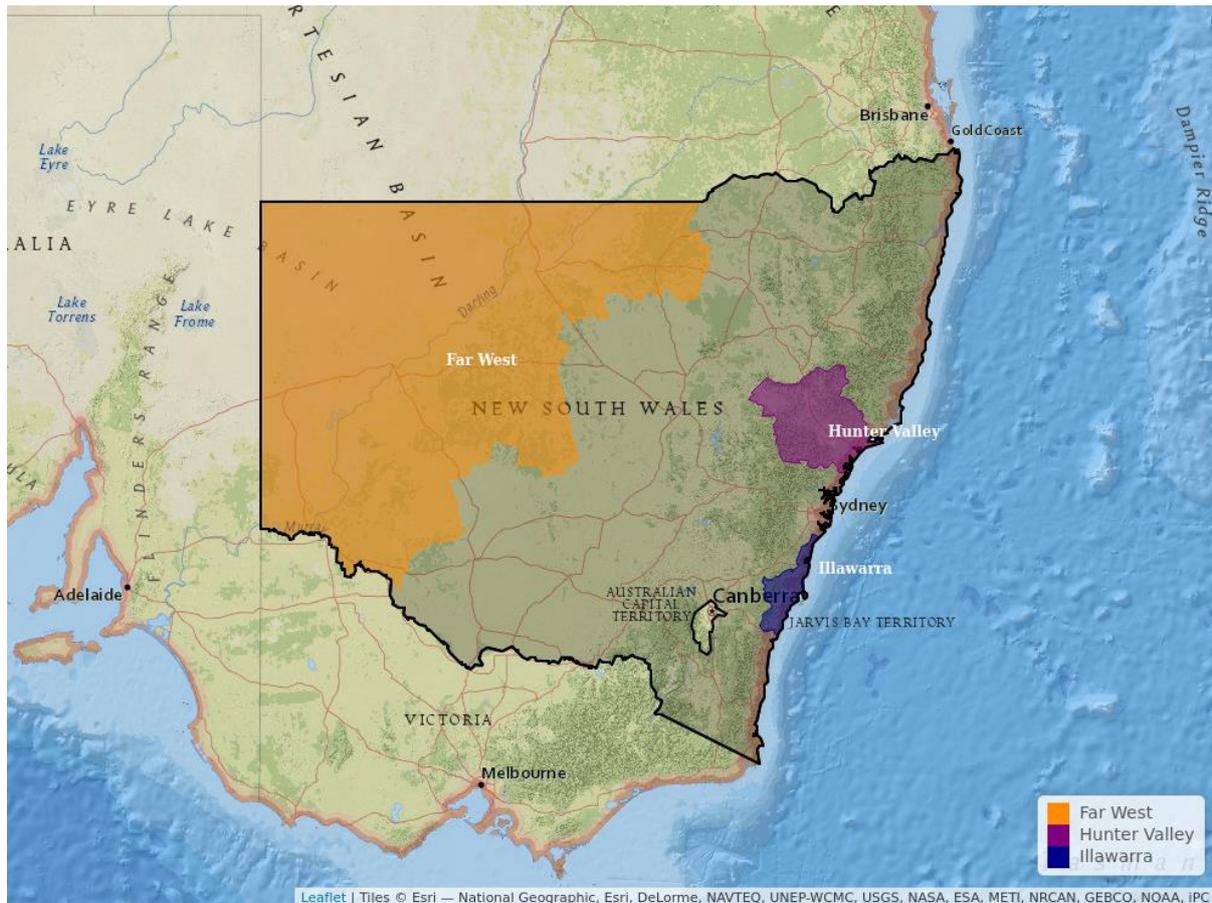


Figure 3: Illustration of the locations of the three case study areas of the present study. Boundaries follow the NSW local government areas these regions are generally considered to encompass.

4.2.1 Hunter Valley

The Hunter Valley is located in the lower northeastern part of NSW and encapsulates the lands of the Awabakal, Darkinung, Geawegal, Wonnarua and Woromi peoples. The region consists of the state electoral divisions of Newcastle, Charlestown, Wallsend, Lake Macquarie, Swansea, Cessnock, Maitland, Port Stephens, Mid-Coast and the Upper Hunter as well as the federal divisions of Newcastle, Paterson, Lyne, Shortland and the Hunter. Within the Hunter, LGAs include the cities of Newcastle, Maitland, Lake Macquarie, Cessnock and Port Stephens, and the shires of Singleton,

Muswellbrook, Dungog and the Upper Hunter. A number of smaller settlements also exist across the region – notably, the townships of Scone, Morpeth, Pokolbin and Williamstown.

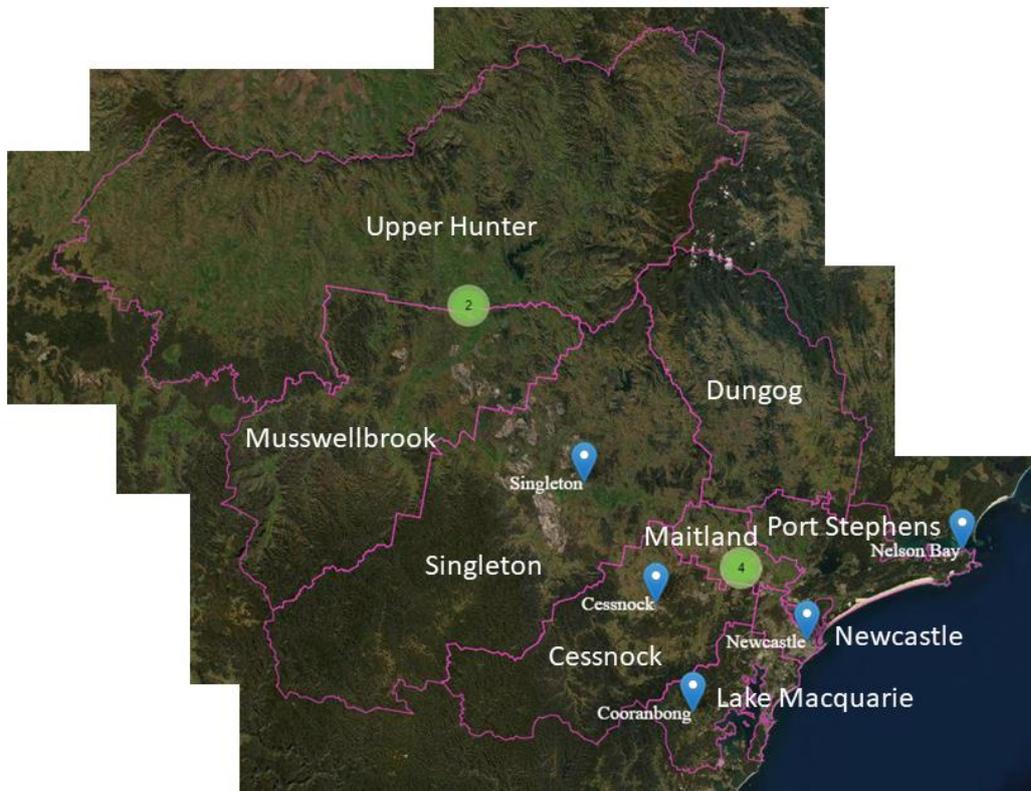


Figure 4: Satellite view of the Hunter Valley region with local government area boundaries and some major towns. Green circles indicate clusters of towns that could not be depicted individually.

The Hunter Valley's dominant land use stems from its long agricultural and mining history, but it has diversified throughout the years to include a range of other land uses including energy production, and commercial and greenfield industrial land. The region is Australia's largest regional economy valued at over \$40 billion, with a Gross Regional Product (GRP) estimated at \$54.9 billion.

The region is situated on the Newcastle and Hunter major coalfields and is home to one of the world's largest coal export ports. Agriculture is another prominent land use across the region. Agricultural production includes cattle, crops, poultry and sheep. Further, the region is known for its viticulture and equine industries. The Hunter is Australia's largest producer of thoroughbred horses.

Since the 1950s, the Hunter has operated as an energy-production hub and is the centre of NSW's power generation through the Liddell, Bayswater and Eraring coal-power stations. The region is part of one of five strategic Renewable Energy Zones (REZ; the Hunter-Central Coast REZ), and renewable energy production has begun to operate throughout the region.

4.2.2 Illawarra

The Illawarra is situated on Dharawal (or Tharawal) land, which extends from below Sydney through the mid-South Coast, bordered by surrounding Dharug, Eora, Gundungurra and Yuin countries. The region is located immediately south of Sydney, and consists of the LGAs of Shellharbour and Wollongong Cities and the Municipality of Kiama. The region falls within the state electoral divisions of

Wollongong, Shellharbour and Kiama, as well as the federal electoral divisions of Cunningham and Whitlam. Wollongong is the main city, followed by Shoalhaven, Shellharbour and Kiama.

The region's \$22.2 billion annual GRP is largely produced by the construction and manufacturing industry. In the 2018–2019 financial year, construction was the highest contributor to GRP and exports across all LGAs in the region, and the value of the construction industry has increased across the region progressively over previous financial years. Comparatively, the mining and manufacturing industry's economic contribution and employment levels have gradually decreased throughout recent years. In 2018–2019, mining operations generated over \$85 million in the export economy with an estimated GRP contribution of over \$159 million.

Port Kembla is the exporting centre and home to the Port Kembla Steelworks, a large-scale steel manufacturing operation that uses the region's coal. Mining and resource production resides most prominently in the northern parts of the Wollongong LGA, expanding through surrounding regions. Coal mining in the region includes the Metropolitan, Dendrobium and Russel Vale coal mines. Other extractive-industry land uses include quarries operations in the Shoalhaven, Kiama and Shellharbour LGAs. Renewable energy production is a growth area for land use in the region, with proposals for renewables beginning with the preparation of an Environmental Impact Statement underway for the development of a hydro power station at Shoalhaven. The region is also hosting one of the NSW Government REZs, with EnergyCo NSW currently in the early stages of planning an REZ for the region.

4.2.3 Far West

The Far West is NSW's largest region, situated across the Bandjigali, Barindji, Barranbinya, Danggali, Kamilaroi, Kureinji, Kurnu, Madi Madi, Malyangaba, Nari Nari, Wadi Wadi, Wailwan, Wandjiwalgu, Wiljali, Wongaibon and Yitha Yitha nations. It is located in the northwest corner of the state, consisting of local government areas (LGAs) of Central Darling Shire, the City of Broken Hill, Brewarrina Shire, Wentworth Shire, Balranald Shire, Walgett Shire, Bourke Shire, Cobar Shire and unincorporated areas of NSW. The region's areas fall within the Barwon state electoral division and the federal divisions of Parkes, Farrer and Mallee.

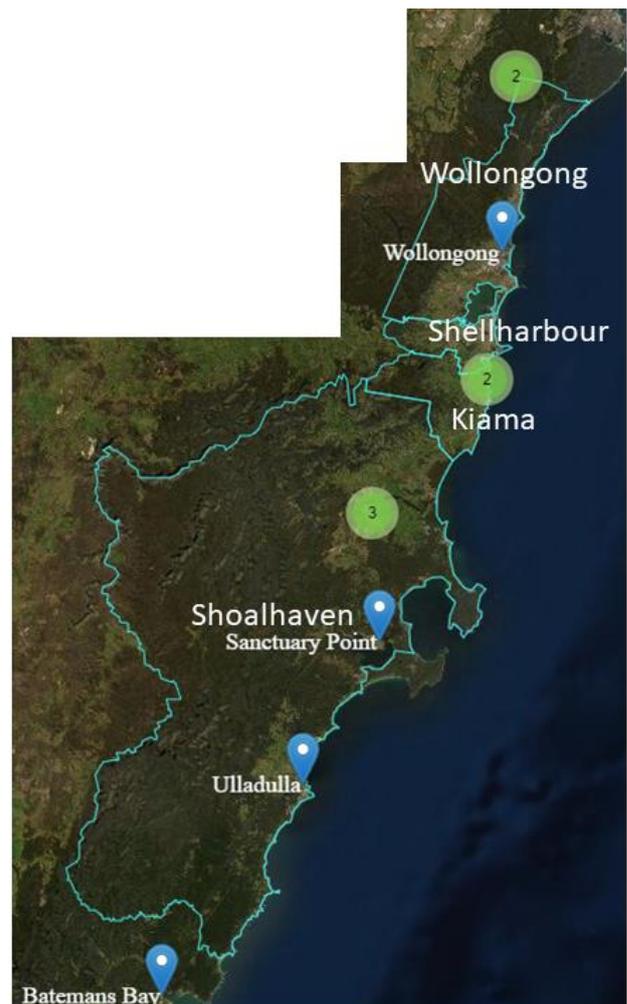


Figure 5: Satellite view of the Illawarra region with local government area boundaries and some major towns. Green circles indicate clusters of towns that could not be depicted individually.



Figure 6: Satellite view of the Far West region with local government area boundaries and some major towns.

Land use in the region is dominated by agriculture, with grazing estimated to account for 90% of land use within northwestern NSW. Other major land uses within the region include dryland agriculture, irrigated agriculture (such as cotton, horticulture and viticulture), tourism, and nature conservation.

Regional mining within the Far West has centred on zinc, lead, cobalt, silver and mineral sands. The mining industry is a significant employer in the Broken Hill, Cobar, Wentworth and Balranald LGAs. The region today leads large-scale renewable wind and solar energy projects, and the area has been identified as optimal for renewable energy due to established energy transmission infrastructure, high solar and optimal wind exposure, low population densities and large spaces of affordable and available land.

The Far West regional economy has grown extensively in the past years and was in 2020 estimated to contribute \$2 billion in gross value to the NSW economy. Agriculture and mining remain significant to the region's economy, but the greatest economic sector is construction and infrastructure, which contributes 22% of the gross value added. Mining and resources contribute 19%, and agribusiness and food provide 17%.

4.3 Methodology

Since the project interrogates different locations and data formats, it requires combining vastly different methodologies. The following sections outline our results alongside the six key methodological approaches adopted for the study: (1) automated content analysis of Hansard, news and Twitter data; (2) social network analysis of Twitter data to ascertain the different coalitions (3) a quantitative survey across the three physical locations to get more broad-based coalitions; (4) Delphi forum among members of different coalitions; (5) semi-structured interviews in the geographical locations to dig deeper into the ; and, (6) community forums/focus groups again by geography.

5 General context: Hansard and news

To establish a proper context, we collect and analyse large amounts of data covering (1) the long-range historical context, in the form of parliamentary Hansard records going back to Federation, and (2) news articles in the last decade or so. We also deploy similar tools to analyse the contents of tweets; hence the methodology also refers to tweets, but we explore Twitter results alongside the social network analysis we carried out on those data.

5.1 Method: computer-assisted content analysis

The main content analysis processing is split into four steps:

1. Data-filtering, which ensures an energy-focused dataset
2. Topic modelling, which finds common narratives
3. Automatic topic labelling, which helps prevent bias in allocation of labels
4. Inferring more descriptive topic labels, which helps interpretation of results.

A detailed description of each can be found in the Appendix 'Content Analysis'. In what follows, we provide a minimal overview of the four steps.

5.1.1 Data filtering

When topic modelling large amounts of raw data, some topics may appear as related when they are only mentioned tangentially. For example, a tweet could mention batteries for mobile phones with little implication for energy policy, a news article could include a link to a completely unrelated article that mentions coal, or a Hansard document could contain an idiom such as 'canary in the coalmine' from a debate unrelated to energy policy.

For Twitter or News datasets, we generally introduced a strict co-occurrence filter so that tweets or news articles would, for example, mention 'climate' or 'energy', thus minimising irrelevant results. Where the query itself did not allow for such filtering, framing keywords and exclusion words (for example, mentions of mobile phones, weather or cooking) were applied afterwards to the downloaded tweets in order to disambiguate terms like 'battery' and 'wind', which may not refer to energy and climate issues.

In addition, many of the initially retrieved documents in the Hansard or news datasets can be long and some may only contain a single reference to relevant terms. To ensure relevance, we first split longer documents into smaller units of meaning: paragraphs with a target length of 300 words and an upper limit of 600, keeping sentences intact and respecting paragraph boundaries where they exist. The next step was to select only paragraphs that contained any of the basic terms. For example, for Hansard we focused only on coal and used 'coal', 'lignite', 'coke' or 'coalmining'.

While the method above is optimised for precision (where there is a high probability of relevance to coal among retained documents), it might compromise in terms of recall (in that a number of relevant documents with no literal mention of a basic term might be excluded). We verified that our final data set is indeed comprehensive by running the well-established BM25 information retrieval algorithm on the original datasets. BM25 returns numeric relevance scores similar to the Google algorithm that ranks pages relevant to a search. See the Appendix 'Content Analysis' for a general explanation, and the Appendices for 'Hansard', 'News' and 'Twitter' for dataset-specific measures.

5.1.2 Topic modelling

Topic modelling is a method for computer-assisted content analysis. Most topic modelling frameworks, such as the dynamic topic modelling (DTM) we mostly use, rely on researchers selecting a predetermined number of topics, based on the expected diversity of content and the size of the dataset. This selection is somewhat arbitrary, but it helps with determining a manageable number of topics to analyse. Others, notably our other tool: top2vec, automatically identify the number of topics, which often leads to very large numbers of mostly 'subtopics' being identified.

In either case, a 'topic' is modelled as the most relevant n terms (usually $n = 10$) that occur in such a topic – after excluding function words like 'be' and 'the'. These 'topics' are calculated based on the distribution of words within documents, but allow for the fact that a single document may contain

several topics. Table 3 provides several examples, together with the various labelling strategies that make these topics easier to understand and report on, and which we cover in the following subsections.

Table 3: Modelled topics from the Hansard dataset with their top 10 terms, automated labels and expert labels

Top automatic label	Expert label	Expert category
Environment	Environmental impacts	Environment
<i>Terms: loss, life, lose, danger, cause, world, year, fire, disaster, coal</i>		
Energy policy	Renewable energy projects	Environment
<i>Terms: project, scheme, energy, renewable energy, technology, solar, clean, renewable, new, government</i>		
Finance	Big business influence	Environment
<i>public, want, big, people, interest, business, hand, money, coal, support</i>		
Agriculture	Water and farming	Environment
<i>area, land, water, farmer, mining, river, mile, district, timber, agricultural</i>		
Employment	Welfare	Workers
<i>people, pay, private, government, work, enterprise, health, country, child, family</i>		
Employment	Employee entitlements	Workers
<i>service, leave, worker, employee, long, employer, fund, industry, work, hour</i>		
Employment	Industrial relations	Workers
<i>public, want, big, people, interest, business, hand, money, coal, support</i>		

In all cases except a general modelling of Twitter data, we use DTM (Müller-Hansen et al., 2021). DTM extends the popular Latent Dirichlet Allocation (LDA) topic model (Blei et al., 2003) by enabling change in term and topic prevalence over time. For example, the ‘Environmental impacts’ topic may be modelled as taking up more or less space over time and also see fluctuation in the prevalence of ‘fire’ or other elements. This is particularly useful to identify trends in discussion at different timescales in all our online datasets.

5.1.3 Automatic topic labelling

As noted above, a key step in topic modelling is interpreting what the set of terms denoting a topic mean. Determining these ‘topic labels’ can easily introduce researcher bias and lead to conclusions that are impossible to verify or reproduce (Müller-Hansen et al., 2020). We use labels taken from [EuroVoc](#), which is a neutral resource in this topic developed to categorise documents by topic in the European Union.

EuroVoc associates long lists of terms with 24 domain labels (examples in Table 3 column 1). Each DTM topic is labelled with four EuroVoc labels resulting in the largest overlap between the topic’s most relevant terms and the EuroVoc labels’ most relevant terms. We use an approach based on term-frequency inverse-document-frequency proposed in Scelsi et al. (2021).

5.1.4 Inference

The resulting label set is used as a basis for the human inference steps, which include finding appropriate and more specific labels than those achieved through automated labelling. For example, a topic discussing ‘loss’, ‘life’ ‘danger’, ‘disaster’, ‘fire’, and so on is not just about the ‘environment’, but rather about ‘environmental impacts’. In addition, it can be categorised together with others such as ‘big business influence’ when the influence refers to approvals for coal mining interests.

Figure 7 illustrates the full process, from obtaining a large corpus of text data to the writing of the descriptions that are presented in the Results section, contrasted with the usual process without automated labelling.

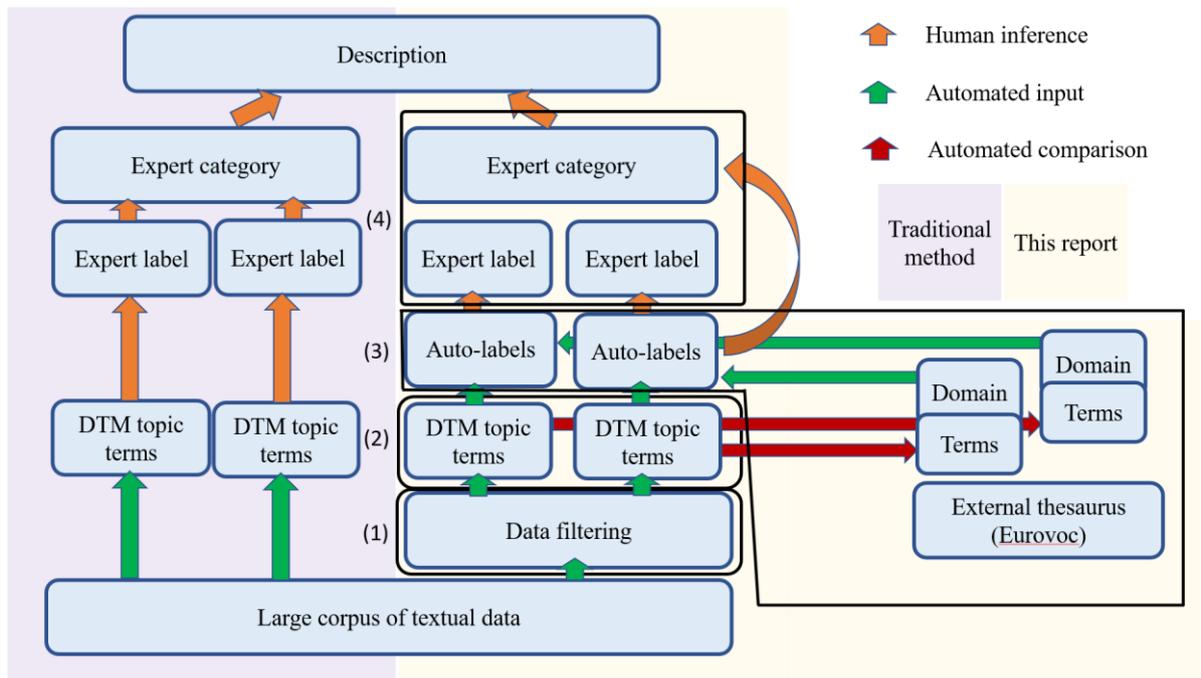


Figure 7: Data analysis process for topic modelling with and without automated topic labelling. For simplicity, the inference step (4) does not represent the incorporation of non-topic data

5.2 Results for Hansard

Historical background is important to understand the deep roots of current issues in coal-related sectors in Australia. The 120 years of Australian Hansard records provide excellent background to the history of coal, the ideologies behind it, and the present political situation in the country. This helps to put into perspective findings from other sources.

The results of our analysis lead us to separate the history of Australian coal into four eras:

- supply constraints era (1901–1935)
- workers’ rights era (1935–1963)
- diversification era (1963–2005)
- Kyoto and mining-boom era (2005–present).

These periods can be distinguished through by three interrelated factors that we cover below: (a) level of parliamentary debates in relation to coal, (b) nature of coal-related topics discussed; and (c) coal industry cycles. Taken together with contemporary accounts and scholarly sources, we show after the three factors (d) how a bipartisan consensus formed in the middle of the century that focused on increased exports of coal. The recent challenges presented by global warming have been difficult to handle because of the longevity and bipartisan nature of this consensus.

5.2.1 Level of parliamentary attention

A standout finding from the Hansard analysis is how coal has not received uniform attention in the Australian Parliament. The two middle eras, from 1935 to 2005, have clear attention peaks (over the 90% percentile of our attention-level measure) surrounded by less active years (see Figure 8). The other two eras are well below this value, with only a handful of years breaking this pattern, notably a large peak in 1929 during the stock market crash, and, somewhat surprisingly, in the years after the major United Nations climate-change conferences in 2009 (Copenhagen) and 2015 (Paris), perhaps due to ‘topic fatigue’.

Figure 8 shows how the Greens have contributed significantly to the debate during the Kyoto period despite the Greens being only a small minority of Members of Parliament in both chambers (10/76 senators and 1/151 MPs at their peak in 2013–2016).

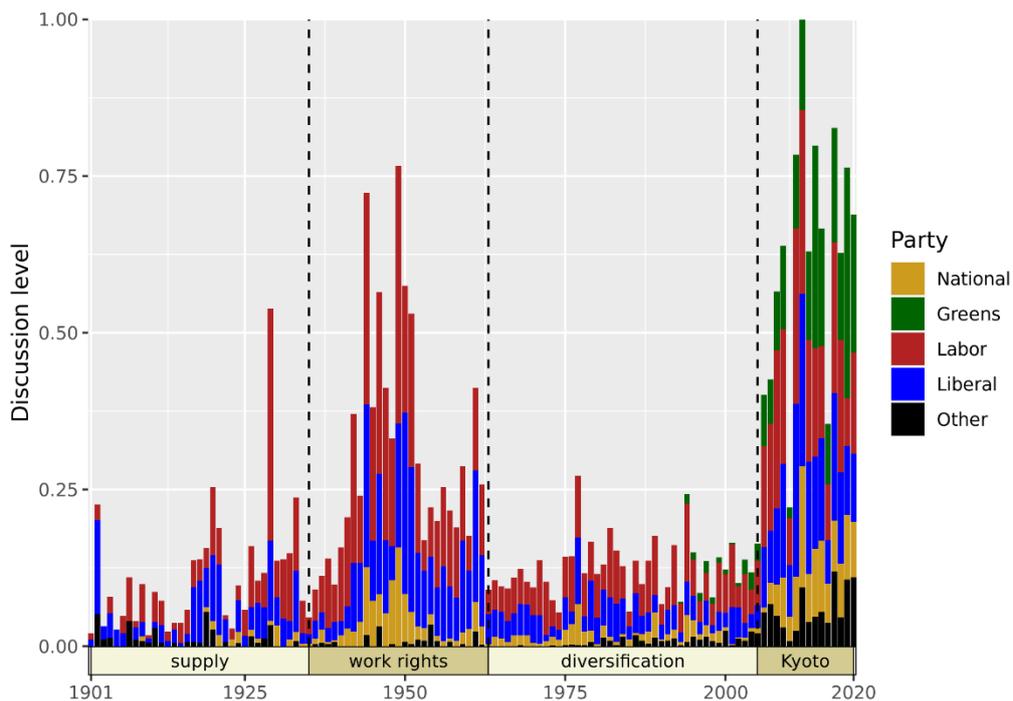


Figure 8: Level of discussion of coal-related issues in the Australian Parliament and our division into eras. The value 1 corresponds to the largest total amount of discussion in 2012 with the remainder scaled relative to it.

5.2.2 Topic modelling: Key themes

The four eras are characterised by different levels of discussion of our six categories of topics introduced in Table 3 (economy, environment, politics, supply, trade and workers). Figure 9 below showcases the main changes in these topic distributions.

The early years of the Commonwealth were dominated by an emphasis on the **supply** and distribution of coal. While supply issues remained in the lead-up to the Second World War and until the postwar era, related concerns around **worker**-related topics (industrial relations actions, entitlements) became particularly salient after a peak in the early years of the Labor government during this period (this was a similar pattern during the first era). Supply and work stoppages are obviously related, but the emphasis of the storylines is different. The emphasis on supply and workers petered out as the efficiency of production increased and workers shared in the profits. In the following period, 'diversification', a diverse suite of topics gained prominence, notably **trade**, which had not been mentioned much before. This was clearly connected to exports (see Figure 10). Issues affecting the broader **economy** also increase in connection with the oil shocks, as well as **politics** involved in the new holistic 'energy policy' responses to those shocks as well as in the opening up of mines in new electorates. Finally, the last period is clearly dominated by **environment** issues. These shot up in importance after the adoption of the Kyoto Protocol in 2005, which soon coincided with an increase in Greens representation in the parliament. During this period concerns about supply, trade and workers reached their minimum. The full discussion of each era is in the Appendix 'Hansard'.

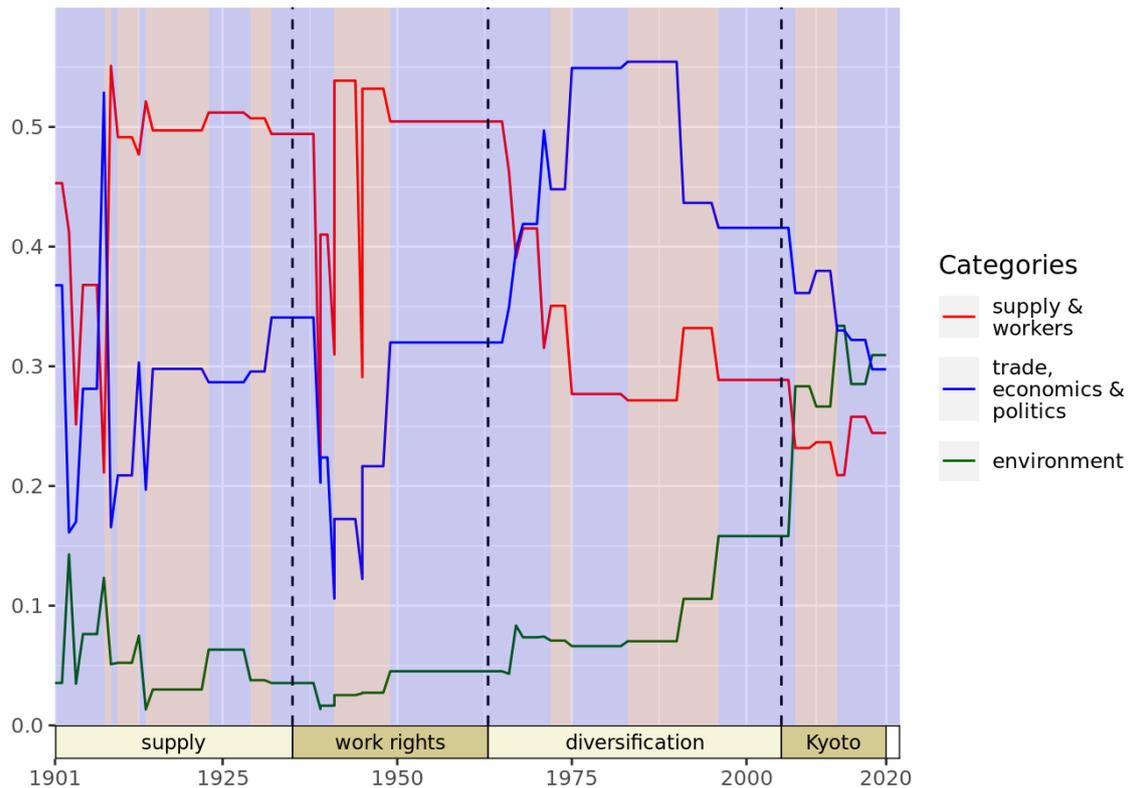


Figure 9: Categories of topics averaged by legislature period. Coloured bands represent periods of Labor (red) and Liberal (blue) governments. Y axis shows the relative prevalence of the topic.

5.2.3 Industry cycles

The four periods coincide with the long-term cycles in the number of coal workers employed, as can be seen in Figure 10. This suggests a strong connection between the discussions in parliament and developments in the industry. The resource-extraction sector has a cyclical employment pattern that corresponds to the different labour needs at various stages of individual mining projects. Opening up new resources is, for example, considerably more labour-intensive than their continuing exploitation (Lockie et al., 2009). The first peak in the labour force happened during the supply era, and the second during the workers' rights era. These two peaks, however, barely served to maintain production and it was first during the diversification period and, later, as part of the Kyoto period, that there was a massive increase in coal-sector employment. The increase in labour force corresponds with a distinctive and sharp rise in production and export (Eyre, 1988).

The persistence in supply issues combined with renewed emphasis on workers' rights and new federal powers obtained during the Second World War motivated the second-era spike in parliamentary activity. The focus was on making coal mines as efficient as possible through mechanisation, which increased profitability and wages while maintaining supply. This was implemented through the Joint Coal Board (JCB) under parliamentary direction and oversight (Beaumont, 1975; Eyre, 1988). The effects on the productivity of the subsequent cycle are self-evident.

The second and even larger spike in parliamentary debates (Figure 8) with a focus on the environment has not (yet) had the expected impact of reducing production, except in the brown coal sector. We expand on the implications of these findings for the overall setting of coal discussions in 21st-century Australia.

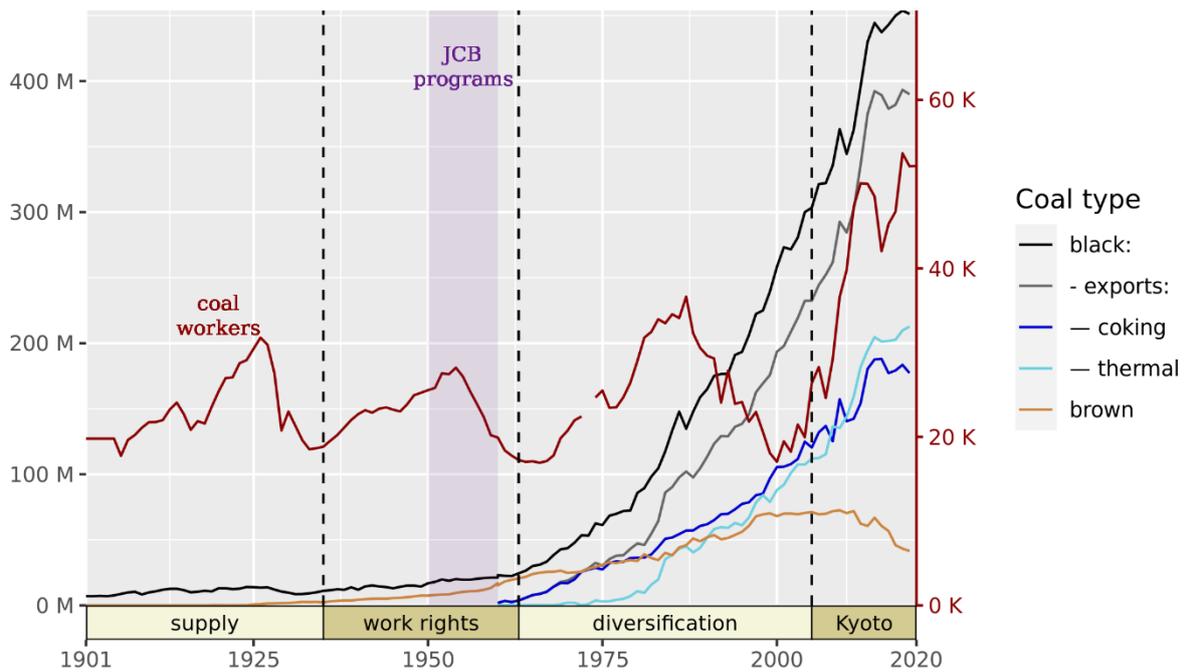


Figure 10: Production of Australian coal and breakdown of black coal production and the share of exports (of both coking and thermal coal) 1901–2020 (in million metric tonnes, left axis) (ABS 2021; DISER, 2021a, 2021b), number of coal workers (in red, in thousands, right axis) (ABS 2021), and period of mechanisation sponsoring by the Joint Coal Board (Eyre, 1988)

5.2.4 The consensual roots of Australia’s coal export success

Australian mines first became competitive through the JCB mechanisation grants during the 1950s (Beaumont, 1975; Eyre, 1988). As the level of production per worker increased, so did profitability. These profits were used to address the workers’ rights problem, including generous compensations for the older generation being forced to retire (Beaumont, 1975). The JCB, created in 1946 by the then Labor government, operated since 1949 under the longest-serving Coalition government in Australian history. Under the threat of communism, Coalition governments were keen to see improved working conditions alongside company growth within the regulatory framework established by the wartime Labor governments.

Overall, the JCB and its contemporary Coal Industry Tribunal embody a compromise between the labour movement, mine owners and the main political parties around the establishment of efficient, profitable businesses that would ensure ample supply and adequately compensate workers. This locked in a high-growth export-oriented trajectory for the industry. Its success meant that by the 1960s, discussion of coal issues in parliament had already diminished substantially and a ‘coal growth for stability’ discourse solidified.

By the time climate change came to the fore as a political issue in the 1990s, coal was already a major part of the Australian economy. The Labor government at the time was nonetheless dealing with a recession. Only a few years prior, all coal export controls had been dropped in an effort to increase export revenues (Draper & Lee, 1988). Labor Treasurer and later Prime Minister Paul Keating had expressed fears the country would become ‘a banana republic’ (Brett, 2020). For their part, unionists were calling for a National Coal Authority to control output (Draper & Lee, 1988). According to the prevalent storyline, however, reducing coal output was the ultimate ‘anti-growth’ and ‘anti-stability’ measure. Thus, growth in coal exports would not stop but instead rapidly increase.

By comparison, Norway, a country whose economy is arguably just as dependent on fossil-fuel exports (oil in this case) as Australia, established its sovereign fund from oil in 1990 in recognition that revenues would or should not last. It also adopted a high carbon tax in 1991. Crucially, the oil industry

in Norway had no history of instability and had remained state-owned (Bruvoll & Larsen, 2004). Except for the brief period around the World Wars, the Australian Government had rarely directly intervened in the industry, and the JCB was set up to regulate, not manage, the industry (Lucarelli, 2011). Australia's inaction in the early 1990s is also notable given that despite uninterrupted growth in output, the Australian coal industry was deemed 'in crisis' by the end of the 1980s as the overall value of its exports declined (Gibson, 1990), and the Labor government of the day was seeking a return to manufacturing (Brett, 2020).

A look at the topic of climate change in the early 1990s (see Figure 11) shows the difficulty the Labor Party had at the time in altering the trajectory. Climate change was brought up more by the Liberal Party (blue) and even the Country Party (gold) than Labor (red) while Labor was still in government (faded red background) pre-1997. Only with the Greens (green) did most of the environmental topics acquire prominence in relation to coal.

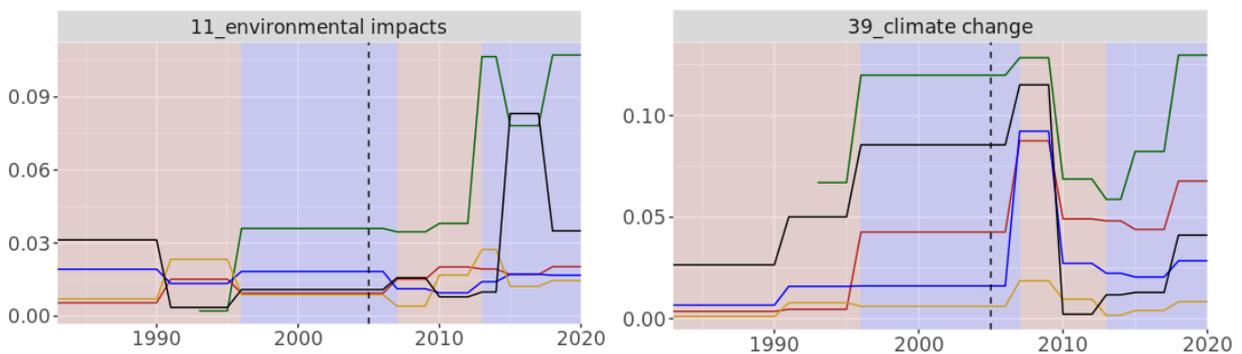


Figure 11: Environmental impacts and climate change topics prevalence distribution (y-axis), showing the Greens a clear driver of discussions. As in Figure 9, background colour bands indicate government in power. Party colours in lines as per Figure 9 Figure 8.

The election of the Liberal Prime Minister John Howard in 1997 did not change this state of affairs. Howard was initially mostly challenged on these topics by the Greens, and it was first with Kevin Rudd's 2007 victory that the tone changed, with greater support for renewables and an emissions trading scheme. As our results show, however, the weight of attacks on coal exports and reminders of their global climate impacts came primarily from the Greens and other minor parties, and, even as pressure increased internationally and inside the parliamentary chambers, the minerals boom was well underway (compare with Figure 9 and Figure 10). During its last tenure, the Labor Party attempted a balancing act of trying to pass climate legislation without affecting carbon-intensive industries in any way (Tranter & Foxwell-Norton, 2021). This hesitancy is also reflected in a widespread desire to move away from coal combined with a reliance on exports, which can be seen elsewhere in our results. Canberra has hosted governments and prime ministers with very diverse views since 1990, yet Australian coal exports have only kept increasing.

5.2.5 Summary: What did we learn from the Hansard content analysis?

Our content analysis of the Hansard provides historical contextualisation of the coal industry in Australia. Based on our findings we can conclude the following:

- The coal industry and associated coal-centred system has a long, proud history in the state of NSW and in Australia, which can be separated into four eras (supply; workers' rights; diversification; and Kyoto/mining boom).
- Coal has not received consistent attention in the Australian Parliament. Instead, the workers' rights and Kyoto eras represent clear attention peaks surrounded by less active years.
- The actions of the Joint Coal Board helped to modernise the industry and led to export success.
- Growth in coal exports were a welcome long-term outcome of successful bipartisan reform of the coal-mining industry in Australia until the mid-2000s.

- There was a significant delay in attending to environmental issues and climate among Australia’s major parties.
- There has been an ‘environmentalisation’ of the question of coal in Australia.

5.3 Results for news

Analysis of the news dataset allows us to focus on the more recent changes in the debate occurring during the Kyoto period. The news analysis focuses on the NSW regional newspapers from the Australian Community Media (ACM) conglomerate (including the *Illawarra Mercury*, the *Newcastle Herald* and the *Western Advocate*), given that they have the highest relevance for our case-study areas. The *Guardian* offers a convenient benchmark of a newspaper with global focus and a well-known anti-coal editorial stance, which helps situate and evaluate the trends in the NSW regional newspapers. Appendix ‘News’ contains the full results for each technological subset.

Figure 12 shows the number of occurrences by quarter of the different sets of terms associated with each technology and with climate change. Figure 13 shows the same value divided by the number of standardised articles published in the same period.

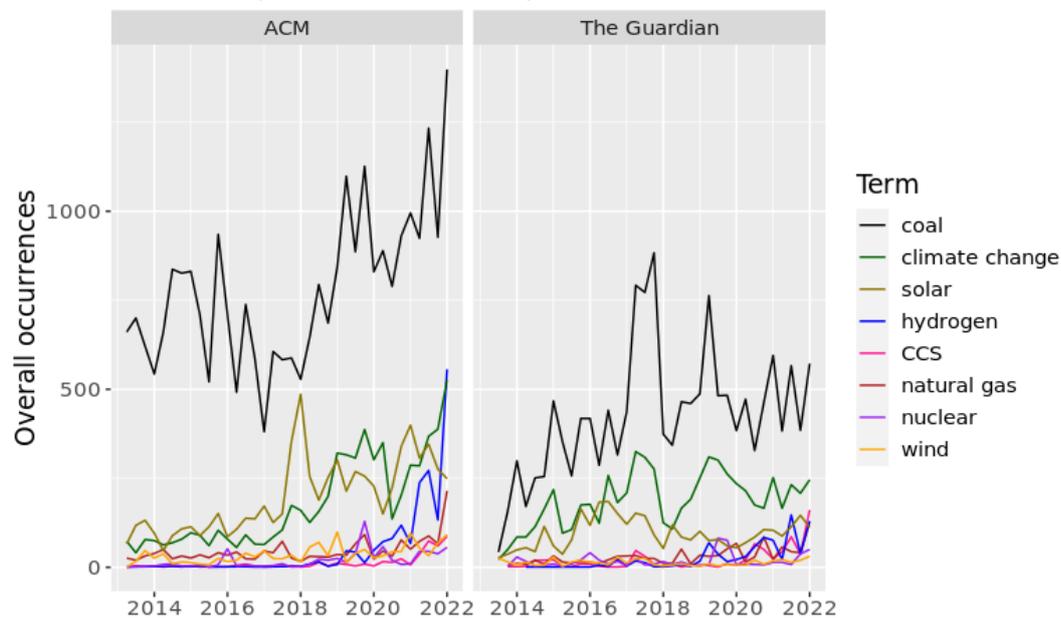


Figure 12: Overall occurrences by quarter of sets of technology terms in the two subdivisions of the news dataset

Coverage of climate and energy issues has increased in recent years, particularly for regional newspapers in NSW. Coal is by far the term that gets mentioned most frequently; however, its dominance is diminishing, with climate change and alternative technologies (particularly natural gas, wind and hydrogen) garnering increasing attention. Hydropower, oil and wave energy have only a very small number of mentions and are not depicted. Note that the key terms related to ‘oil’ (notably, ‘petrol’) were not included as they capture too much discussion of lifestyle issues and pertain to transport, which is not considered a coal-related sector.

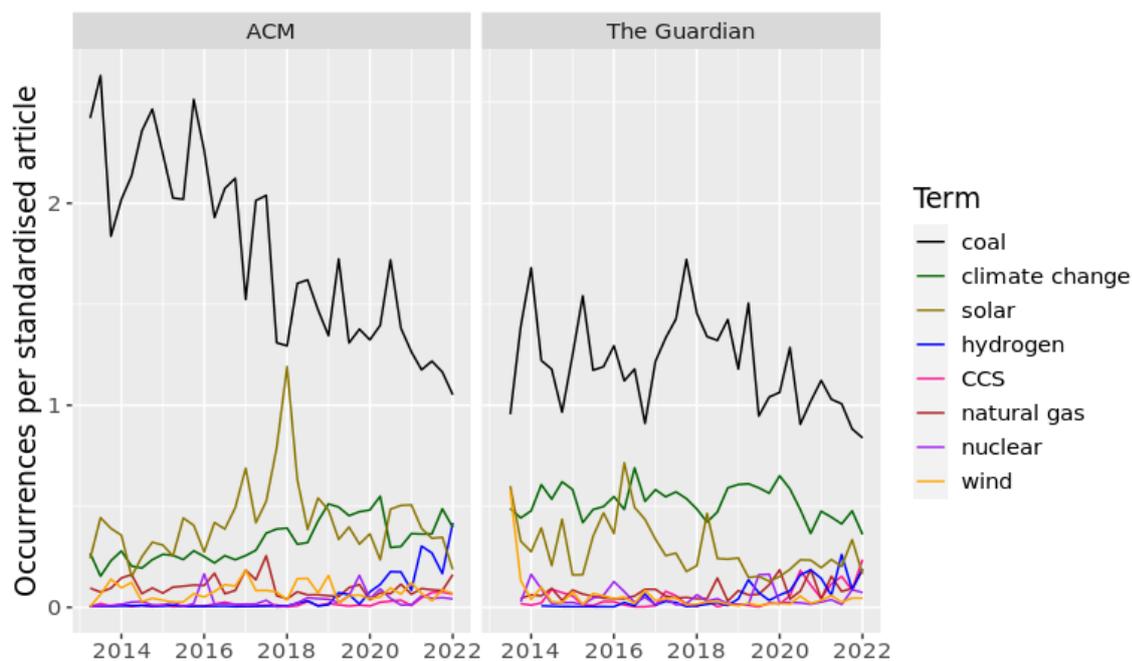


Figure 13: Occurrences as in Figure 12 but divided by the number of standardised articles in each quarter

Solar peaked in attention around 2018 in the ACM newspapers. This coincided with the first jump in utility-scale solar farm installations, and came after a solid few years of rooftop solar installations. Nonetheless, as outlined below, no single topic dominated the solar discussion.

5.3.1 Topic modelling: Key themes

As expected from the last two figures, when all technologies are combined, coal-related topics dominate. Some constants include the significance of coal exports and coal lobbying. However, 'coal planning and approvals' and 'CSG and water issues' have given way to broader concerns with 'emissions reduction targets' and even 'international trade issues'. This is also reflected somewhat in the lower levels of discussion of 'local renewable energy projects and jobs', although the ongoing and forecast 'renewable power boom' has attracted a small increase in reporting.

A remarkable element is that the costs of energy transition do not form a solid topic of discussion at this scale. The relatively small topic on 'energy problems' combines disparate subjects such as the SA blackout and the issue of nuclear waste. In general, nuclear power is only reported on very occasionally. When it is, the focus is on nuclear disasters, nuclear programs and nuclear proliferation. Hence, we focus our detailed discussion below on the remaining technologies: coal, solar, wind, natural gas, CCS and hydrogen.

For news coverage mentioning **coal**, attention to local developments is, understandably, much higher in ACM. These articles cover questions such as 'workplace relations' and jobs in specific regions like Illawarra; new mines and project planning; coal transport in the Hunter; and general stories involving coal and coal miners. However, these have been generally trending down and, since around 2016, have been overtaken by issues such as the highly symbolic and controversial 'Adani project' in Queensland, 'power prices', 'emission targets', 'climate action', and 'clean energy support', as well as 'coal-fired power' and its relation to 'renewable energy'. These stories are national or international in scope, or at least reflect state-wide decisions based on national policy. In the last two years, there has also been a notable increase in international stories, such as 'global climate negotiations', particularly in the last year. These trends also combine with peaks of attention to 'coal exports', and Australian and international emissions discussions. A selection of these topics is presented in Figure 14, with the full range of topic models in the Appendix 'News'.

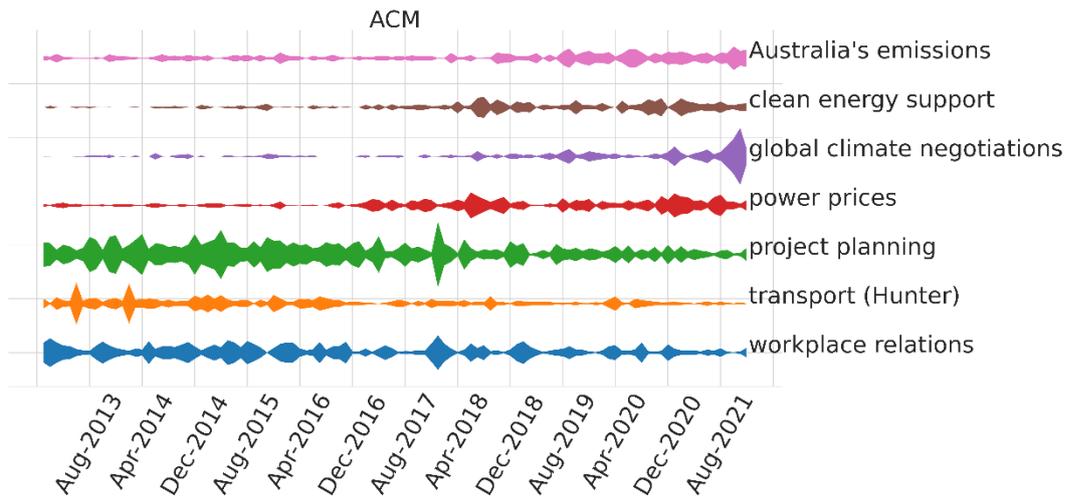


Figure 14: Selected topics in news-coal dataset

One constant across coal issues is that controversies outnumber news items that focus on new development projects or the capability within the region for such. Controversies notably include the question of how subsidies of and investments in coal technologies may detract from investment in renewables. The differences between ACM and the *Guardian* are minimal in this case. Figure 15 condenses the distribution of topics across the controversy/development angle and the level of focus among local, national and international stories. The full labelling is also laid out in the Appendix 'News'.

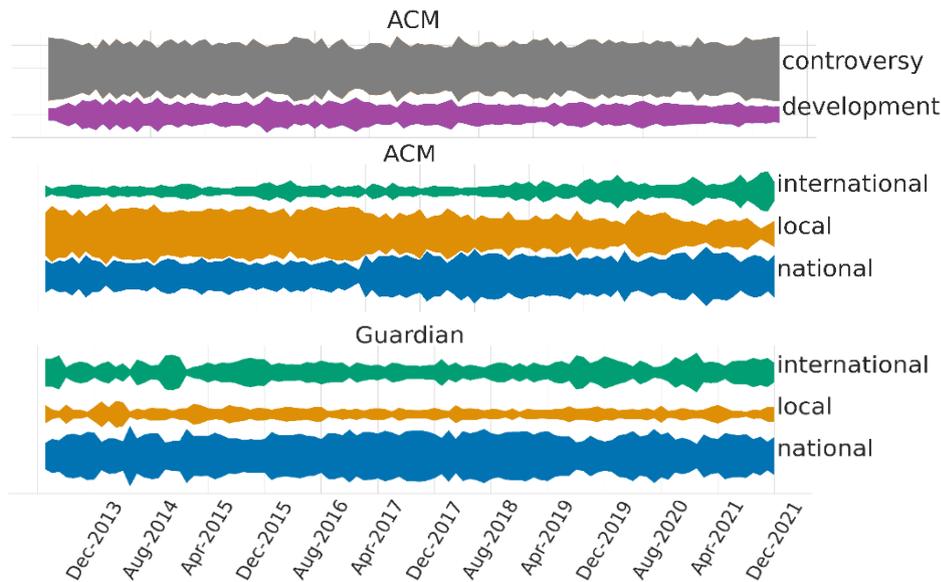


Figure 15: Trends in type of coverage in the news-coal dataset

Solar energy is the second most mentioned technology in news stories during the period of analysis. A clear finding is that regional newspapers place the emphasis on home solar and local solar farm projects. This has been coupled recently with an increased interest in battery technology. While some of the large-scale developments are contested, the news conveys a general community consensus that solar is a good development that can bring solutions to emissions from power and transportation (cf. Figure 16). Even a major 'controversial' topic like 'electricity bill' is mostly related to the boom and bust of the rooftop solar rebates, rather than intrinsic complaints about the technology.

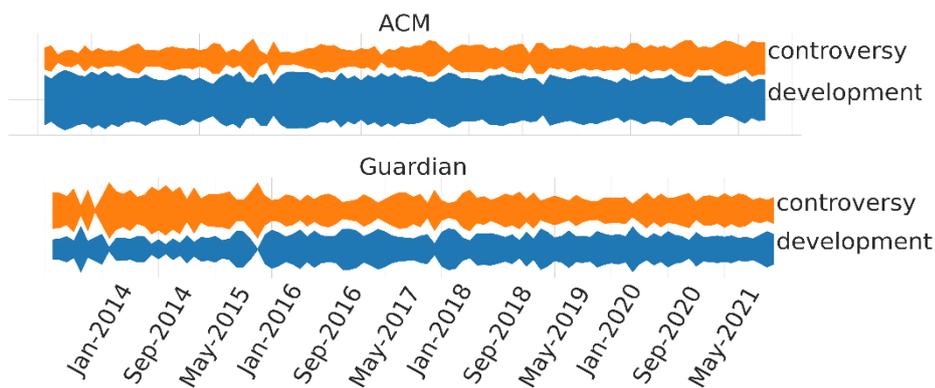


Figure 16: Trends in type of coverage of the news-solar dataset

As to **wind**, the reporting is mostly focused on local wind-farm projects, although recently there has been a shift towards the discussion of broader connections with other aspects of the energy system. There is some limited discussion of controversies such as grid stability and potential health impacts, but on closer inspection the articles do not dwell on the pseudoscience but criticise it.

The reporting on **natural gas** almost completely concentrates on coal seam gas, although Australia's conventional gas production and resources are an order of magnitude larger (Geoscience Australia, n.d.). However, the details of the topics explain the source of interest for reporting are conflicts involving farmers in places like Gloucester and Narrabri. These, and the 'approvals' for exploration, were very salient in the 2013–2017 period but have, naturally, become less so as the planning process has progressed. Methane emissions from cattle and landfill, of equal concern in terms of climate impacts, are only discussed minimally.

In recent years, a particularly salient recent development is the methane emissions target, which seems to have captured. Nonetheless, its use to balance renewables in the 'energy mix' has also increased, most likely in connection with the government's gas-led recovery plans. Newspapers also picked up on the 2016–2017 domestic price spike as the Australian market linked up with the expensive Asian markets through liquified natural gas (LNG) exports.

CCS has received very limited coverage in the studied period overall, with the discussion dominated by its connection with coal-fired power stations and the occasional announcements of generic research outcomes.

In recent times, a more general (and more consistent) concern has appeared with emissions reduction and net zero outcomes that go beyond the power sector. This is particularly correlated with the announcement by the Australian Government of its Technology Investment Roadmap in 2020, where industrial applications ('cement' and 'steel') and 'hydrogen' were mentioned more proportionally to the power sector, even though the discussion was still limited overall. This transformation is reflected in Figure 17. Hydrogen production has become the most discussed application of CCS after being completely ignored in previous years.

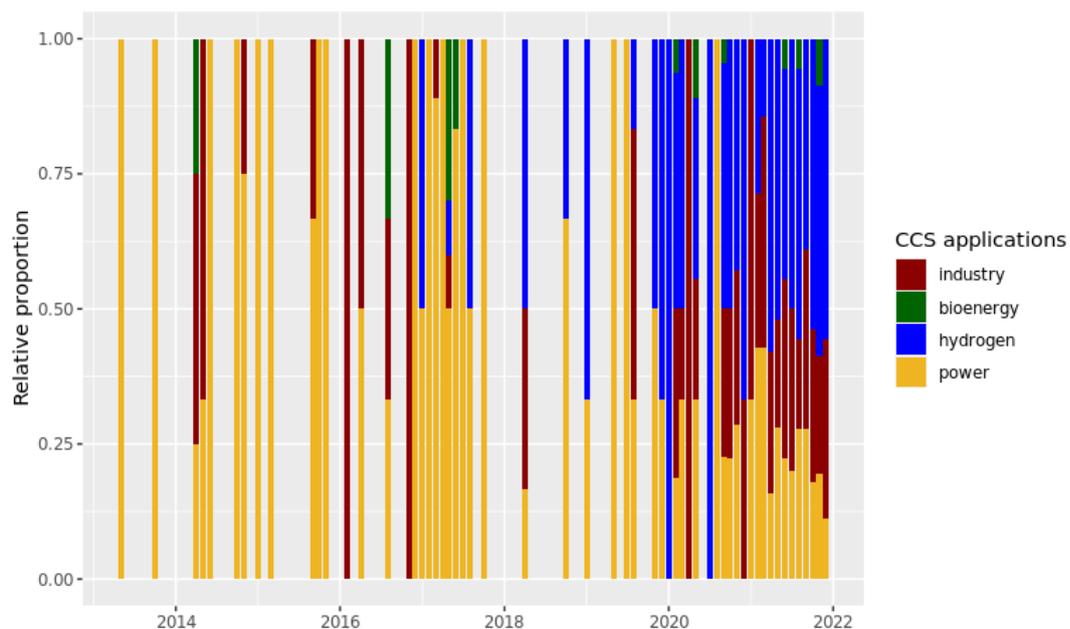


Figure 17: Types of CCS application mentioned in newspapers (empty fields mean no mentions in that month)

Hydrogen had minimal coverage in the study period, with only the occasional breakthrough in research and reports managing to puncture the silence – notably the Finkel review on a hydrogen strategy. The Technology Investment Roadmap reinvigorated the discussion of funding, but the most notable development in recent years has been the growth in attention to potential local initiatives like the Hunter Hydrogen Hub, which attracted most of the attention devoted to hydrogen in the regional papers, particularly compared with the *Guardian*.

Reports linking CCS and hydrogen naturally appear in the hydrogen-specific dataset as well. They are also joined by ‘green hydrogen’ applications, where hydrogen is extracted from renewable energy sources by electrolysis. The reporting balance oscillates, particularly in earlier periods when mentions were very scarce. Overall, however, it seems roughly equal between renewables-sourced and fossil-sourced hydrogen using CCS, sometimes called ‘blue hydrogen’ (see Figure 18).



Figure 18: Types of hydrogen pathways mentioned in newspapers (empty fields mean no mentions in that month)

5.3.2 Summary: What did we learn from the news content analysis?

Based on the findings from the news content analysis, we can conclude the following:

- Similar to our review of the Hansard data, the news dataset further contextualises the current state of the coal industry in the past decade. In the news, we see a shift towards internationalisation and a decrease of the overall attention to coal relative to other energy technologies.
- There has been increased coverage of climate and energy issues in recent years, with the majority of regional newspapers appearing to push for renewables to make up the core of a sustainable energy future.
- While regional newspapers highlight the local impacts and benefits of a transition away from fossil fuels, they have progressively taken a global perspective and do not focus on small-scale, local-control options that would involve a rapid transition.
- Remarkably, the cost of the energy transition has not received widespread coverage.
- The news conveys a general community consensus that solar is a feasible solution to power- and transport-related emissions.
- There has been an uptick in coverage and attention given to hydrogen production by the regional newspapers, but this is concentrated on green-hydrogen opportunities, with CCS appearing only as a poorly understood contrast.
- One reason for the distinct lack of coverage and understanding about CCS could be the absence of large, successful CCS ventures that can compete with the barrage of news about new solar- and wind-capacity records and efficiency achievements.

6 Twitter

Twitter is the third of our online sources and, similar to the Hansard and news articles, it comes with a wealth of content data. However, it also presents us with valuable information in the form of social network data, which we utilise to flesh out our initial approach at methodology.

6.1 Method: social network analysis

Our coalitions are based on discursive elements: how people talk and think regarding sustainable energy futures. The content analysis described above is therefore also applicable to the contents of tweets. However, without pre-existing categories (like the parties in Parliament) that help us assign

topics to specific groups, the task is considerably harder. We could try to hypothesise beforehand what those futures might be, define some associated terms and see who clusters around which terms. This approach would, however, bias the initial selection. We therefore adopted social network analysis (SNA), which establishes coalitions inductively rather than a priori. SNA enables identification of groups of people that gravitate towards each other (forming coalitions), as well as the most central elements within coalitions (key opinion leaders; KOLs). Once we know which groups exist, we can explore the thoughts and ideas they share.

Prior research shows that the best way to identify people who think alike about political topics on Twitter is to focus on ‘who follows whom’ (Barberá, 2015). We deploy algorithms that have been previously used on Twitter data for this purpose – namely, Louvain (Hanteer et al., 2018; Rubin et al., 2020), and leading eigenvector (Dey et al., 2018). Using various detection algorithms ensures we get robust results. A very simple case of SNA is represented by Figure 19. Coalitions are the shaded background behind denser collections of dots and lines, which would correspond, respectively, to Twitter users and their connections – that is, whether at least one of them follows the other.

6.1.1 Centrality measures

In terms of KOLs, on Twitter we focus on ‘central’ users within the network who act as gatekeepers and circulate information (Hemsley, 2019). Centrality is a concept that can be intuitively grasped but has several facets. We analysed three different centrality measures:

- betweenness centrality, which provides the highest score to users in the network that are equidistant from the users that are furthest apart
- eigenvector centrality, which identifies ‘hubs’ that in a Twitter context translates to those users with most direct followers
- authority centrality, or simply ‘authority’, which are the users receiving higher scores when they are followed by more hubs without necessarily being hubs themselves (Kleinberg, 1998).

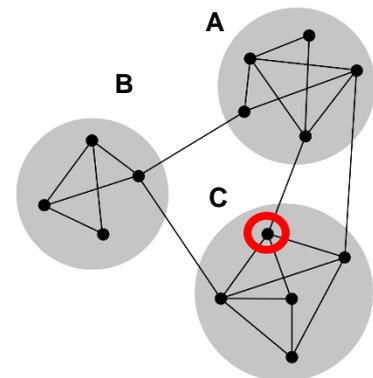


Figure 19: Representation of a social network with a ‘central’ node highlighted in red. Adapted from Wikimedia

The red circle in Figure 19 marks a user with a high ‘betweenness’ score, given that all other nodes are at 2 or 3 steps distance.

Additional detail on the SNA methodology is available in the Appendix ‘Twitter’.

6.2 Results

6.2.1 Hashtags, mentions and topics: Key themes

In addition to the general topic modelling, analysis of the Twitter dataset included simple frequency counts of ‘hashtags’ (for example, #energy) and mentions (for example, @ScottMorrisonMP). See Appendix ‘Twitter’ for details. The common hashtags across all coalitions largely reflect the expected topics of an Australian-centric discussion on energy and climate. These include #auspol and generic names of energy technologies like #coal, #solar and #wind. The only term that was not immediately obvious from our search terms is #china. China is, despite recent tensions, Australia’s largest trading partner, the world’s largest GHG emitter, and one of the main manufacturers and installers of almost every energy technology. Hence it remains a common reference point. By contrast, there are no mentions that are shared across all five coalitions.

In terms of topic modelling, all coalitions discuss to some extent ‘mining issues’, ‘rooftop solar’ or ‘Coalition’ politicians and policies. Mining issues refer to the very prominent approval debates around new and existing coal mining sites, mostly in NSW and Queensland (for example, Carmichael, Dendrobium, Watermark and Bylong), and their operators (for example, Adani, Whitehaven, Shenhua and Glencore). Rooftop solar is also important because of its rapid and widespread uptake in Australia. This has affected the electricity system, contributing to the unprofitability of less flexible generators and hence to ‘power plant closures’, which is also discussed by all coalitions.

Nonetheless, the level of discussion of these topics in each coalition is more variable than with the most frequently cited hashtags, and their accompanying topics reveal their specific preoccupations. See Appendix 'Twitter' for details.

6.2.2 Coalition characteristics

The leading eigenvector (LE) and the Leiden algorithms yielded very similar outputs, identifying five main discourse coalitions. The Leiden algorithm included a 'rump' sixth coalition with just a handful of members and hence was not meaningful for proper analysis. Drawing on the results from LE, we can establish the following five coalitions:

1. **Progressive:** favours progressive/left-wing policy-making and journalism
2. **Grassroots:** favours non-institutionalised left-wing activism
3. **Conservative:** favours conservative/right-wing policy-making and journalism, and climate-change denialism
4. **Science and tech:** centres discussions on science and technology
5. **Green:** favours 'green' policy-making and advocacy (for example, through NGOs).

As we shall see, all show clear pro-renewables attitudes except for Conservatives, which has an equally clear anti-renewables stance.

	Users	Proportion of users	Tweets	Proportion of tweets	Australian confirmed
Progressives	2.7 K	25%	10.1 K	6%	98%
Grassroots	2.4 K	22%	64.4 K	38%	84%
Conservatives	2.3 K	21%	23.2 K	14%	87%
Science & Tech	2.2 K	20%	21.5 K	13%	90%
Green	1.2 K	11%	50.4 K	30%	84%

Figure 20: Basic numbers for each Coalition identified with leading eigenvector algorithm

Progressive coalition: Left-wing news and policy-making

The Progressive coalition has #auspol as its highest-ranking hashtag, while its unique hashtags include #news and #ausbiz, and the less common #breaking, as well as #covid and #covid19 and [redacted: reference to programs featuring investigative journalism and debate of climate topics] and are shared with the Grassroots coalition, which also follows current events. Accordingly, topic modelling shows a general focus on highly political themes, with 'mining issues' at the top, as well as more general news items, like the pandemic and the trade tensions with China, mixed in. This is illustrated in the following tweet:¹

*[Redacted: Mining corporation] to suspend [redacted: NSW location] #coal mines
as China restricts imports <https://t.co/e9kpGDzpdY>*

In terms of mentions, there is a combination of science and economic commentators as well as politicians and journalists. Indeed, the most central users of this coalition are Labor politicians and reporters from left-leaning media (which came through as individual users even though we filtered out media outlets), all widely acknowledged to be left-of-centre. The only exception is [redacted: Liberal politician]. However, [Liberal politician] has been regarded as far closer to Labor positions on climate change and energy than most of his Liberal colleagues, a position noted in the following tweet:

¹ Tweets have been slightly modified to prevent searching and finding of individuals as per Ethics requirements.

[redacted: Liberal politician] says there are three main actors holding back Australia on climate change. Firstly, right-wing conservatives in the Coalition, secondly, right-wing media (including [redacted: Liberal politician]) and, thirdly, fossil fuel lobby. "Why has a matter of physics become a matter of belief"

The central Progressive Twitter users include left-wing commentators at the top of the betweenness ranking and journalists and politicians under both authority and eigenvector centrality. As a result of the above, prototypical tweets, such as the two included below, tend to link up the energy issues with the broader economy and take a relatively 'polite' approach to the issues.

We're in #Wollongong ready for some discussion of the steelworks, hydrogen, higher education, health services. These are industries that will keep the city humming #qanda

Thanks to a sales deal with @CleancoQ, Queensland's public energy company, we will see a \$380 million 157 megawatt wind farm built in Far North Queensland. Construction will start before the end of the year and deliver 150 construction jobs [redacted] #qldjobs

Grassroots coalition: Non-institutionalised activism

Grassroots hashtags indicate a general concern for politics not too dissimilar from the Progressive or Green coalitions but with a clearer focus on energy and climate, a greater enthusiasm for activism, and a more local perspective. Its unique hashtags include reference to Narrabri, the site of a highly contested coal seam gas development, and the controversial Carmichael coal mine proposed by Indian company Adani in Central Queensland. These are paired with #nswpol and #qldpol as well as references to state and federal Coalition governments and the Prime Minister.

The topic modelling confirms this focus, with 'Coalition' topping the lists followed by a topic on 'malpractice', which captures discussions of corruption, nepotism, unfair subsidies, and so on. Its unique topic refers to the 'gas-led recovery', a controversial Coalition policy that seeks to move towards decarbonisation by expanding gas production and consumption in Australia. This highly political focus is mirrored in the mentions, in which Coalition Members of Parliament, activists and some well-known commentators appear across the pro-renewables coalitions. Labor is also prominent in mentions but not as much as for the Progressives. This coalition also features complaints about [a major Australian news corporation], another feature shared with Progressives, as illustrated in the following tweet from August 2020:

HAVE YOU SEEN WHAT [redacted] AND THE BIG FOSSIL FUEL DONORS HAVE BEEN DOING WHILE PARLIAMENT HAS BEEN SILENCED? NATURAL GAS TO RESCUE US FROM CLIMATE CHANGE!

The central Grassroots Twitter users are relatively unknown figures who, by their descriptions, are activists, whistle-blowers, and independent journalists and commentators. As illustrated by the two tweets cited below, their tweets tend to be far less restrained in their assertions and accusations than their equivalents among the Progressive and Green coalitions.

Federal resources minister on the radio complaining that coal mining cannot get insurance...claims it is not fair to single out coal... but you could look at the tobacco industry. When you kill people you should not be in business.

*Meanwhile the banks are *****. Deceiving their customers about their commitment to climate action by investing another \$7 billion in fossil fuel projects.*

Conservative coalition: Conservative news and climate-change denial

Conservatives are also active, but, in contrast to the Progressive and Grassroots coalitions, their hashtags are more focused on energy technologies. Notably, wind is split between #wind and #windpower but in combination would be third overall. It is, however, worth noting that this coalition has the lowest level of hashtag use (13% of tweets vs 60% for Grassroots and Green). The topic modelling shows that Conservatives discuss 'rooftop solar' as part of their 'renewables critique' – for

example, wind power killing birds is a common trope (see Appendix Section 2.1.3 Topic modelling) – and in relation to concerns about ‘grid stability’. Their commentary on ‘mining issues’ is paired with discussions of the importance of ‘commodities’ to the Australian economy. Their unique topic is ‘climate-change denial’, often by reference to debunked cooling trends. This is illustrated in the following three tweets:

*A tariff on the bully boys may help pay for virus that has destroyed our economy.
We should export our gas coal and iron ore to non-commies. Business and
government leaders should get off their bums and do that.*

*Eliminating public subsidies for wind and solar will remove the incentives for
organised criminals; climate alarmism will no longer exist; conservation of natural
resources will be achieved; energy poverty will diminish; birds and other animals
will thrive.*

*I agree that domestic gas prices have fallen this year However prices in Australia
are still higher than in our Asian customers markets Australian #gas consumers
are being price gouged The #gas industry is sending AU businesses broke &
is forcing up electricity prices*

The mentions provide some further clues as to the characteristics of this coalition. Most refer to anonymous accounts that oppose renewable energy developments, and those who perpetuate climate-change ‘scepticism’ and denial. Their most central users by ‘betweenness’ and authority ranks include journalists from the [redacted: major Australian news corporation] decried in other coalitions, and [redacted: far-right politicians], as well as other users whose descriptions highlight conservative and anti-environmentalist values (for example, opposing wind farms, or electric vehicles, or animal rights). These are rounded off with some less politically salient figures, like a well-known comedian and by entertainment journalists. An example of the scepticism towards renewable energy and climate targets shaping this coalition can be read in the following tweet:

*[far-right commentators] destroy [left-leaning commentator] over #NetZero2050
energy policy #pmlive, [government minister’s] energy policy will probably destroy
the coalition’s chances of winning the #[redacted]ByElection*

Science and tech coalition: New technologies and science research

As shown in Figure 21 further below, Science and Tech stands out by discussing coal the least and instead including solar power and hydrogen. Its general hashtag ranking also reflects this and its unique hashtags further clarify that its adherents focus on #sustainability, #cleanenergy, #innovation and more technical issues, such as #carbon_accounting, which is mentioned in the tweet below:

*Really looking forward to hearing from CSIRO scientists at the Perth GRDC
Updates <https://t.co/MXVkUsaJGH>; leading scientists in the field of climate change
and agriculture and carbon accounting. Thank you to the @theGRDC for this
opportunity.*

Unlike for all other groups, #auspol does not appear as a hashtag. A broad range of technologies feature in the topics, including ‘oil & gas production’, ‘batteries’, ‘electric vehicles’ and ‘aviation’. The general topic of ‘innovation’ also appears. The Coalition gets discussed but not the Labor Party or anything related to ‘malpractice’. The attitude tends to be more conciliatory, particularly compared with the foregoing coalitions. An illustrative example of a Science and Tech tweet is

*#Natgas allows for more #renewables to be integrated into the grid because
it can modify its output quickly to the variable renewable generation.
#SouthAustralia is an excellent example where gas and renewables work
side-by-side to deliver lower-emissions energy. #auspol #sapol*

In terms of mentions, there are science communicators, entrepreneurs and a couple of activists, as illustrated in the tweet below. The most central users are related to the fields of research (CSIRO) and science communication. Eigenvector centrality also reveals the importance of farmers whose tweets tend to address various technological options, climate change and its effects on their business.

On-farm energy: tips on increasing renewable energy, emissions reduction, and efficiency that can save money here

Green coalition: Green policy-making and advocacy

For the Green coalition, #coal has the largest share of hashtags but #auspol and #climate are also ranked highly. This coalition's interests seem to overlap somewhat with both Progressives (#covid19) and Science and tech (by mentioning its own rather niche technological option #geothermal), which is unsurprising given the high level of connections with those other coalitions. Green is, however, the only coalition that has #emissions and 100% renewable targets (#re100) in its top 10 hashtags. Targets in general are very prominent, as illustrated in the following tweet:

Our economy needs a legislated net zero target. And that means by 2050, if not earlier... The reason is that it gives certainty to private investment, not just to decarbonise the economy

Through topic modelling, we see that the Green coalition shares technology themes with Science and tech. However, in contrast to the latter, Greens pairs these technology themes with a more political slant, including power-plant closures, malpractice, social policy and global targets. This coalition's top mentions are a mixture of renewables entrepreneurs and commentators and a couple of Coalition Members of Parliament. Its central users exhibit a more political/activist bent and include major NGOs, think tanks, and Australian Greens Members of Parliament. These take slightly different rankings depending on the centrality measure, but are fairly consistent. The following example illustrates the political character of Green tweets:

The Prime Minister and his mates in the gas business are trying to bailout dirty gas pipelines

The main difference from the Grassroots coalition is that the action is oriented more towards government policies and targets and opinions are framed in a somewhat less confrontational way (fewer expletives, for instance).

6.2.3 Technologies

In terms of discussions organised by technology type, as shown in Figure 21 and Figure 22, the distribution is similar across three of the five coalitions, with coal making up a significant proportion of the conversation in all of them. The two outliers are the Conservatives and the Science and tech coalitions. Conservatives display a much greater discussion of wind power and, on a smaller scale, nuclear, while the Science and tech group pays more attention to solar power, hydrogen and, to a lesser extent, batteries. It is noteworthy that CCS receives very limited coverage in all coalitions, particularly considering the relatively 'informed' nature of participants in the debate on Twitter compared to the general public.

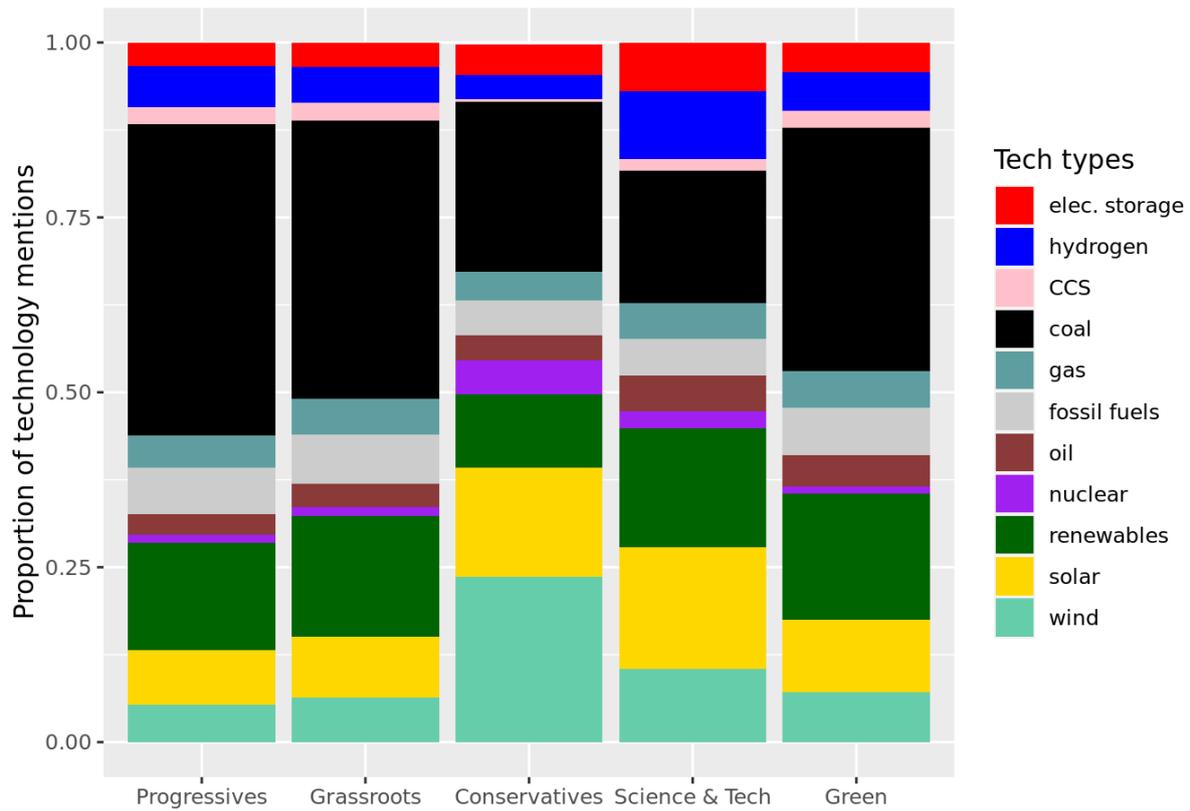


Figure 21: Technologies mentioned in each coalition as a proportion of all sentences (counted once per tweet)

For most of the period under analysis shown in Figure 22, the relative weights of each technology in the discussion remain similar. The significant increase in attention to coal in May 2021 among all coalitions except Science and tech was a convergence of at least two factors: first, a slump in coal exports due to China’s ban on Australian goods, and second, the announcement of the G7 on 22 May that it would aim to stop financing coal projects by the end of 2021. On 4 May, the Australian Government also announced Australia’s first plant to burn hydrogen, which explains the jump in attention to this technology among both Grassroots and Progressive coalitions.

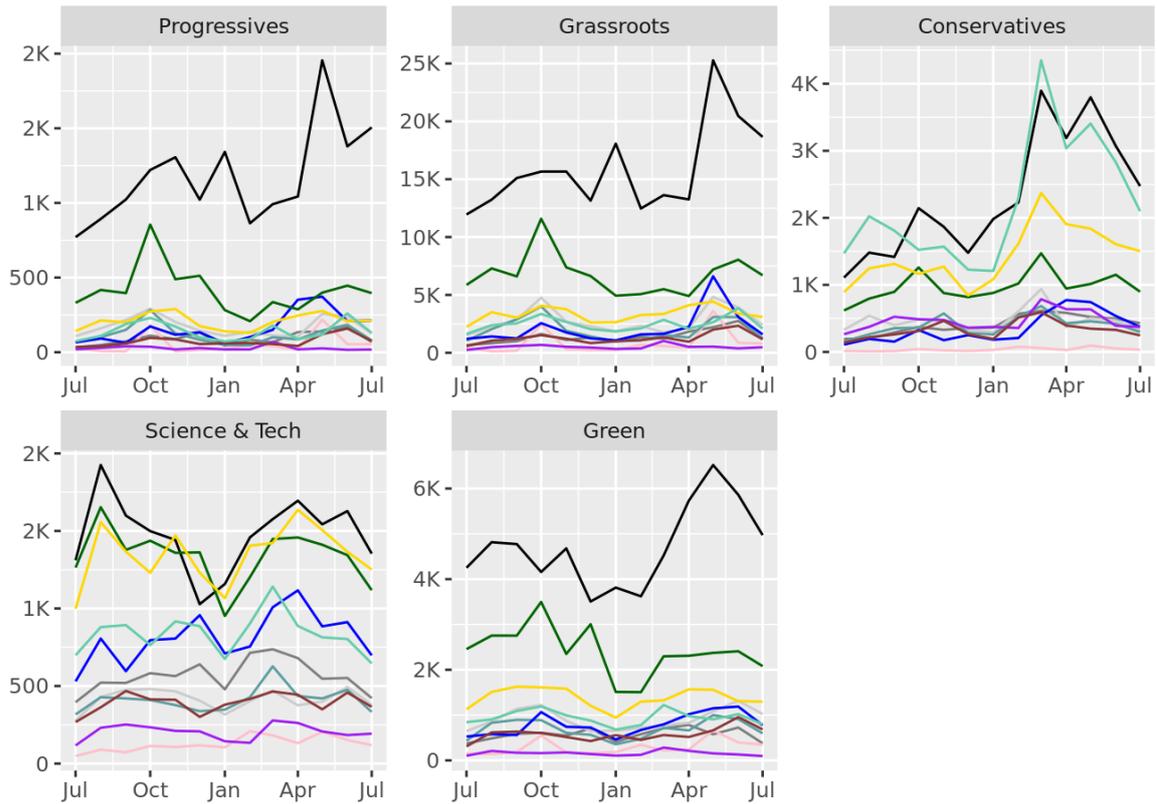


Figure 22: Mentions of various technologies by month in the period July 2020–July 2021 (counted once per tweet). See Figure 21 for colour legend.

6.2.4 Post-hoc analyses

Attitudes to coal

We extract the most common two- and three-word collocations as this gives a quick idea of some issues that were often highlighted by the members of each coalition in relation to coal. Drawing on the foregoing results, sample tweets and expert knowledge of the issues, we build storylines, that is, ‘a condensed statement that summarizes and encompasses more specific narratives’ (Rosenbloom et al., 2016). We use the collocations (see Appendix ‘Twitter’) in ‘inverted commas’ to create these storylines in Table 4.

Table 4: Representative storyline by coalition on coal-related tweets

	<i>Typical storyline</i>
<i>Progressive</i>	[redacted: ‘Liberal politicians’], is ultimately behind the approvals for ‘mine expansions’ instead of focusing on supporting ‘renewable energy zones’.
<i>Grassroots</i>	[redacted: ‘Liberal politicians’] have been ‘bribed’ to ‘divert public money’ to finance the ‘fossil fuel industry’.
<i>Conservative</i>	Australia should not jeopardise its ability to provide ‘24/7 base load power’ by using ‘wind turbines’ and ‘solar panels’ when ‘China’ is building the ‘Menghua railway’ to transport ‘200 million tonnes’ of coal.
<i>Science and tech</i>	The ‘British grid’ had ‘0.0 GW’ of coal-based ‘electricity generation’ for a ‘continuous’ 67 days.
<i>Green</i>	Japan and ‘South Korea’ must stop financing coal to enable the ‘energy transition’ and address the ‘climate crisis’ as well as ‘air pollution’.

Conservatives and wind power

The analysis over time shows the high correlation between wind (and to a similar extent solar) and coal among the Conservatives. The storyline above and the sample tweets below showcase the typical advocacy of coal against wind in this coalition:

Solar and wind are great supplemental power but totally inadequate for general demand in Oz so if there's no hydro or gas the only option is HELE (look it up) coal or nuclear (uranium) ... Australia has heaps so we should have cheap electricity as our Asian neighbours enjoy!!

Coal is the largest source of electricity on the planet with ½ the capacity built in the past 20 years. Hotter more efficient coal plants are the answer to the grid stability problems in the NEM being created by solar + wind generation. [redacted] #auspol

To ascertain the level of discussion of potential issues, we use four sets of terms derived from the literature on public acceptance (Hudson, 2017; Rand, 2017). See Appendix 'Twitter'. This reveals a far greater use of grid reliability terms (~24.7% of tweets mentioned a relevant term) and cost-related terms (~25.8%) compared with terms referring to environmental and health (~6.5%), land-use (~1.7%), or aesthetics (~1%).

Incivility

In random samples of tweets from our dataset, it is easy to spot tweets with uncivil language, from direct insults to interlocutors and others. This has long been a feature of online conversations (Papacharissi, 2004).

Table 5: Strong language use by coalition

	<i>Insults</i>	<i>Swearwords</i>	<i>Total</i>
<i>Progressives</i>	0.5%	1.3%	1.8%
<i>Green</i>	0.2%	0.3%	0.5%
<i>Grassroots</i>	0.8%	1.4%	2.2%
<i>Conservatives</i>	1.1%	1.1%	2.2%
<i>Science and tech</i>	0.2%	0.3%	0.5%

The differences are notable between groups and add to the more subtle distinctions, such as that between the more restrained professional 'Green' activists and more belligerent Grassroots coalition. The high values for Conservatives and low values for Science and tech are both in line with their identities as deduced in the results: the former are frustrated at changes they deem highly disadvantageous, and the latter seek to focus on objective issues.

6.2.5 Summary: What did we learn from Twitter social network and content analysis?

Based on the findings from the Twitter social network and content analysis, we can conclude the following:

- Five discourse coalitions emerge from the highly committed, engaged and arguably influential Twitter population. We label these Progressive, Grassroots, Science and tech, Green, and Conservative.
- Around 80% of Australian Twitter users with a large following that discuss energy issues see renewables, even innovative renewables, as the core of a sustainable future (with only the Conservatives excluded from this, who adopt a clear anti-renewables stance).
- At the same time, most of the Twitter coalitions are likely to endorse the need to keep using fossil fuels as long as needed to avoid severe economic impact, with limited reflection on *what* exactly it will take to transition.
- The distribution of discussions by technology is rather similar across three of the five coalitions, with coal being given significant attention by each. Conservatives display a greater discussion of

wind power and to a lesser extent nuclear, while the Science and tech group pays more attention to solar power, hydrogen and, to a lesser extent, batteries.

- The focus on coal as a target of criticism and controversy is clear from the Twitter data.
- Key opinion leaders emerged from our Twitter assessment, which allows us to link certain discourses with dominant individuals in the network (detailed further in the Discussion).
- The positioning of each Twitter coalition's attitudes towards the conversation about and support of fossil fuels spanned from critical (criticising 'the other side', including by using expletives) to constructive arguments (more concerned with finding solutions).
- 'Echo chambers' do not exist as such; all Twitter coalitions show a good amount of connectivity, and Conservatives have more connections to other poles than the activist-led Grassroots group, which has the least. Nevertheless, the tone of debate on Twitter seemed to afford limited room for compromise among those most diametrically opposed to one another

This section summarises results in chronological order and increasing level of specificity. We start with a historical overview through content analysis of Hansard records (for the long term) and news datasets (for the shorter term). Social network and content analyses of Twitter provide us with an initial five coalitions structure, albeit conditioned by Twitter's specific demographic. We then turn to analysis of the quantitative survey. The latent factor analysis of the responses of the more diverse (arguably less radical) survey respondents yields six coalitions. As noted in previous sections, we further explore these with the Delphi forum and dive deeper into the themes that distinguish these coalitions through our interviews. Our communications strategy (community forums) provides a final test of the findings of the preceding analysis and a way forward towards enabling broader coalitions.

For each result, we report 'key themes' that will eventually coalesce into contextual data and 'beliefs'. From the Twitter results onwards, we also include findings specific to the coalitions and the case-study regions.

7 Survey

Surveys are an essential tool in gauging attitudes across a broader share of the population than represented in traditional and new media, as well as parliamentary records.

7.1 Method

7.1.1 Recruitment

The quantitative survey was envisioned for distribution in the three case-study regions: the Illawarra, Hunter, and Far West, with Sydney, and the remainder of NSW as control groups through panel sample of a representative subset of the adult NSW population by an established provider: Dynata. Dynata uses postcodes as the geographical indicator for respondents, so we provided lists of postcodes for each region based on overlaps with the LGAs noted in Section 4.2. The survey was trialled through distribution among relevant organisations and contacts in mid-August 2020. It was launched on 3 September 2020 and closed on 22 November 2020.

As reported in Q3 2020, given the difficulty in obtaining responses from the Far West, which did not reach 20 respondents, we negotiated with Dynata to extend the collection beyond the paid-for 1750 respondents by including a larger number from other rural regions. For the purposes of representing the remote 'Far West', we group all NSW postcodes that fall into regions classed as 'Outer Regional Australia', 'Remote Australia', and 'Very Remote Australia' in [the 2016 Australian Statistical Geography Standard](#) for 'Remoteness Structure'. We call this region 'Remote rural'. The remainder of respondents are placed in a 'Major rural' region. Figure 23 visually depicts the geographical distribution of the various responses (cross-checked by our own and the respondents' assessment of their region). Table 6 provides the numeric breakdown of participants across the survey.

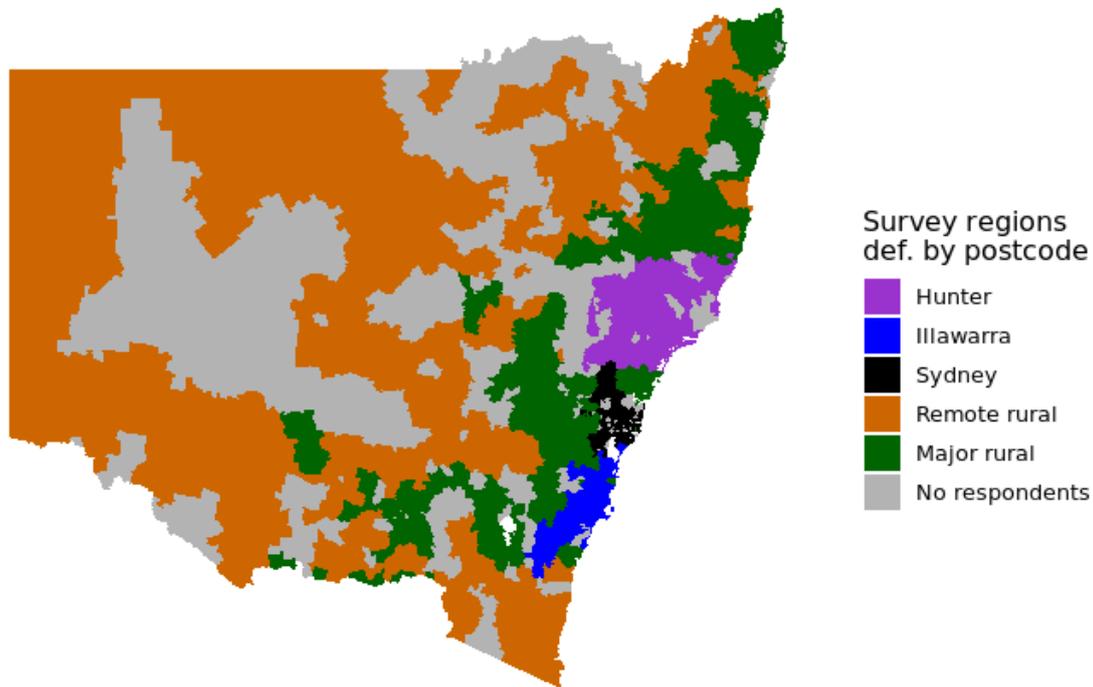


Figure 23: Spatial distribution of respondents to survey over a map of NSW. Note that the boundaries of LGAs and postcodes do not match perfectly.

Table 6: Numeric distribution of responses to survey. Each location excludes all others (for example, Major rural does not include rural locations in the Hunter)

Region	Num.	Prop.
Hunter	400	19.9%
Illawarra	299	14.9%
Major rural	467	23.3%
Remote rural	246	12.4%
Sydney	590	29.5%
Total	2002	100%

The 2002 responses noted above already excludes answers out of area or of poor quality (for example, people reporting a postcode in Queensland, and those who did not follow simple instructions correctly). Some of the statistical analyses described below exclude a handful of additional responses due to 'Don't know' answers for certain items.

The median age in our sample was 57 years (53 for females and 61 for males). This is somewhat high but comparable to the median adult age outside of Greater Sydney (54 years) towards which our sample was intentionally biased (see Figure 24). The male/female ratio across the sample is 0.9, slightly female biased, which again corresponds to the tendencies in rural/older populations. Only one response is non-binary and is not reported for privacy and lack of statistical significance reasons. The most common educational attainment is TAFE-equivalent education. The regression output in the Appendix 'Survey' shows that, while some elements of gender and age are somewhat statistically significant in predicting support for some technologies, the effect is very small, so we do not highlight these demographic differences further. The summary of characteristics by coalition is listed in the Appendix 'Survey'.

7.1.2 Questionnaire

The survey aimed to identify community views about low-emissions technologies and energy transitions. The focus was on ascertaining the support for different types of ‘energy futures’ and the factors influencing their support. Energy futures were specified in two dependent variables: the level of **support for individual emerging technologies** and a multiple choice of **support for low-emissions pathways**.

The technologies were chosen based on the Australian Technology Investment Roadmap (ATIR), which, at the time of the survey launch (early September 2020), was still in [its draft format](#). The selection aimed to be representative of various types of technologies with limited or no deployment in Australia and different implications for individuals and the energy sector. The goal was to create a closer comparison, as it is already well established that, for example, traditional wind and solar are much better known than CCS (Ashworth et al., 2015). Offshore wind or concentrated solar power should be just as novel, however.

In turn, we translated the low-emissions pathways from [the IPCC 1.5 degree report](#) into a simple dichotomy between:

- a) **lifestyle changes** involving less energy consumption to allow renewables to completely fill the gap left by the removal of fossil-fuel generation; or,
- b) **technological changes** that achieve negative emissions through burning of biomass, such as wood, while capturing and storing the emissions long term or capturing carbon dioxide directly from the air (through CCS).

As to the independent variables, we ascertained a wide range of elements that could be conceived to form beliefs and support for various technology futures based on the literature: the socio-economic status and geographical situation of respondents, their general political inclinations, their knowledge of the technology, their beliefs regarding nature, general beliefs regarding the reasons for their particular selection of technologies (economic, health, environmental reasons), and their sources of knowledge (family and friends, media, internet, social media, and so on). Finally, we incorporated a treatment on local vs global themes. That is, respondents were presented with two slightly different versions of the survey asking them to think about technology futures in general terms or in terms of their local area. This seeks to test for the importance of local attachment for technology preferences. This includes the ‘not in my backyard’ phenomenon, which has become more contested in recent scholarship (Bertsch et al., 2016). The full questionnaire is attached separately, and the significance of individual variables is explained in the next sub-section.

7.1.3 Regression analysis

Support for individual technologies yielded the most interesting results and we centred the analysis on this dependent variable, while keeping ‘support for pathways’ for later exploration. In order to ascertain the factors explaining support for technology, a regression analysis is necessary. Since the variable ‘support for technology’ is a single item with 5 points going from totally disagree/oppose to totally agree/support item, we carried out both multinomial ordered logistic (Peel et al., 1998) and ordinary least squares (OLS) regressions. The latter treats the dependent variable as continuous, which is widely accepted for [5 or more items](#). This assumption is robust for identifying the variables that have a strong impact on the response (Agresti, 2010), which was our main goal. Indeed, both ordered logistic and OLS regressions yield very similar results in terms of statistical significance of variables and the magnitude of their response. OLS results are more straightforward and lend themselves to visually clearer outputs. Both are reported in the Appendix ‘Survey’. We cite only the coefficients from the OLS output.

We put together a theoretically informed model that allows us to explore common questions from the literature and from previous steps in our analysis. We thus arrive at the following robust model:

$$\text{support}_t = \text{know}_t + \text{age} + \text{education} + \text{gender} + \text{our_regions} * \text{glocal_treat} + \text{NEP} \\ + \text{economy} + \text{health} + \text{participation} + \text{politics}$$

How to read the model:

1. ‘t’ subscript (t) refers to technology – for example, ‘offshore wind’, ‘coal’ or ‘CCS’

2. 'know' refers to the self-assessed knowledge of the technology, which is a common item in public acceptance research (van Rijnsoever & Farla, 2014)
3. 'age', 'education', 'gender' and 'politics' are typical control variables in any sociological study. 'Politics' captures the self-assessed political alignment of respondents (1: extreme left, 10: extreme right)
4. 'NEP' refers to 'New Environmental Paradigm' scale, which is a well-established measure of attitudes towards nature; it is higher the more the respondent puts nature at the centre of their views (nature-centric). The lowest scores are therefore considered human-centric (anthropocentric) (Dunlap et al., 2000; Hobman & Frederiks, 2014)
5. 'our_regions' refers to the case-study regions and seeks to cover issues relating to place attachment (Liebe & Dobers, 2019) or landscape impacts (Olson-Hazboun et al., 2016). This is combined with the following term through an interaction (*) – that is, we explore all potential combinations of the two terms separately
6. 'glocal_treat' indicates the aforementioned 'survey treatment', which involves asking the respondents to consider their answers from either a local or a global angle. This can be expected to cover some of the NIMBY phenomenon mentioned in Section 2.1.1.
7. 'economy' and 'health' relate to the reasons provided for supporting technologies and pathways (for example, greater or lower agreement with environmental or economic reasons)
8. 'participation' captures the perceived ability of respondents to have a say and obtain relevant information from the authorities, which is a common theme in acceptance research (Boutillier & Black, 2013; Dwyer & Bidwell, 2019; Scherhauer et al., 2017; Walker & Baxter, 2017; Zárate-Toledo et al., 2019).

Because of our reporting of results from the slightly more sensitive OLS method, we set strict cut-offs for statistical significance, starting at $p < 0.05$ (*) and more often reaching $p < 0.001$ (***)

7.1.4 Latent class analysis

To support the effort of identifying the broad coalitions of people who share common beliefs and attitudes towards particular energy technology futures, the survey analysis also needed to identify groups of respondents that display consistent outcomes. For this purpose, we used latent class analysis (Hagenaars & McCutcheon, 2002). The 'classes' are our groups of interest (the coalitions), which are not immediately observable from any one variable, hence 'latent'.

Because of the nature of latent class analysis, which relies on converting all elements to binary variables, specifying a large number of variables dramatically increases computation requirements. Models were run using the poLCA package, using gender, age groups, NEP, politics and location as independent variables and the full set of 'support for technology X' (offshore-wind, BECCS, and so on) as dependent variables. We also check the effect of replacing the gender, age and location variables by independent variables from our own OLS regression analysis, such as health and economic concerns. Results are extremely similar to one another.

7.2 Results

The main dependent variable we consider in the survey is the support (via taxation) for a wide range of *emerging* energy technologies. Referencing only emerging technologies equalises the issue of 'lack of knowledge', while representing all major technological groupings (renewables, renewables assistance, fossil fuels, fossil-fuel assistance and nuclear). The technologies under consideration with their abbreviations as used in all graphs and output are nuclear, carbon capture and storage (ccs) with several variants using coal, bioenergy and hydrogen, and in steelmaking (coal_ccs, beccs, h2_ccs, and steel_ccs); hydrogen (H2); batteries (batt); high-voltage direct current transmission (hvdc); local smart grids (smart_g); concentrated solar power (csp); and offshore wind (off_wind).

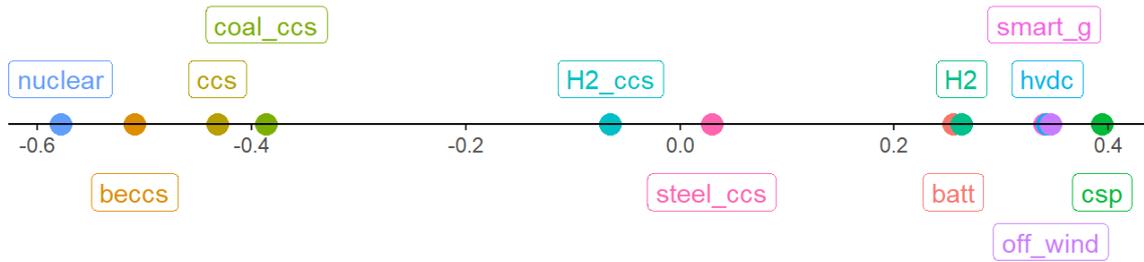


Figure 24: Average support for specific energy technologies as a difference from the average support across all technologies

Average level of desired support is in 3.5 or above in a 5-point scale for all technologies except nuclear. As clarified in the Delphi forum (see 7.5), there is greater faith in the ability of technology, rather than people, to create change. Nonetheless, within this small range there are clear differences. Figure 24 shows the relative levels of support for each technology as a distance from the average. Renewables and their supporting technologies cluster at the higher end, and traditional sources at the lower end, with steelmaking and hydrogen CCS options lying in the middle. In the following subsections, we tease out the specifics of this support distribution.

7.2.1 Regression analysis: Key themes

The factors that had the greatest influence on support for various technologies had commonalities across technologies, but also some unique effects.

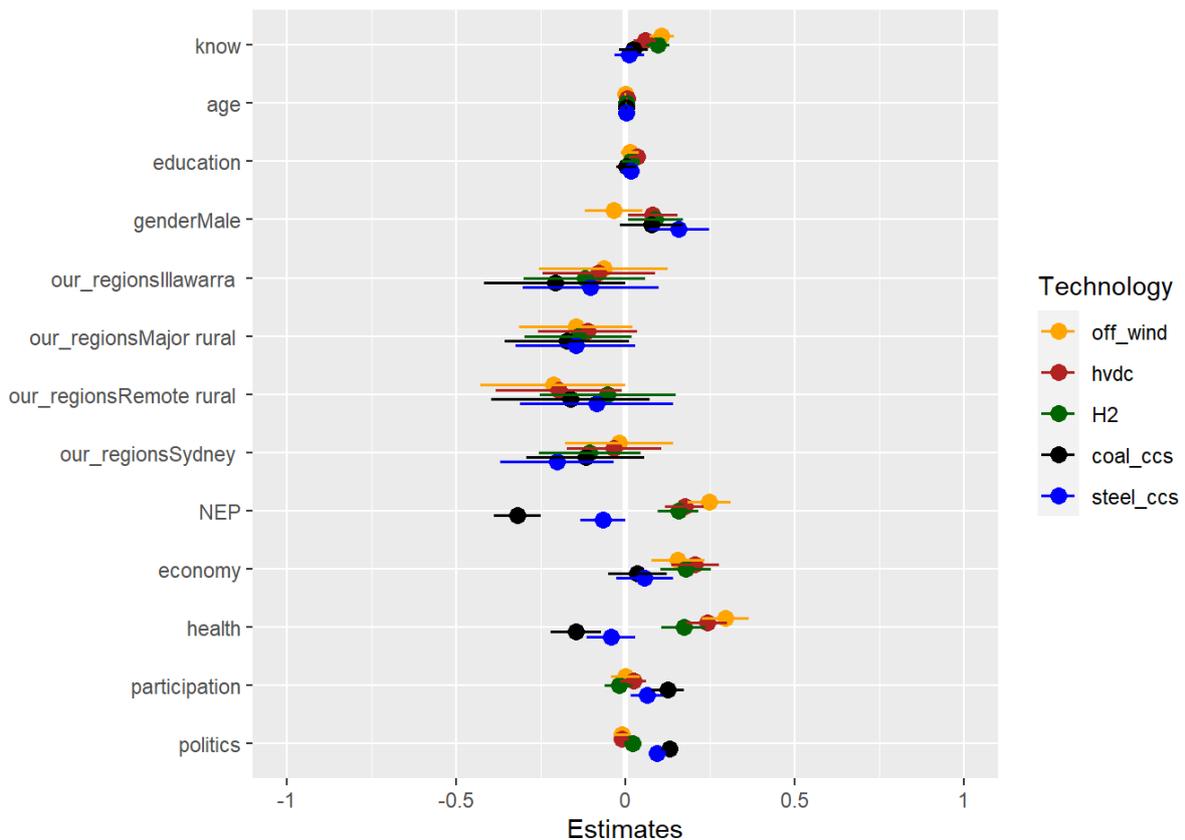


Figure 25: Graphical display of estimates (points) and their confidence intervals (lines) for all major variables in the ordinary least squares (OLS) regression model for a selection of renewable and non-renewable-related technologies. The ‘condition’ variable and its

interactions with 'our_regions' are omitted as their estimates were imprecise (large confidence intervals).

Below we briefly present the largest, statistically significant coefficient estimates (β), i.e. effects of one variable on support for technologies. The full regression tables both for OLS and for ordinal logistic regression are in the Appendix 'Survey'.

The attachment of respondents to nature, which we measured with the New Environmental Paradigm (NEP) score, was the main predictor of their support for a technology. Higher nature-centric attitudes led to higher support for renewable-related technologies and lower for nuclear and CCS-related technologies. The largest coefficients are thus for the negative relationship between NEP and support for nuclear and coal CCS (in OLS, respectively $\beta = -0.370$; $\beta = -0.319$; both $p < 0.001$). This means that a one-point increase in the NEP scale (more nature-centric) corresponds to 0.370 and 0.319 points decrease in support, respectively. Figure 26 showcases these so-called marginal effects of NEP. The opposite effect can be observed for offshore wind, high-voltage direct current (HVDC) or, to a lesser extent, hydrogen (H2). Hydrogen with CCS and steel CCS have non-significant and small effects.

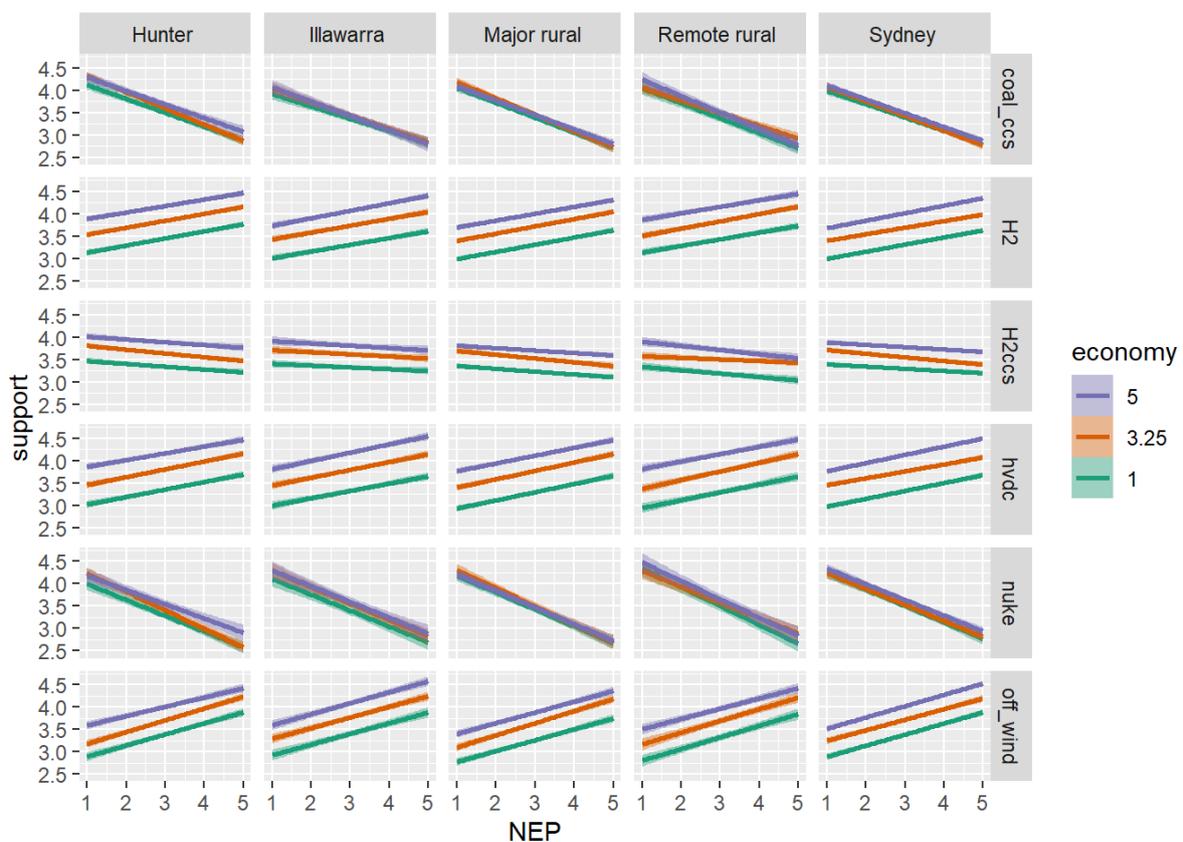


Figure 26: Marginal effects of nature-centric attitudes (NEP score) on support for a selection of technologies with estimates at different levels of expressed concern for 'economy'. All other variables held at their mean. All axes in this figure are on a 5-point scale (1 = lowest level, 5 = highest level).

Figure 26 also shows the effect of people expressing economic concerns on their support for various technologies. A higher economic concern leads to higher support. The effects are clear for renewables and related technologies; but they do not exist for coal CCS or nuclear power. It is also notable that there are no clear differences between regions. A small effect was statistically significant between remote rural locations and others in their greater support when asked through our condition

to consider technologies for their local area (for example, smart grids) than more globally. This set them apart from all others and explains the statistical significance, but it is swamped by other effects.

Another noticeable effect is that of knowledge, which affects positively renewable and related technologies, but most clearly nuclear ($\beta = 0.223, p < 0.01$). CCS as a whole is less strongly affected ($\beta = 0.061, p < 0.05$) and the specific forms of CCS are not affected at all, possibly because survey participants did not have much knowledge regarding these technologies.

Further, a greater sense of ‘participation’ was associated with greater support for CCS technologies and, to a lesser extent, nuclear. More conservative/right-wing politics were also associated with greater support for nuclear and CCS technologies. Overall, it seems that a sense of control and influence on the process is correlated with increases in support for the more controversial technologies. The noticeably greater support of nuclear among males ($\beta = 0.336 p < 0.01$) is potentially part of the same phenomenon.

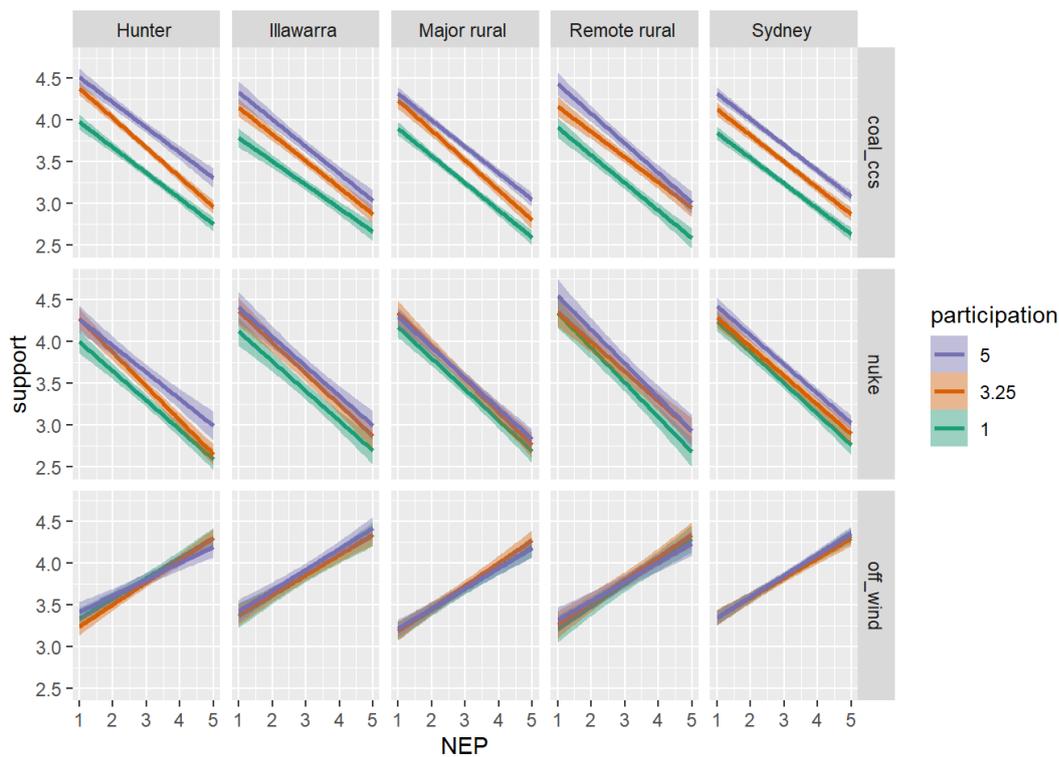


Figure 27: Marginal effects of NEP scale on support for a selection of technologies with estimates at different levels of perceived levels of ‘participation’ in the decision-making process. All other variables held at their mean. The axes scales are as in the previous figure.

The explained variation for most technologies is at or above the range seen in similar studies (Hobman & Ashworth, 2013; Liebe & Dobers, 2019). As in those studies, lesser-known technologies like CCS show lower values ($R^2 \approx 0.1$) than others ($R^2 \approx 0.25$), which indicates greater variability in responses. The results also largely agree with a recent study that found an overlap between environmentalism-leftist orientation and support for renewables in Australia (Clulow et al. 2021). It is worth noting that this study did not include an explicit measure of environmentalism like the New Environmental Paradigm, but rather asked about reasons for support including 5 different options of which one was clearly environmental. In any case, the upshot is that ideology, particularly as it defines attitudes towards the environment, is a key defining factor in the formation of preferences. This dovetails with studies on related topics like climate change beliefs/activism.

7.2.2 Coalition-specific analysis: Latent class analysis

The above findings highlight what influences support for technologies overall and, like all regression analyses, are concerned with average effects. However, in many questions, such as energy transitions, it is also important to understand the various groupings that are affected by this. This is where the latent class analysis described in the Methodology section helps.

Through this tool, the quantitative survey could identify a more diverse set of coalitions than is available from the analysis of social network data. While the two are not connected, most of the survey coalitions seem less polarised in terms of the range of technologies that they are willing to support, and they additionally cover some of the more ambiguous individuals.

The following dot points summarise some of the key characteristics of each of the six coalitions as reported in Table 7 and Figure 28.

- **Renewable energy sources (RES) fans** (22.5% of 2002 responses): RES fans are extremely supportive of renewables (both wind/solar and auxiliary) and negative about coal and nuclear. CCS in general and its more specific applications receive more favourable reviews than coal and nuclear, but these individuals are still rather neutral in their assessment. They have the highest NEP score of all coalitions.
- **Pro RES** (24.7% of 2002 responses): In comparison with RES fans, Pro RES people are positive, but not as enthusiastic, about renewables. More of them are neutral about coal and nuclear.
- **Tech fans** (12.3% of 2002 responses): Tech fans are extremely supportive of deploying any and all technologies and claiming (on average) far greater knowledge about them, which is in line with also reporting the highest level of education (the most common being a Master's degree). They have (alongside the 'Indifferent' group), the youngest median age, the highest income, and are the most male-dominated with almost three males per female (n = 184 and 61, respectively).
- **Broad choice** (22.4% of 2002 responses): People in the Broad choice coalition are moderately supportive of all technologies (range = 7-8), with a balanced male/female ratio (n = 238 and 210) and generally average values across the board. They have a relatively high median age of 62 years.
- **Sceptics** (6.9% of 2002 responses): Sceptics display the lowest support for renewables in the entire sample. They also support nuclear or CCS for coal more than most other groups, but that is not as clear as their disapproval of renewables and related technologies. They are the oldest group with a median age of 63 years, are mostly male (n = 96, females = 43), and have a low environmental concern. They claim slightly higher technical knowledge, in contrast to reporting an average TAFE level education similar to most other coalitions.
- **Indifferent** (11.2% of 2002 responses): These respondents had a neutral opinion on all technologies and reported the least knowledge about all technologies. Note that they passed all attention tests and thus seem to provide genuine answers. This group reports the (equal) second-highest levels of environmental concern (M = 7).

Table 7 presents the median (numeric) or the most common value (categorical) for some of the most relevant variables for each of the six coalitions as identified by the latent class analysis. For simplicity's sake, all numerical scales have been normalised to a range of 1 for lowest (or left) and 10 for highest (or right) for the tables below. The original values stem from 5-point scales (1 = strongly

disagree to 5 = strongly agree), political alignment (1 = extreme left to 10 = extreme right), or more complex measures such as the NEP (nature-centric values) scale (Dunlap et al., 2000).

Table 7: The median or most common values for the most relevant variables for each coalition

Characteristic	RES fans	Pro RES	Tech fans	Broad choice	Sceptics	Indifferent
support for CCS	6	7	10	8	6	6
support for coal CCS	3	6	10	7	8	6
support for nuclear	3	6	10	8	8	6
support for other CCS	6	7	10	7	6	1
support for renewable aux.	10	7	10	7	6	4
support for wind & solar	10	7	10	8	3	6
education	TAFE	TAFE	Masters	TAFE	TAFE	TAFE
male/female ratio	0.58	0.56	3.02	1.13	2.23	0.64
age	61	53	49	62	63	49
NEP ('nature-centrism')	8	7	6	6	6	7
respondent's perceived influence in energy topics	4	6	8	6	6	6
political alignment	6	6	8	6	7	6
technical knowledge	3	3	5	3	4	2

Figure 28 depicts the spread of each coalition's level of support for each technology (for example, CCS, nuclear, offshore wind, and so on). All items in this figure are on a 5-point scale so we maintain it (1 = lowest level of support, 5 = highest level of support).

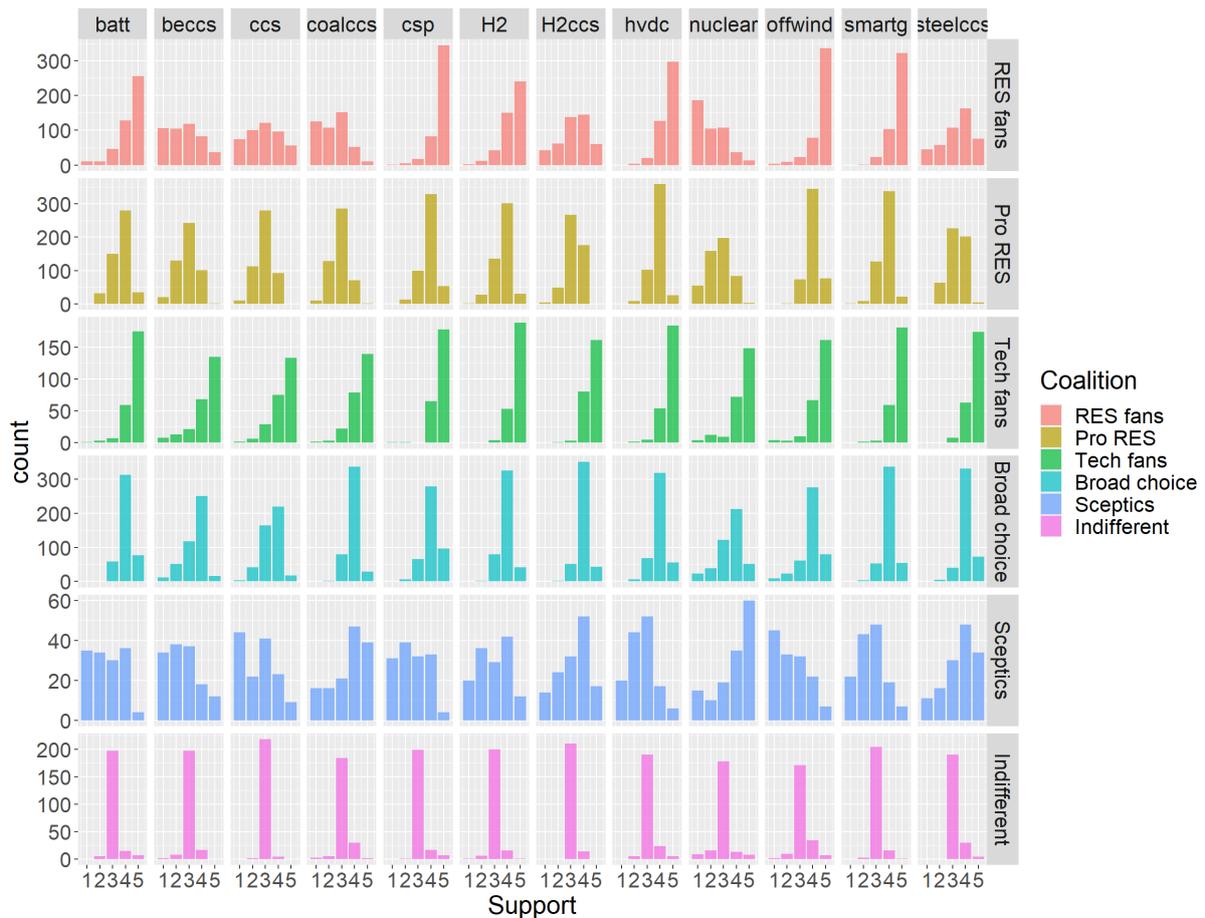


Figure 28: Histograms depicting each coalition’s level of support for each technology. All items are on a 5-point scale (1 = lowest level of support, 5 = highest level of support).

Table 8: Distribution of members of each coalition, with largest percentage highlighted (percentages as depicted due to rounding)

Coalition	Hunter	Illawarra	Major rural	Remote rural	Sydney	Total
RES fans	22%	14%	26%	14%	24%	100%
Pro RES	19%	15%	22%	11%	34%	100%
Tech fans	21%	16%	20%	14%	29%	100%
Broad choice	21%	15%	22%	11%	31%	100%
Sceptics	15%	15%	30%	13%	27%	100%
Indifferent	20%	13%	23%	13%	30%	100%

7.2.3 Knowledge versus support of technologies

Figure 29 depicts the relationship between each coalition’s knowledge of and level of support for all technology types. To illustrate this, note the distribution of nuclear support and knowledge (in purple) among RES fans. The crossed circle indicates the mean for both support and knowledge in each coalition and tech type. RES fans have, on average, very low knowledge and very low support. However, as knowledge increases, there is less opposition, although it never crosses the boundary of 0.5, indicating positive support.

We can see that Tech fans have on average the highest level of knowledge regarding each tech type; but most have far lower levels. In all coalitions, support for renewables and related technologies (offshore wind, concentrated solar power, renewable hydrogen, batteries, HVDC) marginally increases with greater knowledge; but the starting position, as determined by NEP and other high relevance variables, is a more determining factor. Notably, more knowledgeable Sceptics are only slightly less critical of renewables. CCS presents a more complex picture; Sceptics and Tech fans are more supportive of coal CCS the more they know about it. By contrast, greater knowledge of any kind of CCS leads to lower acceptance among RES fans.

The technology with the highest level of change is nuclear power. It elicits much stronger support the greater the knowledge of the technology and regardless of the coalition. The relative starting points are still important and RES fans, for example, would still not support it. However, among those advocating Broad choice, the shift is from lowest to highest support in the group.

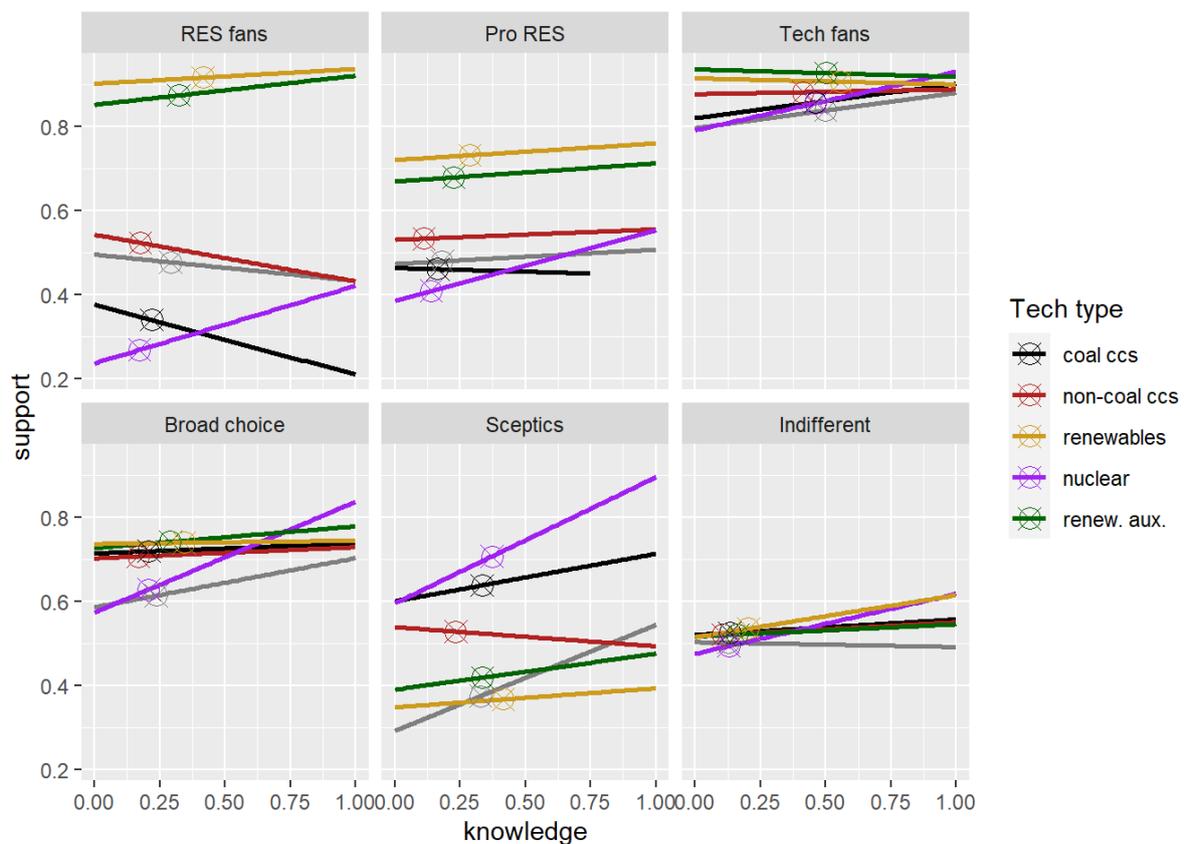


Figure 29: Plots depicting each coalition’s knowledge of and level of support for each technology

Overall, this confirms that merely providing additional knowledge about a technologies will not change opinions (Lock et al., 2014). Acceptance of a technology likely evolves over time from the interaction of deeply held beliefs, education, and the societal context and accepted common sense (Rothman & Lichter, 1987).

7.2.4 Pathways

The preferred ‘pathway’ for deep emissions reduction revealed some interesting insights. For memory, the pathway options were ‘translated’ from the IPCC 1.5 degree report into a simple dichotomy between lifestyle changes involving less energy consumption or technological change with negative emissions. A chi-square test showed that there was a statistically significant association between coalition and preferred scenario, $\chi(15) = 56.065$, $p < .001$. However, the magnitude of that association is small (see Figure 30). In addition, the most obvious results are somewhat

counterintuitive: the coalition with greatest support for negative emissions, which is reliant on CCS, are the RES fans, who were generally least supportive of CCS technology, while the coalition with the least support for negative emissions is the Sceptics, even though they more frequently favoured CCS. Note that this is exactly equivalent to high support for lifestyle changes by Sceptics and low support for them by RES fans.

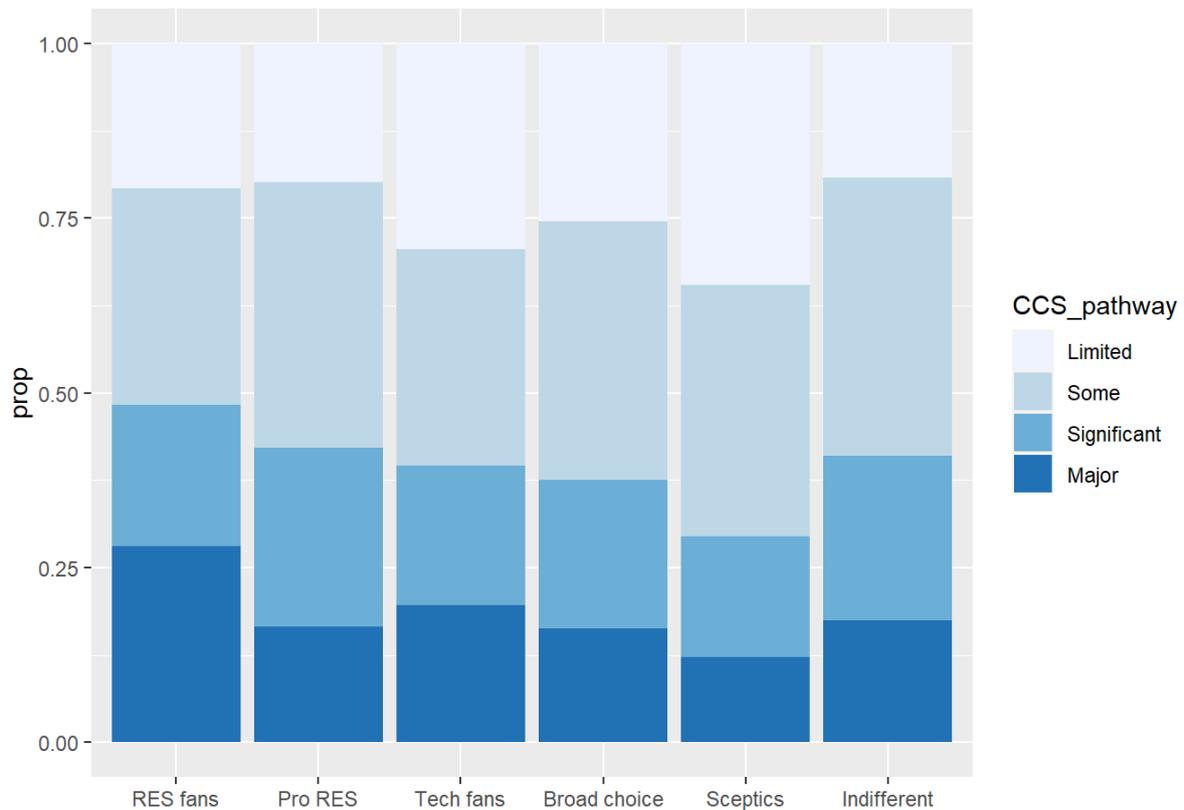


Figure 30: Bar chart depicting preferred pathway choices of each coalition represented as a function of negative emissions technology penetration

The Delphi forum results, which we turn to in the next section, suggest that personal action, such as that required for lifestyle changes, is universally regarded by participants as unlikely to happen at the desired scale. These pathway preferences thus reflect the two most extreme coalitions' respective concerns about the level of emission cuts required: RES fans tend to be extremely concerned about the degree of havoc likely to be wrought by climate change. They thus see 'negative emissions' as more necessary. Sceptics are largely unconcerned by emissions and often saw themselves as virtuous in their use of resources, and hence would see no problem in advocating 'lifestyle changes', even if they believe these changes are unlikely to happen.

A final explanatory element that can be advanced from the Delphi forum for the diversity of choices across all coalitions is that people regard the burning of biomass (wood, municipal waste, etc.) that would be at the heart of negative emissions with suspicion. The issue thus appears to many as an intractable choice between a disliked option (biomass burning) and an unrealistic wish for people to change their lifestyle.

7.2.5 Coal exports

As identified in all the previous stages, the question of Australian coal exports is central to the discussion. The survey hence contained questions on whether stopping coal exports would lead to improvements for the economy, environment or health of the region/globally. As with the general regression, whether respondents were asked to focus on local or global conditions did not matter. Responses varied within coalitions, albeit with some noteworthy patterns. For example, the most common view of RES fans was to 'strongly agree' with stopping exports, while most Sceptic

respondents were decidedly against ending coal exports. However, even within these coalitions, opinions diverged with an average tendency to disagree. Stopping coal exports for economic reasons tended to be far less supported across the board. Overall, there is uncertainty as to the consequences, and many picked the 'don't know' option.

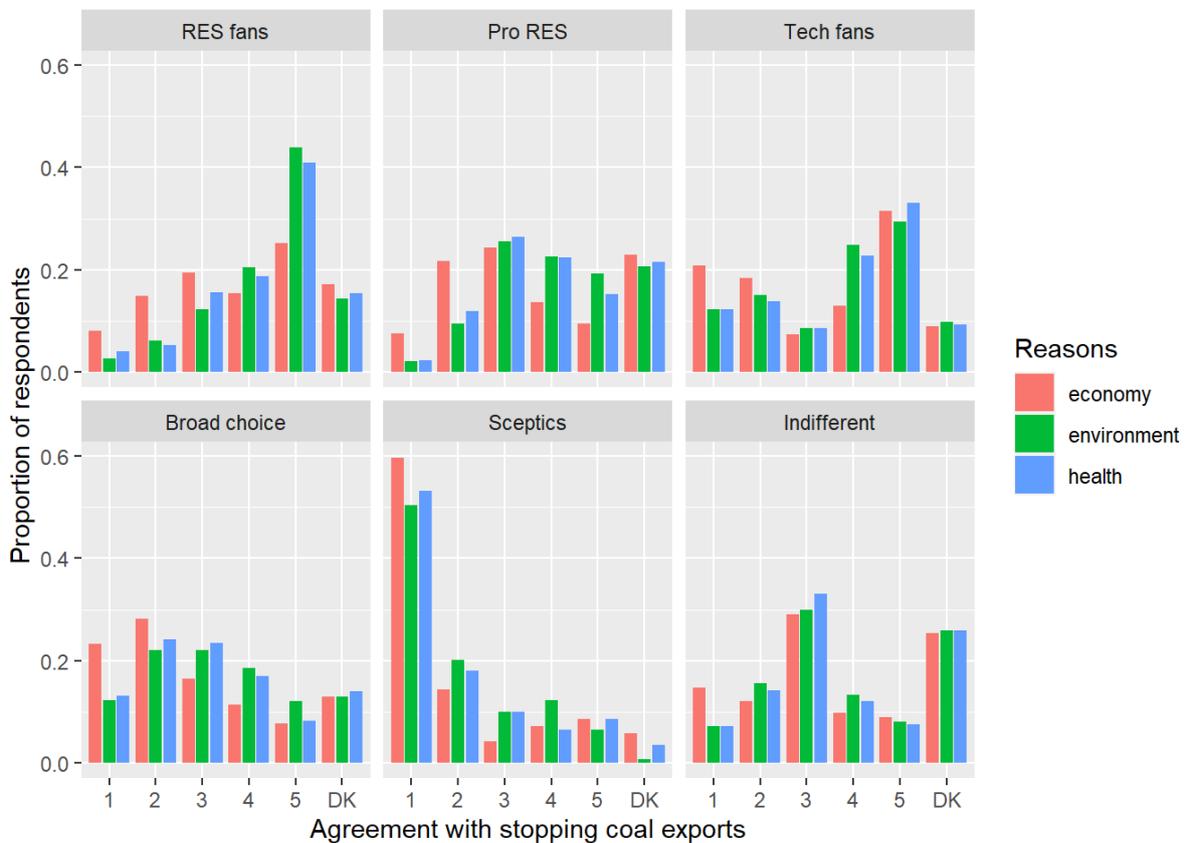


Figure 31: Histograms depicting each coalition’s views on the need to stop coal exports for various reasons (Strongly disagree = 1, Strongly agree = 5, DK = ‘don’t know’)

7.2.6 Summary: What did we learn from the survey?

Based on the findings from the survey, we can conclude the following:

- Six coalitions emerge from the survey dataset: RES fans, Pro RES, Tech fans, Broad choice, Sceptics, and Indifferent. There exist some overlaps between the survey and Twitter coalitions, the former being more diverse and less polarised in terms of the technologies they are willing to support and the latter characterised by more extreme elements.
- The greatest predictor of support for various technologies is environmental ideology (attitudes towards the natural world) and the perception of whether decision-making can be influenced.
- Support for renewables and related technologies marginally increases with greater knowledge; but the starting position is a more determining factor, indicating support likely evolves over time from the interaction of beliefs and overall context.
- As in the case of the Twitter coalitions, some 80% of the survey coalitions definitely see renewables (including innovative renewables) as the core of a sustainable future. This excludes the Sceptics, who see the future of the grid as being centred on fossil fuels (similar to Conservatives).
- The question remains as to *how* renewables are best supported, particularly during a hard-to-define period of transition. For RES fans (and Twitter’s Grassroots), the ideal solution is a small-scale option involving local control and for renewables to be supported by any technologies that make fossil fuels redundant and benefit local communities.

- Knowledge of CCS-related technologies (for example, ‘blue hydrogen’ or steelmaking with CCS) is fairly low across coalitions, though compared to other CCS options, the lower support of coal CCS in particular is noticeable. Overall, this lack of knowledge leads to ambivalence or hesitance in support of CCS-related technologies; ultimately it is not preferred but also not rejected.
- There is a lot of hesitation and uncertainty regarding the benefits, even environmental or health benefits, of stopping coal exports.

8 Delphi forum

The Delphi forum is an iterative process of structured and anonymous communication between individuals that asks participants to respond to questions about the future evolution of a topic (Elfvingren et al., 2014; Geist, 2010; Landeta, 2006; Wassermann et al., 2011). This future-oriented nature explains its name, related to the ancient Greek oracle at Delphi. Contrary to surveys or interviews, a Delphi forum may be conducted over several weeks. It thus allows for reconsideration and diminishes bias induced by the circumstances of the survey or interview.

8.1 Method

8.1.1 Pool of contacts

The survey included the possibility of being contacted for subsequent steps in the project. Some 784 out of 2010 accepted this and provided an email address to be contacted on afterwards. In order to select representative candidates from this subsample, we first establish the ‘ideal’ candidate from each coalition against which to evaluate the responses of those willing to be contacted. As is the case for both the Twitter and survey groupings, individuals are not always unequivocally members of one isolated group and, therefore, we wanted to invite the most ideal representatives (those holding median values of responses in their respective coalitions) in line with common practice (Geist 2010; Wassermann et al., 2011).

Overall, the final set-up for the project’s Delphi forum was as follows:

1. online exchange through Microsoft Forms and email (hosted at University of Melbourne and University of Newcastle)
2. 15 participants selected from the survey.

The Delphi forum was carried out in three iterative rounds of questions and answers:

- Round 1: 16–25 May, 2021
- Round 2: 1–10 June, 2021
- Round 3: 15–24 June, 2021

Based on Round 1 we recruited 12 men and 4 women ranging in age from 35 to 79 years, which reflects the demographic profile of those who express most consistent opinions on energy futures (mostly men and mostly older). Their education level ranged from Year 8 high school (6.25%), high school (12.50%), TAFE (31.25%), Bachelor’s degree (25%), to postgraduate studies (25%). On a Likert scale measuring political orientation (1 = Left-leaning, 10 = Right-leaning) the mean response was 5.75 (i.e., right-of-Centre; SD = 1.61, 3-9).

The questions/content was made available to the participants at the beginning and they had the full period to respond at their ease. The intervening days between rounds were used by the research team to assess responses and fine-tune the content for subsequent rounds.

8.1.2 Nature of questions

The **first round** verified coalition membership through a traditional survey questionnaire and set the scene for Delphi exchanges with a general open-ended question on the ‘future of energy’ in the participant’s community, Australia and the world. This round was carried out on Microsoft Forms by providing respondents with [this link](#). The structure of the questions and the summary of responses in this and subsequent rounds are in the Appendix ‘Delphi forum’.

The **second round** drew on these answers to put together a list of themes about which respondents had to express their level of agreement. We also provided specific quotes for reaction on issues surrounding energy decision-making, the nuclear pathway, and use of Australia's abundant coal and gas resources. Finally, we provided two types of questions: (1) we asked Sceptics, who do not recognise climate change as an issue, about their scepticism regarding solar and wind power; and, (2) of other coalitions, we sought reactions on CCS and the trade-offs between technological development in such negative emissions technologies and the need to diminish their own consumption. This round was carried out with a locked Microsoft Word form with various sections.

The **third round** focused on themes identified as contentious in the previous rounds. Analysis of the second-round data identified points of disagreement or unexpected suggestions, including removing certain levels of government from decision-making, the meaning of 'just and fair', the importance of putting 'Australians first', and the priority of 'developing cleaner technology' over 'convincing the public to change their ways'. We also addressed the question of willingness to live close to specific technologies with an emphasis on understanding 'why' people made such choices. Again, this round used a locked Microsoft Word form organised by sections.

8.2 Results

Below we list the insights divided among those where near-consensus exists, those that are coalition-specific and those where individual variability dominates. We then provide more detail on the key question of the speed of transition away from fossil fuels.

8.2.1 Key themes

8.2.1.1 *Near-consensus views*

Based on the analysis of the Delphi forum, we identified a near-consensus on the following:

1. **Concern about the environment is widespread** even with different implications for policy choices and despite different beliefs about the role of humans in nature.
2. **Investment in new technologies is consistently supported.**
3. A targeted approach to **eliminating fossil fuels where they can be** should drive policy, though some lenience should be applied, while being more lenient with sectors/technologies that do not have ready replacements. A caveat specific to Sceptics is that they did not consider any technology as being ready yet.
4. **Convincing people** is seen as **harder**, less of a priority and less desirable.
5. There is a general **scepticism about the willingness of others to change**, despite a **general willingness to limit one's own consumption** if needed (with the exception of the Sceptics).
6. 'Fairness and justice' involve **taking care of vulnerable people and people in affected industries** as well as achieving equitable outcomes internationally (although there's disagreement on whether we should largely expect benefits or costs from the transition).
7. **Change is happening.** While Sceptics believe that climate change is not an issue and favour a maintenance of the status quo or slow changes for other reasons (notably pollution or fossil-fuels depletion), they accept **changes are underway**. All other coalitions are convinced of the **need for change**.
8. **Tolerance of biomass infrastructure nearby is lowest on average** across all coalitions, although reasons vary by coalition/individual. For example, we noted concerns about 'odours', opposition to any kind of 'burning' because of pollution, an affective attachment to plant life, or low effectiveness compared to coal and gas.

8.2.1.2 *Individual variability*

We also identified some individual variability (hard to predict from coalition membership):

1. **Willingness to compromise** is somewhat lower than would seem desirable overall and we see, even at the extremes of opinion on energy futures, widely different attitudes – for example, RES fans and Sceptics, the most 'extreme', had at least one respondent that rejected compromise and another that explicitly called for it.

2. Appeals to **nationalism** ('putting Australians first') have mixed effect, some people are explicitly uneasy about it while others emphasise it.
3. Additional **expert input** is demanded but understandings of expertise may diverge.
4. **Tolerance of coal and hydrogen infrastructure** varies significantly and is related to current or prior experience.

8.2.2 Coalition-specific views

The Delphi forum identified views that can help us further distinguish between groups:

- There is a wide range of beliefs and opinions on **speed of transition** away from fossil fuels, but these map well to the range of coalitions, *increasing* from '5–10 years for Net Zero' as espoused by some RES fans through the '20-30 years' for Tech fans to 'never' for Sceptics. This correlates highly with the confidence in the uniqueness of renewables for tackling the climate change problem.
- Closely related to the preceding point is the impression of **where local employment and economic benefits lie**, which are unsurprisingly considered a positive. The RES fans, Pro RES and Tech fans coalitions may emphasise the opportunity of a shift (with differing degrees of vehemence) to renewable industries, while others emphasise the need to maintain currently profitable enterprises, including mining. Meanwhile, Broad choice members are concerned about **local costs**, while Sceptics essentially see zero benefits.
- **Political leadership** is criticised, but for different reasons. The clearest divide is again between Sceptics, who largely disagree with wind and solar deployments, and RES fans, who are particularly vocal about the need for swift action to stop coal. The Broad choice coalition stood out for supporting a simplification of Australia's energy policy to one level of government, mostly out of a distrust of political matters in general. Members of other coalitions tended to voice support for bipartisanship.
- **Role of innovation and techno-optimism** is implicit in some coalitions such as RES fans, while Tech fans advocate for it more explicitly.
- **Australia's role** is seen as both a rich country with a responsibility to provide for others in terms of emissions reductions (RES fans, Pro RES and Tech fans) and a country with significant dependence on fossil fuels (Broad choice and Sceptics).
- **Grid stability** as a result of an energy transition is not an issue for RES fans, but Pro RES members are not so sure. Tech fans tend to be knowledgeable regarding a number of ways to solve the issue, while Broad choice members specifically mention 'clean coal' as a solution. Sceptics are adamant that there will be a 'lot of candles & torches from power blackouts or even brownouts'.
- **Tolerance of wind and solar infrastructure** is high to very high for RES fans, Pro RES members and Tech fans, and less so for Broad choice members and Sceptics.

8.2.3 Transition away from fossil fuels

A particularly revealing coalition-specific finding came out of the second and third rounds when participants were asked about the conditions and the speed for a transition away from fossil fuels.

The responses include various conditions and varying willingness to state a specific time period. However, there is a clearly increasing level of demands in line with the identity of each coalition. Thus, we see RES fans stating either very short timescales or medium timescales for 'total closures', which contrast with either longer timescales or similar timescales for 'partial transitions' for other coalitions. Some are comparatively optimistic regarding years, but emphasise that it is hard to guess because the scale of the challenge is enormous. The responses for the conditions are highlighted in Table 9 below. Respondents 3b and 5b did not address this question.

Table 9: Summary of responses questions on the desired speed of transition

Coalition	Respondent	Timeframe in years	Related statement (if any)
RES fans	1a	7	Net zero
	1b	5	
	1c	20	Need total closure of coal mines and power stations
Pro RES	2a	10–15	90% of fossil fuels
	2b	12–15	
	2c	10	Fossil fuels cannot be completely killed off yet as there is no viable alternative at the moment and we make \$54.62 billion in coal exports, \$244 billion in gas exports for our economy
Tech fans	3a	20	for a transition including steelmaking
	3c	30	
Broad choice	4a	?	It's in the lap of the gods. Absolutely necessary to develop alternate power sources but this should be done at a measured pace
	4b	?	no one really knows or can comprehend the enormity of the change to get away from fossil fuel
	4c	?	As long as needed without severe economic impact
Sceptics	5a	30	I do not want to go back to blackouts or brownouts as it was in the 50s & 60s just so some climate warrior who like MP Matt Kean can feel good in themselves for saving the Planet
	5c	Never	we should keep using our current reserves of coal and gas as we need this for our economy to flourish. We should certainly be looking at cleaner sources of energy but the current options are not green as such

8.2.4 Summary: What did we learn from the Delphi forum?

Based on the findings from the Delphi forum, we can conclude the following:

- Finding consensus across a population about a particular energy form is marked by distinct challenges.
- The exchanges elicit strong opinions and lack of willingness to compromise among certain participants.
- The personal experiences of particular technologies and industries (for example, socioeconomic, spatial and moral proximity to mining [Askland et al., 2016] or renewable projects) will inform individuals' willingness to compromise. For example, a member of the Pro RES coalition who already lived closer to mines was less vocal in their opposition to coal mines. This has implications for the NIMBY issue, highlighted in previous research
- There is a strong polarisation between a majority who believe climate change requires urgent action and a minority who refuse human-induced climate change and claim it to be either a hoax or unimportant.
- As in the case of online debate (Twitter), the two-party political system informs the bipolar politics and debate around energy futures and generates a two-camp structure in which the most passionate tend to accuse one side of politics while those with more centrist opinions would prefer bipartisanship.

9 Interviews

The previous steps reported on above sought to identify (a) the broad themes of the Australian energy debate and how different technologies are positioned within this debate, (b) *if* there are distinct discourse coalitions of people who share common beliefs and attitudes towards particular energy technologies, and if so, (c) *what* these discourse coalitions look like and *how* these coalitions manifest. The interviews sought to interrogate *why* these coalitions exist, that is to gain a better sense of *why* people embrace particular energy futures.

9.1 Method: semi-structured interviews

Adopting an open-ended semi-structured approach, we sought to get to know more about people's history and background, their connection to the area in which they live, their past experience and knowledge of various energy technologies, and, importantly, their hopes for the future and their visions of how different energy technologies may be part of this.

We interviewed 20 individuals in each of the three case-study locations ($n = 60$). The qualitative data collection took place between September and December 2020. The majority ($n = 49$) of interviews were conducted face-to-face as part of fieldtrips to the case-study regions. The remaining interviews ($n = 11$) were conducted via Zoom or phone as individuals were not available for a meeting at the time when the research team was visiting the case-study regions. The breakdown of participants in each location is as follows:

	Far West	Hunter Valley	Illawarra
<i>Gender (M/F)</i>	13/7	14/6	11/9
<i>Township</i>	<ul style="list-style-type: none"> - Broken Hill: 9 - Silverton: 2 - Cobar: 5 - Brewarrina: 1 - Lightning Ridge: 1 - Other: 2 	<ul style="list-style-type: none"> - Upper Hunter: 2 - Newcastle: 7 - Limeburners reek: 1 - Muswellbrook: 2 - Valentine: 2 - Maitland: 2 - Nelson Bay: 1 - Other: 3 	<ul style="list-style-type: none"> - Wollongong: 6 - Port Kembla: 2 - Mt Warrigal: 2 - Moss Wale: 2 - Shellharbour: 2 - Kiama: 2 - Shoalhaven: 2 - Nowra: 1 - Woonoona: 1

The in-depth nature of the qualitative interviews means that the sample size is smaller than for statistical/quantitative data-collection methods. Rather than seeking data to generalise across a population, the qualitative interview seeks to go deep into the issues at stake. Thus, sample size from each case-study location was limited to a maximum of 20, a total number of interviews that is small enough to facilitate deep, phenomenological analysis of the themes of the research. This follows conventional recommendations for qualitative analysis.

To recruit participants for the interviews, we distributed a generic call for participation through local media, social media and open online community forums. An extensive database of local community organisations with publicly available information from the three case-study areas was prepared through web searches and review of public submissions to state-significant development projects related to energy projects. These organisations were sent an email with a request to distribute information about the study to their members or people they thought would be interested in the study. We also contacted local councils and asked them to distribute the information through their channels. To ensure voluntary participation, all potential participants had to self-nominate for an interview by contacting the researchers after seeing the generic call. Additionally, survey participants had the opportunity to opt in to participate in further stages of the research and, if they had done so, they were sent the same generic invitation to participate in an interview. Further details about the study were subsequently sent via email and the participants had the opportunity to ask questions about the study before consenting to participate.

We did not set up a targeted-cohort approach but invited anyone interested in the topic to participate. Participants had to be over the age of 18 and be a resident within one of the three case-study locations. This broad, open call for participation resulted in a wide range of interview participants. The interviewees comprised individuals from all walks of life from young people currently in tertiary education to older retired residents, from well-off professionals to people living in public housing and on Centrelink payments. The participants included miners, farmers, academics, councillors, stay-at-home parents, lawyers, engineers, self-employed and unemployed people.

The interview schedule used to guide the interviews is attached as Appendix 'Interviews'. All the interviews were recorded and transcribed by a professional transcription service. Subsequent to the translation of conversation to text, the interviews were uploaded to the qualitative data analysis software NVivo. The analysis was initiated with an inductive read of the transcripts and notation of

themes and patterns within the text. From this, a detailed code book was developed, and all the transcripts were coded deductively using the code book. After initial coding, the team conducted further sub-coding, identifying themes and patterns within each of the overarching code with additional sub-codes added inductively to identify detail within each broader theme (see full code book in the Appendix 'Interviews').

9.2 Results

The results from the interviews complemented that from the earlier stages of the study, finding a similar pattern of polarisation centred around the question of fossil fuels, specifically coal. We found several common views and points of contention:

Interviewees broadly agreed that:

- renewable energy is fundamental to a sustainable energy future
- Australia is rich in natural, sustainable resources
- governments (federal, state and local) must do more
- current, centralised power generation is not ideal.

Interviewees broadly differed on their:

- views on where renewables sit in the energy mix
- priorities (climate change, the economy, politics, jobs)
- understanding of sustainable energy technology
- perception of Australia's role in a global sustainable future.

The interviews reflected the pattern identified in the earlier stages of the research, with a spectrum of attitudes towards different energy technologies that could broadly be split into those who retain a continued reliance on coal and fossil fuels (Sceptics), and those who prefer change to renewables (all other coalitions). As in the case with the discourse coalitions identified on Twitter and through the survey, there was a continuum of perspectives across the spectrum, aligned to people's perspectives on human-induced climate change and the sense of urgency they felt in reducing reliance on carbon-intensive energy sources and moving towards a carbon-neutral economy.

Note that names in this section – following a long-standing tradition in anthropology – are all pseudonyms and bear no connection with real names.

9.2.1 Coal, carbon capture and storage, gas and nuclear

Those who argued for a continued exploration and extraction of coal expressed concerns about the **reliability of renewable energy sources**. Greg (HV11) from the Hunter Valley and Monty (FW17) from the Far West, for example, explicitly stated that they are worried about the capacity of renewables to supply the energy needs of their communities and think that fossil fuels such as coal have a 'role' in ensuring baseline power generation. Another issue with renewables stated by those in favour of continued coal exploration was related to the potential waste and secondary pollution that can come from renewables. As Far West respondent Jane (FW12) stated:

Coal, I'm still a believer in coal, I can't see why we can't have the technology to do low emission coal-fired power stations. They're doing it overseas – why are we having so much difficulty in sourcing new technology for that? ... I have a concern about solar panels, when they're past their time, where are they going to go? In landfill? Are they gonna be recyclable, or what do we do with all these big aluminium panels that end up filling up the country? I'm a little bit concerned about that. ... I do like coal. I mean, it sounds silly. Coal seems like it's reliable, it seems like we have lots of it, it's accessible, it's available, and it can be affordable. So that covers that section [laughs]. Because to me, a wind farm, if there isn't any wind you're not generating anything. Solar farm, if you have a bout of cold, rainy weather for a month, I don't think it's going to generate as much as it should. It's

beyond minimum generation rather than maximum and you want it to be at max all the time, that's the whole idea of it (FW12).

Here, Jane repeats a common mantra that is connected to the question of reliability and availability – namely, the trope of **'no sun, no wind, no energy'**. This mantra is central to the Sceptics' core belief that fossil fuels are essential to progress, growth and modern life as we know it. The trope comes across as a powerful argument for why they support fossil fuels, particularly coal, and reject renewable energy. Garry (FW11), for example, argued:

A lot of people, my generation, are sort of saying, 'Well, what happens when the wind doesn't blow and the sun doesn't shine? Where do we get our power from?' (FW11)

This view is held by a minority of participants who have interiorised the fact that the traditional electricity grid – which has limited storage – always needs to carefully match generation and consumption. **These perspectives see nature and the environment as unstable and unreliable, and therefore unsuitable for our energy needs.** They also tend to minimise or omit the role of weather forecasting in enabling us to plan accordingly, as well as the possibilities presented by energy-storage technology. For example, Garry, cited above, warns:

The government of the day and the investors, the big business, they've got a job ahead of them to convince mums and dads, and not only mums and dads, but you know, the younger generation as well, that they can guarantee that they're gonna be able to turn on the light switch at any time of the day or night and they're gonna get power (FW11).

When prompted about the role of batteries and challenged to consider alternative perspectives on the state of renewable energy technology, the common response from Sceptics was that 'the technology is not there yet' or that it would never be an adequate substitute for coal. Structural economic constraints and modern consumption patterns were highlighted as a key argument against transition, with an emphasis on the need to retain current lifestyle characteristics and economic progress at the centre of energy options. Nonetheless, besides one climate-change denier, all those who support continued extraction of coal recognised that it contributes to the problem of carbon emissions. 'Clean coal' thus appeared for them as a viable option, in opposition to those supporting renewables, who dismissed it out of hand. Garry and Jane, for example, made reference to not using 'brown coal' or building 'low emissions' coal-fired power plants. All it requires, as Jane emphasised, is to 'control emissions' and invest in the technology that can allow this to happen. For Jane, Garry, and the few others, a pro-coal attitude was linked to a **nationalist agenda** whereby the emission reduction that can come through burning high-quality coal over brown coal and technological investment did not exclude continued export of 'dirty coal'. Jane stated how she thinks Australia should 'keep the black and export the brown' so that the coal industry in Australia can reduce emissions and justify its continuity. Jane seemed to belong to the Broad choice coalition since she did not outright reject renewables as something that perhaps could feature in the future energy landscape but argued that there would be an economic imperative to keep extracting and exporting coal. Illawarra resident Michael (I10), who could also be considered a Broad choice advocate, argued that older technologies will be replaced by new ones that 'are better for the environment and are better for the economy'. This, he contended, is the path forward:

So why wouldn't we move in that direction? You know, it's a logical way forward and in so doing, we are allowing Third World nations to advance their economies, so they can catch up to us ... by using our coal and also by investing in sustainable [energy]. We don't need our coal as much if we're moving into more sustainable forms of energy. We can do the grunt with renewables whilst they use our old technology to try and catch up ... I just don't think we can deny fellow human beings their own industrial revolution just because we think that it's gonna harm us some way, and we then should help them move to a cleaner, greener economy as soon as we can. But you know, their health, their health which should come first, and their security as human beings, must be a priority for us as fellow human beings rather than environmental concerns. It always comes first (I10).

Unlike the Sceptics, Michael does not see coal as part of the Australian energy future but it still has a role to play in driving developing countries out of poverty. He sees coal as intrinsically linked to modernity, though he suggests that newer technologies can produce sustainable energy will be the basis of further modernisation and development.

A key technology to help reduce emissions mooted by the interviewees who support continued coal-burning is **carbon capture and storage (CCS)**. These participants – 5 out of the 60 people interviewed – argued that carbon emissions from coal-fired power plants can be offset with carbon-capture technology, thereby justifying the continuation of coal as a central component of power generation. The interview data confirms the Twitter and survey findings that CCS is overall very poorly understood. CCS was generally only mentioned in passing or in anecdotes, and without much elaboration. For the participants who had heard about CCS, it was generally seen as a ‘good’ thing, but their understanding of the technology or viable ways to implement it was scant. The vast majority of interviewees had to be prompted directly about the technology as an alternative option for carbon reduction, with a common response being ‘I don’t know about that’ or ‘I have not heard about that’. Without extensive explanation on our part, when our interviewees first heard ‘carbon capture’, they commonly conflated its usual meaning as a technological method leading to long-term (geological) storage with the short-term carbon fixation in plant materials. An example of this is from our conversation with Jane, who mentioned that CCS partnerships can be used as a way for rural landowners to generate income in difficult times, but immediately acknowledged problems related to water availability and the risk that it might ‘tie their properties up for a hundred years’ (FW12). While this example illustrates a significant sense of ambiguity and misunderstanding about carbon capture, it points to an important theme from all the interviews which stretched across the coalitions – namely, **a general openness to initiatives that may benefit the local economy coupled with a strong suspicion that most benefits will actually not remain local.**

Indeed, the vast majority of participants were sceptical of carbon-capture initiatives. Far West residents Jennifer and Billy (FW19–20), for example, identified CCS and carbon farming as ‘interesting’ but were ultimately mistrustful of this as an alternative. They described carbon farming as ‘quite a corrupt system’, which is ‘put in for the rich by the rich’ (FW19–20). Sebastian (FW10), on the other hand, was very supportive of carbon capture that uses algae to convert CO₂ to biofuel. However, drawing on extensive knowledge and research drawn from his professional experience, he emphasised that in arid places without large-scale industrial development like Broken Hill, the ambient temperature would be too high for this method to be viable and there are not enough emissions to warrant its use. Yet others (for example, Anthony, FW16), questioned whether CCS is economically viable in general. A common summary articulated by interviewees when prompted about CCS is that ‘we don’t know enough and there are other alternatives’. Patrick (FW18) articulated similar scepticism, arguing that it is ‘probably just the way of the coal industry justifying continuing to do what they’re doing’. He acknowledged that he does not fully understand the technology behind CCS but does not see why the focus should not instead be on renewable energy sources. He further argued that the process is ‘not proven’, and that ‘the better option is to leave it in the ground, not try and put it back in the ground’. The interviewees here suggested a mismatch between the climate emergency and efforts to redress it: **the sentiment they share is that rather than going for proven (renewable) technology, industry and government keep flirting with alternatives that can work as a ‘band-aid’ to justify continued coal exploration and extraction.**

In relation to **gas**, the participants’ narratives were conflicting, with interviewees who could be categorised as Sceptics or Broad choice seeing the benefits of gas as an alternative fuel source, and RES fans arguing adamantly against gas for anything other than short-term stopgaps. The interviews were conducted around the time when the Australian Government’s proposal of gas as a ‘transition source’ featured across social media and media channels. The interviewees never positioned gas as an alternative in and of itself, but those who supported it put it forward as a pathway for transition away from coal, or as a ‘short-term solution’ (Donald, I9) while other technologies are being developed. Those who rejected gas as an alternative emphasised its status as a finite resource not only physically, but in terms of its economic and political viability. On gas not being a renewable resource, Anthony (FW16) said, ‘I think you can kind of run out of coal and you can kind of run out gas, but you’re not necessarily going to run out of air and sun.’ Economically, gas is seen as expensive to locate, capture and transport.

Concerns were also raised about the localised environmental risk posed by gas exploration. Participants acknowledge that (coal seam) gas is positioned discursively as the ‘future’ of regions such as Narrabri. That Narrabri featured specifically as an example should be seen in relation to how the interviews were conducted around the time when Santos’s Narrabri project received its approval notice from the NSW Government. These issues have local relevance for many participants in the case-study regions, particularly in the Hunter and Illawarra where the extraction of coal seam gas in future projects has been the subject of significant debate and tension (e.g. Askland et al., 2016; Bailey and Osborne, 2020). The sense of futurity that emerged in relation to gas was positioned as a key reason for pro-coal-seam gas sentiment in regional areas that believe their longevity as a community relies on the industry. The question of gas as an alternative power source was seen as expensive, both in acquiring it and for storing and transporting it, but also as **‘proven’ and therefore ‘trustworthy’**. Some participants implied that gas is a more reliable, legitimate option for power generation because of its **‘known’ and ‘tangible’ characteristics**: it is identifiable, mineable and storable in a way that is different to wind or solar. The legitimacy of gas as an alternative energy source here was linked to a lack of understating of, or faith in, alternative renewable technologies (for example, solar and wind) and their ability to meet consumer needs, both in terms of power generation and economic feasibility.

A minority of interviewees – as with the Twitter users, survey participants and Delphi forum – also subscribed to a pro-nuclear-energy stance. Participants such as Jennifer and Billy (FW19–20) stated that ‘the amount of production you get from such a little amount of it is just massive’. Lucas and Frida (FW2–3) concurred, saying that new tech means that small nuclear substations ‘can generate a huge amount of power with the smallest amount of radioactive materials’. They argued that nuclear as an alternative is shadowed by its bad reputation linked to the Chernobyl and Fukushima nuclear disasters and that, as an alternative technology, nuclear ‘has come a loooong way’ (Lucas) and, if done at a smaller scale, can be a safe option. For these participants, nuclear has the potential to be the strong foundation that will ‘prop up’ renewable energies that they see as less reliable, such as wind and solar.

The interviewees displaying pro-nuclear sentiments can be categorised as belonging to Sceptic or Broad choice coalitions. They did not have much to say about the management of nuclear waste, which seems to be the main concern about nuclear power for the public more broadly and also for the majority of interview participants who refused nuclear as an alternative. Only two participants specifically mentioned waste management. George (FW1) discussed the potential reuse of nuclear material, with somewhat oblique references to feeder reactors and heavy metal recovery. Jane (FW12) also mentioned waste management but did not have a clear idea about how it should occur. She suggested storing nuclear waste ‘in the middle of Australia, somewhere where it’s uninhabited, in one of the deserts or something, away from people’. The idea (realistic or not) of vast swathes of isolated, unoccupied, uninhabitable land is attractive for the storage of potentially hazardous material, though, as Frida (FW3) noted, there are obvious implications around the concept of ‘uninhabited’ land and Traditional Ownership. This was something of great concern to participants from the Far West specifically, who expressed significant concern about becoming ‘the dumping ground’ for coastal projects. Sebastian (FW10), for example, mentioned how cities like Broken Hill remain ardently anti-nuclear, at least in part because of a **perception of an imbalance of power between urban and regional/rural areas**.

9.2.2 Renewable alternatives

As in the other data sources, a general pro-renewable discourse was prevalent within the interviews, with particularly frequent mentions and strong support for **solar** and **wind**. Many of the interviewees spoke about positive experiences of having rooftop solar and how **using their homes to support the grid with renewable energy or to fuel their own homes not only saved them money but was an empowering experience**. Those who did not have rooftop solar articulated a strong desire for it and expressed significant frustration in situations where this was not possible (for example, when renting or living in public housing). As Annika (I2) explained, solar would for her be the evident choice for future energy technologies, starting locally at people’s homes; but for her, this is out of reach due to her living situation:

Yeah, solar would be the big one. I would love to have solar panels, but I can’t because I’m in a block of flats and my landlord is the state government and do you think they’re gonna install solar panels? No, no frigging way (I2).

Interviewees generally wanted local, state and federal governments to support better rooftop solar systems and batteries for local storage and use. In the Far West, most of the interviewees had already taken advantage of earlier renewable energy initiatives by the government and the local council has made significant investment in using renewable energy sources for public spaces and buildings. These initiatives were locally celebrated and underpinned a strong local consensus, particularly in Broken Hill, to reconsider not only the sources of energy but also how and where it is used and distributed. Olivia, an elderly Broken Hill resident, told us how she's had solar panels for over a decade, a decision she is still very proud of and happy with:

Yeah, they had a meeting down at the Musos, I think it was. And when they finished they said, 'Right, we'll put these panels on your roof if you want them' and all the rest of it. And they said, 'You pay \$100 deposit on it and then we go from there' sort of thing. So I just ... when we went out, when the meeting finished, the girl was sitting there and I just walked straight up to her and I said, 'Will a cheque be all right?' and she said, 'Yeah!' And I was the first one! [laughter] That was it!
(FW4)

Large-scale solar and wind farms were more contested among the participants, as these brought in questions about land-use conflicts, amenity and distribution and distributive justice. Nonetheless, such options were almost always preferred to the environmental and visual impacts of open-cut coal mining particularly, except for the minority who desired continued coal exploration and expansion (discussed above).

Aside from solar and wind, participants also mentioned **wave** and **hydropower** as alternative energy futures. Hydro projects were among a range of renewables that were frequently referred to as being the way of the future. By contrast, wave energy was only mentioned in passing or as a rhetorical device to make a specific point about renewables more broadly by three participants. Sally (FW15), for example, mentioned wave energy as an example of electricity generation based on **inherently reliable 'natural cycles' that occur in the environment**. She explained how she sees wave energy as an example of many kinds of energy

that are sustainable because they just continue, they're continuous, they're ongoing, and they're not things that, you know, you have to dig up and then use and then they're gone (FW15).

The interviewees express a degree of uncertainty about the state of renewables other than wind and solar in the Australian landscape. For example, Anthony (FW16) made a vague reference to a supposed geothermal energy project that has since 'disappeared'. Ronald and Andrew (FW9–10) referred to the same project and expressed that 'you don't hear much about it ... success or failure'. The interviewees were rarely able to point to specific, ongoing projects to base their views on, instead relying on pre-existing ideas of the effectiveness of these power sources to evaluate their future relevance in the Australian context. This uncertainty is captured well by Patrick's (FW18) views on hydrogen:

It's still very new here ... so I'll be interested to watch that and see where it goes and how it develops (FW18).

As part of the discussion about renewable energy futures, the role of **batteries or other storage** was discussed at length. It is noteworthy here that storage was only spoken about in the interviews in the form of batteries. Interviewees argued that batteries and energy storage provide opportunities for new forms of power generation that are responsive to local needs. Different participants lamented the large, cumbersome 'pipeline' infrastructure that generates power centrally and distributes it (at a cost), and a key argument emerging from the qualitative interview data is the need to build energy futures that are responsive to local needs and that source energy locally. This ties in with the enthusiasm about locally sited rooftop solar.

Within all the case-study areas, there was a general sentiment articulated, particularly from those advocating for renewables and a move away from fossil fuels, that the **grid and large-scale energy systems present challenges related to waste and distributional inequity**. Power is said to be 'wasted' by relaying through the centralised grid, rather than being generated and used in the local

community, and the regions are seen to be left with the negative social and environmental consequences and further alienating the population within coastal centres about the real-time consequences of their energy consumption and use. This resonates with findings from previous studies of rural and remote areas (for example, Askland, 2016, 2018). Batteries and storage were here put forward as a way to ensure consistent local supply, and to get around the limitations of a centralised power grid. Participants were aware of the fact that this poses a fundamental challenge to the way energy has always been created and distributed, and that centralised approaches to energy generation are demonstrative of '1960s thinking'.

One of the major advantages of batteries and storage, for these interviewees, is the **potential for smaller localities that would otherwise struggle to attract investment for renewables**. On this issue, George (FW1), a resident of Broken Hill, argued that to attract investment and infrastructure, there is a need 'to have a big market, and 17,000 people is not a big market'. These interviewees believe that generation and storage could happen locally, and that networks of locals could develop a **communal power-sharing** arrangement, supplement each other and become self-sufficient without having to rely on a centralised grid. Some participants see this configuration as the way of the future. Stella (HV10) said:

I would've liked to have seen, you know, investment in alternative energies and industries and not necessarily great big ones. I don't think that's the way of the future ... We need to be thinking ... a bit more local and sort of more smaller pockets of things, but lots of them (HV10).

Sebastian (FW10) complained about the lack of attention given to upgrading the power grid, lack of political will, and a lack of investment that has severely reduced the capacity for wind farms to generate power. Some concern and scepticism was also raised about the fact that **energy companies regardless of energy source are, ultimately, seeking to earn profits and may not be driven by a motivation to invest in and support local communities**. Greg (HV11), for example, questioned whether the companies have a viable solution or whether they simply want money:

[They say] they've got the answer to our problems in terms of batteries and so forth. But I mean, have they really? Or are they just pushing an investment point and convincing people to come on board to invest in their product?

9.2.3 Coalition-specific counts

Seeking to see how the qualitative material aligned with the results from the other data collection methods, we coded the data in line with the six advocacy coalitions identified in the earlier stage: RES fans, Pro RES, Tech fans, Broad choice, Sceptics, and Indifferent.

Within the qualitative data sample, most people do have an opinion: only four participants made statements (7 mentions in total) that spoke to an indifference about energy futures. The two coalitions that stand strongest in the qualitative data are Pro RES (33) and RES fans (32), with 98 references for pro RES and 121 references for RES fans. Second to these is Broad choice, with 29 files and 79 references. Sceptics and Tech fans are relatively even with 18 files (56 references) marked as Sceptics and 14 as Tech fans (55 references).

While we may get a rough sense of support from this quantitative breakdown, the qualitative analysis also shows that people may pick and choose themes and topics that we could associate with any coalition. On the one hand, this complicates the matter when looking into specific on-the-ground developments; it also shows that consensus and agreement may be more possible than suggested in settings with more self-selecting audiences such as Twitter or the Delphi forum.

Further findings from the interview data appear in the Discussion (Section 7), and example findings from the interview data in line with the code book can be read in the Appendix 'Interviews'.

9.2.4 Summary: What did we learn from the interviews?

Based on the findings from the interviews, we can conclude the following:

- Different coalitions support different futures, but they are not motivated by the same beliefs, and these beliefs are what will ultimately determine what specific technologies are acceptable.
- We can identify three categories of argument around which participants' views on sustainable energy futures can be classified: ideologies (pertaining to values and beliefs, and sourced from key opinion leaders), technical mantras (oft-repeated statements based on partial technical knowledge), and the attachment to place (care for their local area and community).
- Interview participants expressed a lack of knowledge about CCS-related technologies and consequently voiced support for moving onto other technologies. As this lack is reflected in both the quantitative and qualitative data, there appears to be a need for better education regarding CCS-related technologies.
- While there was general openness to initiatives that may benefit the local economy, this was often coupled with a strong suspicion that most benefits will actually not remain local.
- Those interviewees espousing a renewables-based future and rapid transition away from fossil fuels see the old system as stuck in the 1960s vision of a centralised grid.
- In contrast, a key aspect of Sceptics' desire for a fossil-fuels-centred grid concerns the mistrust that renewable technologies can provide grid stability.
- Compared to Twitter, concerns about echo chambers are even less salient among the wider public, given interviewees were seen to pick and choose from a variety of narratives.
- Overall, the quantitative and qualitative findings paint a bipolar landscape between a large majority who see coal and other fossil fuels as the problem, and the minority, who take issue with renewables instead. Ultimately, finding consensus across a population about a particular energy form will be marked by distinct challenges.

10 Community forums

The final stage was a communication event consisting of three community forums, with an in-built focus group for feedback and discussion of preliminary research findings, one in each of the case-study areas. The community engagement did not discern any major new findings but sought to test the findings of the preceding analysis. In particular, we questioned whether the dynamics and patterns that we had observed suggesting potential ways forward (for example, on the potential for CCS or other combination of technologies) matched their views.

10.1 Method

Central to the community forums was to have a communication strategy that would serve as an 'intervention' that would (a) outline the key findings of the study, (b) clarify misconceptions, and (c) test how different messages about the energy transition using coal-related technologies – such as CCS and High-Efficiency Low-Emissions (HELE) – would be received. We worked on message formulation in the lead-up to the forums, drawing on the findings from previous stages, including elements that target factual inaccuracies for all relevant advocacy coalitions.

Because of the COVID-19 pandemic and associated restrictions, we were not able to conduct the community forum and focus group face-to-face as planned. Instead, we held the three forums on Zoom and used the interactive online tool 'Padlet' to guide the focus-group discussion and collaborative discussions. At the beginning of the forums, the research team gave a presentation on the project to date and the key findings emerging from the analysis. The participants were subsequently split into breakout rooms for a focused discussion around the issues at stake and clarification of misconceptions. Reflecting on the findings presented, they were asked to discuss the following questions:

- What are your main concerns about the future of energy?
- What are your hopes for the future of energy?
- What types of responses or solutions are important to shape the future of energy?
- What energy technologies do you want to see advocated?
- Who are the people who can drive change?

The communication strategy was conceived to start from people's concerns, rather than from the presupposed technological solutions to those concerns. By focusing on concerns rather than

technology up front, we aimed to guide the discussion towards collaborative problem-solving, driving the analysis of possible consensus forward. This approach enabled us to explore how people see concerns (problems) linked to energy futures and technologies and to identify technically feasible pathways that attract widespread consensus. It also revealed misunderstandings as to what role each technology can play at what stage, which can then be translated into public outreach for a specific locale.

10.2 Results

10.2.1 Case study specific pattern

The community forums suggested a potential case-specific pattern that had some statistical significance in the survey and was observed through the interviews, but was not able to be distilled as a distinct finding. This pattern relates to the root concern guiding the debate around energy futures within each of the three case-study areas:

1. **Hunter Valley:** just transition and need for (but lack of) political leadership
2. **Illawarra:** social and environmental justice
3. **Far West:** remoteness and richness of renewable energy sources

Each one of these should be read in light of the geographic, social and economic position of each of these three regions and where they sit within the current transition landscape of NSW.

In the **Hunter Valley** community forum, there was a lot less trust in the government's capacity and willingness to change and lead a transition into a low-carbon future. In the Hunter Valley, the transition debate is manifesting in the everyday realities of working people. Transition, here, is real, with a heated community debate around continued coal exploration and extraction versus a transition away from a carbon-intensive economy featuring within communities, neighbourhoods and even families. Unsurprisingly, the topic of a just transition was central to the community forum and a feature of debate that sets the Hunter Valley apart from the two other case-study regions where transition was spoken about in less material terms. Importantly, a key observation from the community forum, and confirming the interview data specifically, was that people in the Hunter, including coal miners, are deeply concerned about climate change and recognise the need for an energy system that sets up a transition away from fossil fuels. The discussion suggested that it is, in fact, possible to be a coal miner who is concerned about climate change and supports a transition (though the scale and timeframe of the transition may be contested), while also being concerned about future employment. Ultimately, the community forum in the Hunter, which included two focus groups, conveyed that the key concern is not a transition in its own right but the lack of political leadership to ensure (a) that a transition takes place and (b) that the transition is just. At the same time, these focus groups displayed a sense of hope, particularly in the fact that the younger generation is savvy about energy issues and that a generational political shift is to come. Some statements made in the focus groups include the following:

- My main concern is that the government doesn't take up the mantle of leading.
- There is major apathy regarding decision-making despite the increased urgency regarding climate issues.
- Energy is too politicised and politicians will only pander to voters.
- Politicians have to follow the party lines even if they disagree.
- It is the 'faceless men' behind the machine driving the agenda.
- There is extreme urgency for action.
- We need work-force transition and normalisation of renewable careers in the same way that coal mining is normalised.
- We need optimism about the transition and show it will demonstrate community values, including economic benefits, well-paying jobs and less air pollution.

The key theme that stood out in the **Illawarra** community forum, and that resonated strongly with the qualitative data collected in earlier stages, was a concern about social justice and its links to environmental justice. The theme of class and socio-economic disadvantage became evident at the outset of the Illawarra focus group, with questions about energy availability, affordability and transition closely linked to notions of economic disadvantage and the need for work. The Illawarra forum foregrounded the theme of distributional equity, from both geographical and intergenerational perspectives. While this was also evident in the other two case-study discussions, it had a unique emphasis in the Illawarra where participants in the community forum highlighted concerns raised by interview participants about the need to create a cleaner earth and sustainable future for future generations. The working-class history of the region emerged in concerns around green manufacturing and the need to retain an employment base for the region. The steel industry was

emphasised as a significant local employer and there is a concern that loss in mining could have consequences for the steelworks. That being said, steelwork and manufacturing were not seen as contrary to moving towards carbon reduction. As one participant emphasised: 'Even in more recent times, mining hasn't been as prolific in the Illawarra. Those that are around still enjoy a level of prosperity, but eventually mining will close down. What do we replace it with? There has to be something else, otherwise mining families will have to look for other employment opportunities.' The 'something else' points to the need for diversification and the imperative to ensure upskilling of the workforce and a just transition. With the core pillar of the discussion set on the theme of social justice, the central concern coming out of the Illawarra focus group was the need to ensure better affordability, better opportunities for local communities, better conditions for workers and better connections. Affordable energy provision is seen as a benefit of renewable energy projects, including solar systems, but it requires political support and subsidies to encourage those who do not have the financial incentive to be part of a positive green transition to join in and change the momentum.

Showcasing a distinct 'frontier logic', research participants from the **Far West** stand out from the other case-study areas in their call for energy autonomy and the desire to see the region move towards a self-sufficient energy system. This was deemed to be both a matter of energy security and a matter of distributional justice. A decentralised energy system that is built around local supply, production and consumption is regarded as practical, economical and safe, and an approach that would be feasible, as 'there is so much sun and wind'. Focusing time, energy and resources towards supporting infrastructure in remote Far West (for example, Broken Hill) is seen as pivotal, with localised capacity-building and skills advancement to ensure the future sustainability of the region. For those in the Far West, the current era presents an opportunity to plan for a localised energy system that provides energy security, economic stability (maybe even progress), skills diversification and population stability (maybe even growth). The community forum confirmed the sentiment expressed in the interviews that there is a real community will among residents in the Far West to rethink the way our energy system is structured, but that this needs to be backed up by political will. In the community forum, governments at all levels are seen as the key drivers of change, and the participants exhibited a general trust in the state government particularly but argued that it requires a 'groundswell', this contrasts somewhat with expectations that industry is in it only for profit (cf. Terwel 2011); that is, collective pressure from community to drive the change. As one community-forum participant stated, 'They will make difficult decisions if they are confident people will understand and there is enough public pressure.'

Through all three focus groups, what was clear was that there is a significant amount of community drive and desire to see a move towards a greener energy system that can support a fairer world, build resilient communities, and generate opportunities for diversification and change, both now and in the future. The Australian Government must take the lead but listen to community in the process. At this stage, communities do not feel they are seen and listened to in the discussion about sustainable energy futures. Across the board, there is agreement that while this is a **global challenge**, it is one that will require **local solutions, and all three levels of government have a key role to play**.

10.2.2 Summary: What did we learn from the community forums?

Based on the findings from the community forums, we can conclude the following:

- In the Hunter, the key concern was about a just transition and how to ensure that coal-mining communities can emerge strong through a process of transitioning away from coal and towards renewables. There is concern regarding the need for political leadership to ensure this just transition.
- In the Illawarra, a key concern was on social and environmental justice, and the opportunity for a renewed energy system not only to address environmental concerns but also to redress social inequity and poverty.
- In the Far West, there was an acknowledgement of, but also concern, regarding the remoteness and richness of available renewable energy sources. As in the interviews, a frontier sentiment emerged, both in the desire to create self-sufficient systems and in concerns about becoming the 'dumping ground' for coastal needs and agendas.

11 Discussion

Here we discuss the answers to the three research questions that stem from the above results. As stated in the introduction, the questions are:

- What are the core and peripheral beliefs associated with each coalition and who can be considered their key opinion leaders (KOLs)?
- What 'sustainable energy futures' might be supported by these coalitions?
- What energy future garners the broadest support across coalitions?

11.1 Beliefs and key opinion leaders

Different coalitions support different futures, but they are not motivated by the same beliefs. These are what will ultimately determine what specific technologies are acceptable. Below we introduce both the beliefs and the key opinion leaders.

11.1.1 Understanding beliefs

We identify three categories of argument through which participants' views on sustainable energy futures can be classified: ideologies, technical mantras, and attachment to place.

Ideology is the main element driving support for one or another energy future. Participants make a range of ideological judgments in assessing their priorities regarding energy technology. These include the value of the environment against the value of the economy and job creation, the value of tradition against future development, and individual action against corporate and state action. These elements dovetail with findings related to the primacy of ideology in supporting climate change action (Hornsey et al. 2016). As we saw in the survey, the greatest predictor of support for various technologies is environmental ideology, but also the perception of whether decision-making can be influenced. There is wide discontent with political inaction and a fear that the average person will be left behind.

Highly correlated with these ideological positions are **technical mantras**. These are oft-repeated statements that stem from technical and expert discussions but penetrate the general discourse. They are usually decontextualised and supported by statements that are, at face value, undeniable. For example, the 'no-sun, no-wind, no-energy' is well grounded in obvious issues with integrating non-dispatchable renewables into a system that requires on-demand generation and consumption. Similarly, 'keep it in the ground' or calls to 'move on from fossil fuels' draw on the thorough studies that show extraction and burning of existing fossil fuels is the key issue contributing to climate change. Yet another example lies in the faith in humanity's ability to innovate our way out of trouble – 'necessity is the mother of invention' – be it through high-performing battery technology or low-cost carbon capture. This is again grounded on the fact that innovation has 'saved humanity' from, among other things, deadly diseases.

Finally, the most uniform influence on the views of any participant concerns the **attachment to place**, to wherever they call home. The survey showed that neither asking the respondent to use a global or local angle when considering their opinion nor checking for their region of origin was relevant in explaining *differences in support for one or another technology*. Other elements like attachment to nature were more important. However, this certainly does not mean that they do not care about their local area. When given the opportunity to explain their support in interviews and the Delphi forum, participants made reference to what they believed was best for their home, their property, their community, their town, and their country. Some participants raised the aesthetic value of their area that they perceived to be under threat by industrial development or waste management. Others discussed their pride in place and the legacy of their town, whether they sought to preserve an idyllic rural agrarian identity for their area, to protect the industry that employs their friends, neighbours, and compatriots, or to advocate for the potential of their region as a future hub of renewable energy development.

In our discussion of beliefs in the next section, we focus on the ideological elements, given that the technical mantras tend to follow them, and that the attachment to place is universal. In addition, we

maintain the tradition of separating 'core' and 'peripheral' beliefs as in the advocacy coalitions literature (Sabatier, 1988).

11.1.2 Understanding key opinion leaders

Key opinion leaders are the sources of the ideologies, which are in turn supported by technical mantras and often translated into localised issues. The easiest way to identify such leaders is based on our Twitter assessment, which allows us to link certain discourses with dominant individuals in the network, some of whom were also referenced in the qualitative interviews.

Participants in the other parts of the research avoided mentioning very specific opinion leaders that have served as inspiration for their beliefs. This is understandable, given that it requires a significant amount of introspection for a topic that is rarely at the top of their everyday concerns. When pressed, interviewees identified *categories* of organisation and people who are seen to hold the power to inform attitudes and shape knowledge about various energy systems, although it was sometimes unclear if it was for them personally. These include energy companies, government departments and ministers, higher education, industry, investors, local councils and councillors, manufacturers, media, NGOs, scientists and celebrities. Nonetheless, participants frequently recognised the role of the news media and social media in shaping everyone's views, thus reinforcing our choice to focus on Twitter connections.

11.1.3 RES fans (Twitter: Grassroots/Green)

11.1.3.1 Core beliefs

The overriding principle is the **urgency to avoid catastrophe**. Tweets, Delphi forum and interview statements all make it clear that some people are positively terrified about the consequences of climate change. These concerns are in line with the ever-direr warnings from scientists, which they seem to follow particularly closely. This sense of urgency is translated into a greater **emphasis on faster, more decisive action and less willingness to compromise** on certain elements.

While the survey makes it clear that attitudes towards the natural world are an important predictor of the differences in support for various technologies, it is in this coalition specifically that the **sanctity of the natural world** is a part of their core beliefs.

A final core element is their support of **small-scale and local control**. This explains their much clearer support for local 'smart-grids' than for long-distance 'HVDC'. Support for local battery storage was not necessarily higher overall, indicating that anything that benefits their local communities is the goal, rather than strictly local generation and storage. Nonetheless, the advantages of local generation and storage were pointed out repeatedly in the Delphi forum and by interviewees with experience of residential rooftop solar installations.

11.1.3.2 Peripheral beliefs

In relation to the above focus on localism, we also note a distinct belief that **individual political activism** is necessary for change. In addition, this group displays a clear mistrust of large organisations and government. This is somewhat tempered by a recognition that 'interventions' by such powerful entities is the only way to move forward.

Finally, **concern for Indigenous peoples and cultures** also seems common within this coalition, as this is often mentioned in the Twitter campaigns and appeared in the interviews. However, it was not a universally defining feature.

11.1.3.3 Key opinion leaders

This is an activist-oriented coalition that draws inspiration from NGOs. Greens politicians and left-leaning journalists, among others, are also likely to have sway. More locally, they are likely represented by activist community members, and, on a larger scale, they link up with global 'climate celebrities'.

11.1.4 Pro RES (Twitter: Progressive)

In many ways, as indicated by their assigned label, the Pro RES group is a more moderate version of the RES fans. Its members show significant interest in **environmental protection**, but they also note that the economy is the foundation of many important activities. They expressly note that they may be willing to **compromise**.

They explicitly note the need for more **expert involvement** and keeping politics out where it is a hindrance; but on other points, they note a need for **better coordination between state and federal levels of government and bipartisanship**.

11.1.4.1 *Peripheral beliefs*

Affordability for local people is seen as one of the reasons to support renewable energy and move on from fossil fuels. Delphi forum statements mention specifically the price hikes of gas after the LNG markets opened up, which appeared in the news.

11.1.4.2 *Key opinion leaders*

We would consider this a 'centrist' coalition. From the Twitter results, Labor politicians and centrist or left-leaning journalists are likely to feature prominently, as are pro-renewables Liberal politicians.

11.1.5 Tech fans (Twitter: Green/Science and tech)

11.1.5.1 *Core beliefs*

This coalition is numerically small both in the survey and Twitter estimates. **Techno-optimism** is its hallmark, which can be seen in the generous support for all technologies expressed in the survey, in the comparatively broader discussion of energy sources on Twitter, as well as to the calls in the Delphi forum to be innovative, creative and 'open to ideas'.

Many of the contributions emphasised the **improvement of living conditions and equity**. This follows on from the techno-optimism and a general belief that technological advancements will eventually solve many of the problems of humankind as they have in the past. This is a well-known position in energy-expert circles, and it is not surprising to find that those who claim greater knowledge of energy technologies subscribe to it.

11.1.5.2 *Peripheral beliefs*

This coalition seems to take a more **global outlook** due to its general appreciation for science, which it regards as useful to humanity in general.

11.1.5.3 *Key opinion leaders*

This is a rather niche group that largely follows the big-tech entrepreneurs and commentators, as well as science organisations like CSIRO. Energy-expert communication is likely to have an impact on this well-educated group. Their political orientation is uncertain, but a key trait is that they favour 'progress' and 'change'.

11.1.6 Broad choice (Twitter: Conservative/Science and tech)

11.1.6.1 *Core beliefs*

This coalition believes that **Australia's economy must be protected** and is mistrustful of very rapid changes if they lead to economic disruption. Although they did not all disagree with the term 'urgent transition', they were quick to point out that adequate safeguards must be in place to protect jobs and income, used terms such as 'measured pace', and noted that fossil fuels are acceptable in the short-term.

This group was also **disenchanted with politics and political action at any scale**. Whereas RES fans may be less than enthusiastic about the federal government's insufficient support, this coalition has people calling for direct democracy and agreement with measures generally regarded with suspicion by other groups, such as concentrating energy policy in one level of government.

This group **opposed the 'domination of the green agenda'** and expressed concern about **local costs** in terms of **employment** and also about **national impacts** in terms of **export revenue**.

11.1.6.2 *Peripheral beliefs*

This coalition is concerned about **issues with grid stability if a transition happens too fast**, and can easily contemplate continuing to use coal and other fossil fuels to ensure that does not happen.

11.1.6.3 *Key opinion leaders*

Alongside the Pro RES coalition, this is a ‘centrist’ group that may listen to Labor politicians and pro-renewables Liberal politicians, and both right-leaning and left-leaning journalists. However, rather than the occasional Green commentator or tech evangelist, this group seems to attract leaders in farming and other fields less directly associated with renewables.

11.1.7 Sceptics (Twitter: Conservative)

11.1.7.1 *Core beliefs*

The view that **renewables threaten grid stability** is indisputably the core concern of this coalition. There are genuine fears – which we saw in tweets, in statements during the Delphi forum and in interviews – that wind and solar power are completely unreliable and generate next to no energy, and are thus an unjustifiable expense.

Underpinning this belief is that **nature is outside of our control and influence**, which has a dual implication: on the one hand, it means using the sun and wind to power human society is not feasible, but also that climate change means the climate will hardly be any different from what it always was. Climate-change policy is largely seen as part of a progressive agenda with which Sceptics disagree.

11.1.7.2 *Peripheral beliefs*

The proud **history and heritage** of Australian mining and, in particular, the key role coal has played in various regions are brought up in defence of retaining fossil fuels. These beliefs do not seem to be essential to the argumentation but are nonetheless prominent.

Nationalism is often present but mostly as a corollary to the perceived globalism of the pro-renewables agenda.

11.1.7.3 *Key opinion leaders*

This coalition feed off the most conservative Liberal politicians, One Nation politicians and right-leaning journalists. In addition, some conspiracy-oriented social-media commentators also feature as figures of authority. These commentators tend to hold generally contentious views, both directly related to the energy question, such as denying that climate change is human induced, and also doubting the science and public health orders concerning the COVID-19 pandemic.

11.2 Sustainable energy futures

Our various methods allow us to derive the broad outlines of what type of ‘sustainable energy futures’ people have in mind, and what they perceive as appropriate. We sought to understand the situation in the next 10 to 20 years and we used that rough period whenever required for clarification.

Even though many of the technologies we asked about were not related to electricity; electricity and the grid attracted more definitive answers (cf. support for offshore wind or modular nuclear, and that for hydrogen CCS or steel CCS). This is understandable as they are the most tangible and easy reference for our respondents. The grid offer the best window into the thinking and beliefs of most respondents. Nonetheless, the electricity grid is not the only part of a sustainable future. The issue of exports and other end-uses will likely be of even greater economic importance than domestic power generation. We first cover the grid in detail and then complement it with some discussion of the export and other uses of coal. Finally, we contrast these wishes and desires with expert projections for these sustainable futures.

11.2.1 The grid

We identify the following basic types of future grid that adequately capture the current spread of opinions among our various populations of interest:

1. renewables-focused
 - a. small-scale backup technologies
 - b. large-scale backup technologies
2. non-renewables-focused.

The following sections introduce the reasoning and the backing of each.

11.2.1.1 Renewables-focused

This type of future would be supported by a large majority of participants in the study. Taking the survey as the most representative of the broader population, some 80% see renewables, even innovative renewables, as the core of a sustainable future. Taking Twitter as a much more engaged and potentially influential subset of the population, the proportion is likely to be around 75%. This view is echoed in regional newspapers. Excluded from this are the 'Sceptics' in the survey and the 'Conservatives' on Twitter. The key question in this future is how renewables are best supported, particularly during a hard-to-define period of transition.

The small-scale option

For 'RES fans' in the survey, the ideal situation is a complete and rapid overhaul of the energy system. Renewables to be backed up by local batteries, renewables-generated hydrogen and, only where not possible, any technologies that make fossil fuels completely redundant. These views are arguably echoed by the Grassroots activists in the Twitter sample, who tend to regard maintaining fossil fuels, particularly coal, as an unacceptable capitulation. In the Delphi forum, RES fans would prefer the transition away from fossil fuels to happen immediately. Interviewees espousing this kind of future explained that they saw the old system as stuck in the 1960s vision of a centralised grid. They acknowledge the long and meritorious history of a centralised system but also its inertia, as discussed in the Hansard section. Local empowerment is generally important across the board but particularly for this option. However, while empowering local areas is the ultimate goal, supporters of this option see the need for fast and decisive action by authorities at federal and state levels to stop fossil-fuel use and also to set up an adequate framework.

Coal in this future is completely out of the picture. While the least radical would accept some transition period with gas, coal is seen as anathema to any kind of 'sustainability'. An oft-heard mantra, very clearly visible in the Twitter Grassroots coalition but also in the interviews, is 'keep it in the ground'. Coal is seen as a massive problem for the future on, due not only to its responsibility for air pollution and greenhouse-gas emissions, but also to its status as a finite resource.

The large-scale option

For most survey-derived coalitions, without any 'Sceptics' but perhaps including some of the more flexible 'RES fans' (~70%), the best option is a gradual replacement of large-scale fossil fuels by large-scale renewables and their assisting technologies with necessarily attempting to make this local or small-scale. As noted above, the Delphi forum shows that there is a gradation in the speed of this transition away from fossil fuels across the various survey coalitions, which roughly correlates with the identity of the coalition. Those in the Pro RES coalition are mostly keen to see it as soon as possible but with caveats ('10–15 years to remove 90% fossil fuels') and without the vehemence of RES fans ('5 years'). Tech fans' longer timeframes conform to the hope that the more we wait, the better technologies will be. Finally, those advocating Broad choice see a need to keep using fossil fuels 'as long as needed without severe economic impact'. Most of the Twitter coalitions, except some in the Conservative and the aforementioned 'Grassroots', would also support this option (~). Regional newspapers, while highlighting the local impacts and benefits of the transition, have also progressively taken a global perspective and do not place emphasis on a 'small grid' option.

Some would still see a very limited role for fossil fuels and would rather introduce a wider range of renewables-supporting technologies (for example, HVDC). However, the optimism about a fully renewable system is not shared by all. Broad choice proponents and occasionally others individually note that some form of fossil fuel may be needed for the system 'not to be out of balance' – in the words of one interviewee – and to 'maintain supply'. The variety of potential options explains the general ambiguity towards CCS technologies in the survey: not preferred but not rejected.

Within this option, coal is neither particularly welcome nor rejected out of hand. The lower support for coal CCS compared with other CCS options is noticeable, however. The focus on coal as a target of criticism and controversy is also abundantly clear from the Twitter data and reflected in newspapers and interview data. While some people do see value in innovative coal technologies (including HELE and CCS); natural gas seems likely to attract much broader support as a transitional fuel, with or without CCS, ahead of coal if the choice is presented. There is recognition of the role that coal plays in metallurgy, but options that remove the need for coal, like green hydrogen, receive more attention.

11.2.1.2 *Non-renewables-focused*

Those who see the future of the grid as centred on fossil fuels make up some 6.9% of the survey respondents (corresponding to 'Sceptics') and potentially 25% of our Twitter sample (corresponding to 'Conservative'). Note that the remainder of survey respondents (11.2%) were the 'Indifferent' group. A key aspect concerns the mistrust that renewable technologies can 'keep the lights on' when there is 'no sun and no wind', which is shared with others to some extent, notably the Broad choice coalition. However, opinions in this group are often expressed as fallacies, such as displaying tremendous concern for the comparatively limited impacts of wind farms on birdlife, while failing to mention the wide range of impacts on wildlife that fossil-fuel use is known to cause.

Coal would be a key component of this option alongside nuclear. For some, this is accompanied by support for coal CCS or HELE, but for others, the technologies that would fit within a typical sustainable-energy scenario are often considered unnecessary. This latter view is therefore often linked to climate-change denialism, as we could observe on Twitter, the Delphi forum and interviews. Nonetheless, there are also those who simply doubt renewables and would propose a massive deployment of nuclear energy if coal is rejected by others.

11.2.2 *Export and other end-uses*

Coal remains important for three industries that can play a major role in a sustainable energy future in NSW: hydrogen, steelmaking, and direct coal exports. The vast majority of respondents had neither knowledge nor strong opinions on these topics; but we can extract some insights.

Hydrogen could be used to support or even replace natural-gas capabilities. In the survey and interviews, knowledge of this technology was higher than for CCS, for example, which can be explained by the heightened attention in regional newspaper coverage. In the survey and other discussions, its production involving CCS (so-called 'blue hydrogen'), whether from coal or gas, does not attract as much interest as green hydrogen generated from renewable electricity. Again, this dovetails with the current NSW Government's expectation to use only green hydrogen for its Tallawarra B power plant (NSW Government, 2021). Blue hydrogen can also be exported, but it will be subject to the same kind of scrutiny as direct export of coal.

As for steelmaking, there is an emphasis on the fact that people in industries affected by the energy transition will need to be taken care of. Some expressed hope that there would be continued or expanded steel manufacturing, but these people did not specify a technology preference. In any case, the survey results indicate that steelmaking, along with CCS, suffers from a lack of knowledge, which leads to ambivalence in support. In both the interviews and community engagement session, we heard the point that without knowing more details about CCS, people would rather move onto other things. The use of green hydrogen at the Port Kembla steelworks was mentioned specifically in the community engagement because it had been agreed to only a couple of weeks before.

Most coal in NSW is mined for export. Although transitions are happening overseas – for example, India's rapid energy transition was recently lauded by the International Energy Agency (IEA, 2022) – coal consumption (and exports) still maintained record highs after the Covid slump. Our survey results show that there is a lot of hesitation about the benefits – environmental or health – of stopping exports. In the Delphi forum we see complex interactions between the perception of Australia's competitive advantage in mineral extraction and its climate responsibility. Even Pro RES respondents are concerned about the billions of dollars that may be lost if exports stop and there is no commodity that can replace them.

11.2.3 The expert view

Before we dive into inferring the broadest coalition possible going further, we need to situate the above in the context of the latest expert projections for the main areas involved: the grid and exports. Starting with the domestic grid, the Australian Energy Market Operator (AEMO) (Macdonald-Smith, 2021) and the NSW Government are planning for a renewables-focused grid with minimal coal contribution (see Figure 32 below).

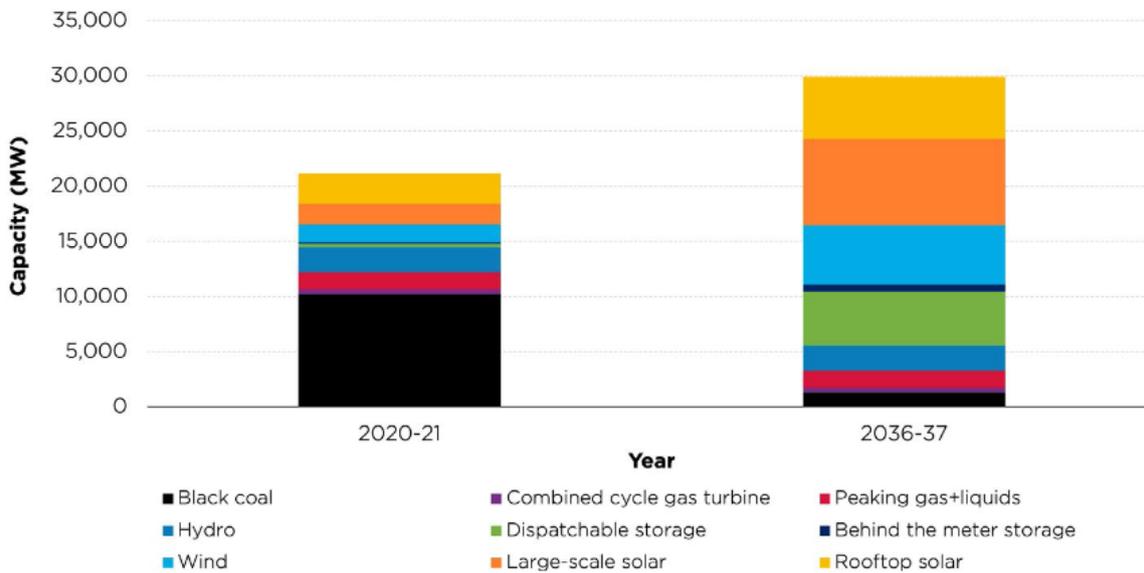


Figure 32: Australian Energy Market Operator’s 2036-2037 forecast for NSW generation capacity as presented in the NSW Electricity Infrastructure Roadmap (DPIE, 2020: Figure 4)

In terms of exports, Figure 33 shows various, wildly diverging future pathways for coal exports from Australia out to 2050 as recently forecast by the Reserve Bank of Australia. In this analysis, the current trends lead to a world with severe climate change effects, while others are progressively more compatible with manageable levels. The main variables are (a) the speed with which importers will implement emission reduction policies that diminish their demand and (b) technological evolution.

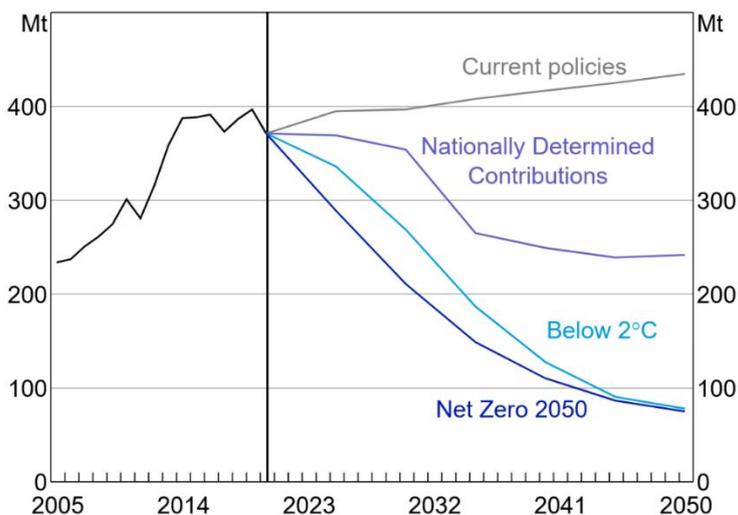


Figure 33: Australian coal export scenarios by the Reserve Bank of Australia (RBA 2021).

Overall, the combined picture suggests that the domestic electricity grid will in all likelihood follow the popular majority's expectations, probably tending towards lower levels of fossil fuels than expected. As we shall explore in the next question, this may have implications for the ideal pathway in exports.

11.3 Enabling broader coalitions

The final task of this research project was to infer, based on the evidence collected, what type of sustainable energy future attracts the broadest possible coalition. The ultimate goal is for society to present a united front in the fight against climate change.

11.3.1 No full consensus, but no echo chambers either

The results do paint a polarised landscape between a large majority, who see coal and other fossil fuels as a problem – with or without immediate solution – and a small minority, who take issue with renewables instead. This mirrors and is fed by the divide around the severity (or even reality) of climate change (Jang & Hart, 2015), as well as the portrayals of new coal developments, such as the Adani Carmichael coal mine, as highly controversial or beneficial (Stutzer et al., 2021). Strict consensus is impossible given that the minority that opposes renewables has serious doubts that any measures can stop climate change, but the remaining coalitions do offer a broad basis for agreement.

In line with recent research on social-media polarisation (Iandoli, 2021), we find that 'echo chambers' do not exist as such. The Conservatives, who may correspond to the Sceptics or Broad choice Twitter coalitions, are not particularly affected by this phenomenon, either. Firstly, on Twitter, all coalitions demonstrate connectivity, and Conservatives are not particularly self-involved; they have more connections to other poles than the activist-led Grassroots, who have the least (see Appendix 'Twitter'). The Delphi forum and interviews also show that the most conservative participants are critical of specific actions of the so-called 'green agenda' that they often know and react to. For their part, Twitter's Grassroots coalition and the RES fans and, to a lesser extent, others in the pro-renewables group, address their criticism directly to government Members of Parliament through mentions (see Appendix 'Twitter' and Table 4). In addition, when not forced to select options very strictly, we saw that interviewees were open to considering a variety of narratives.

This has implications for the ability of information to circulate in the networks. It is unlikely that the extremes will convince one another; but the boundaries between coalitions are never watertight and, for example, it seems possible to bring part of 'RES fans', 'Tech fans', or 'Broad choice' close to the positions of 'Pro RES'.

11.3.2 The broadest consensus

Figure 34 on the next page is a visual summary of the distance and overlaps between the Twitter coalitions. This representation reflects the attitudes towards fossil fuels as well as the perceived attitude towards the conversation. If the focus is on criticising or drumming up support against 'the other side', including by using expletives, then the attitude is critical. The focus is constructive if the participants are more concerned with finding solutions. Figure 35 shows the same for survey-derived coalitions. As we have noted throughout, these coalitions overlap, but the Twitter ones have more extreme elements, which is why they are depicted as clustering towards the middle.

The upshot of our findings is that the broadest coalition can be found around the 'minimum necessary' use of fossil fuels. This would exclude only those 'Sceptics' that reject renewables outright and those that are opposed to any kind of fossil fuels under any circumstances (arguably a subset of 'RES fans'). Still upwards of 80% would be on this grand coalition. Notably, if AEMO and NSW government plans turn out as expected in Section 11.2.3, the evolution of the domestic grid will make the 'No-sun-no-wind' mantra lose strength. The crux of the matter is the implications for exports.

As we have seen in the Hansard and newspapers, there is already an 'environmentalisation' and internationalisation of the question of coal in Australia. This trend is almost certain to continue inevitable as domestic uses diminish and the global climate warms. Thereby, the choices regarding exports will likely become as clear as they have been for the domestic electricity grid: the broadest coalition will appear around a limited use of fossil fuels, which will mean an alignment between coal exports and emission reduction goals. Sceptics are likely to support continued exports in any case, regardless of the status of the grid domestically, so we focus on the other coalitions below.

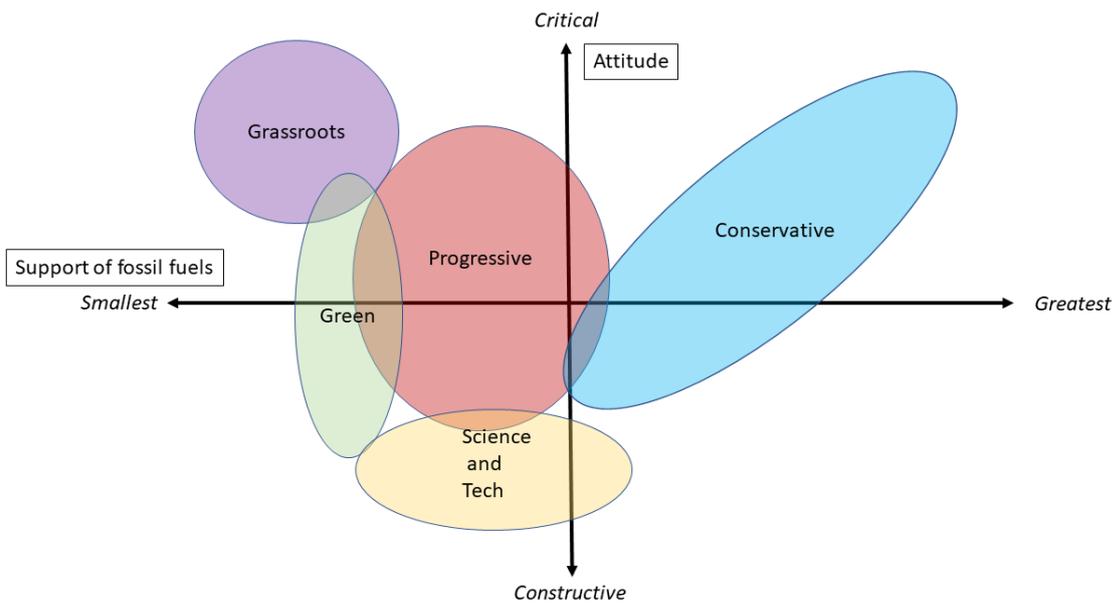


Figure 34: Qualitative spatial representation of the positioning of each Twitter coalition regarding attitude towards the conversation and support for fossil fuels. Size represents breadth of opinions rather than number of constituents

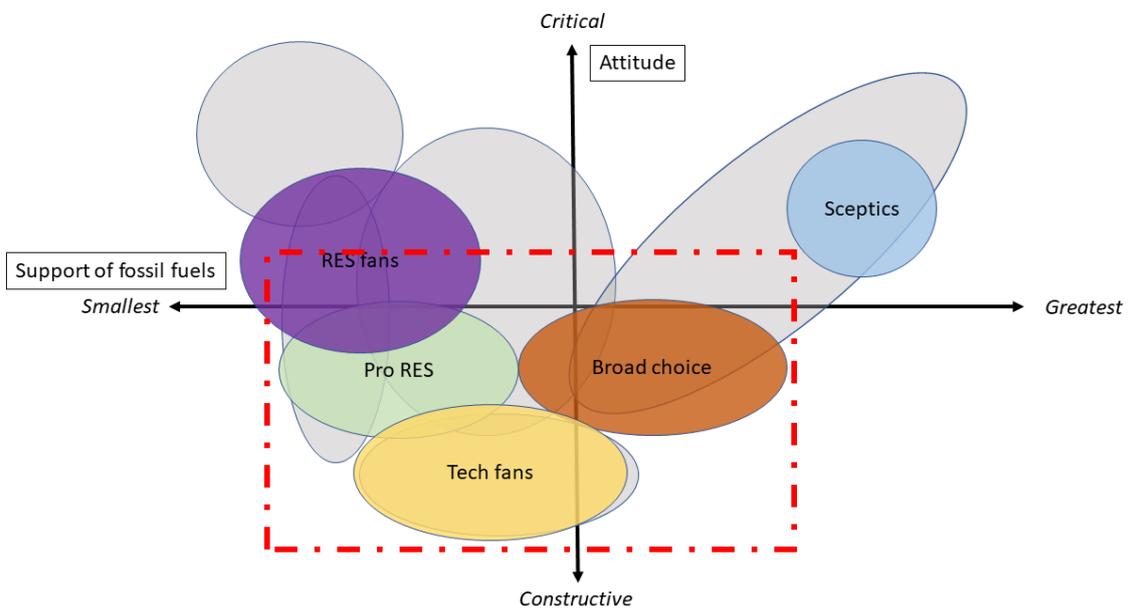


Figure 35: Qualitative spatial representation of the positioning of each survey-based coalition as in Figure 34. Grey shapes in background stand in for those in Figure 34. The dot-dashed square indicates roughly the area with greatest agreement

RES fans (~23% of survey sample) were most clearly opposed to exports, which befits their concerns about a 'climate emergency'. This group is likely to grow, rather than diminish, as climate-change

impacts become more obvious and more damaging in the short to medium term. Nonetheless, their greater desire for negative emissions, which necessitates CCS, also shows that they are not opposed per se to the technologies that would enable coal to operate in a more sustainable way. However, their suspicion of such technologies will be enormous unless alternatives have been attempted thoroughly. The conditions would be similar for Pro RES (~25%), who are sufficiently concerned with environmental protection, although perhaps with less suspicion. Further down the slope of suspicion, we would find Tech fans (~12%) and Broad choice (~23%). As the transition takes place in Australia, these coalitions will likely increasingly wonder whether coal-related technologies are necessary elsewhere.

Considering the internationalisation of the discourse in news and political life, all these (non-Sceptics) coalitions will sooner or later seek assurances that continued coal-export operations are clearly the best option for the local area in NSW, but also for the recipients overseas. Speculating somewhat, this may imply a greater focus on coking coals, or on ensuring that the destination has access to CCS technology or other verifiable reason to justify export of NSW coal. NSW coals are demonstrably lower in emissions than others, but driving this claim is pointless if NSW coal does not effectively displace other coals.

Given the trajectory of thought among the majority coalitions investigated in this report, if Australia continues to export coal, the public at home will likely expect to be shown that emissions are not simply being displaced elsewhere while Australia's own grid decarbonises. Such an outcome would require careful consideration of the uses of coal in destination countries.

12 Conclusion

This report has presented an analysis of data collected from digital and on-the-ground sources in NSW and across Australian society more broadly, with particular attention to case-study areas in the Hunter Valley, the Illawarra and the Far West. These data were collected and analysed through qualitative and quantitative methods. This report sought to answer three questions:

1. What sustainable energy futures are discussed and supported in Australia?
2. What coalitions are behind them and what belief systems underpin them, including the key sources of opinions?
3. What pathway will ensure the broadest coalition of stakeholders for the low-carbon future of coal-related sectors?

Our historical contextualisation draws on a review of Hansard data that provides the necessary context for the current situation of the coal industry, as well as clues as to how crises have been overcome in the past, and notably in the precedent of the Joint Coal Board that modernised the industry and led to Australia's export success. The news dataset provided context for the recent past, indicating a shift towards internationalisation and a decrease of the overall attention to coal relative to other energy technologies. Our social-media analysis narrowed the profile of the existing coalitions based on a highly committed and arguably influential population. It was followed by a survey that captured opinions among the entire cross-section of the adult NSW population. This yielded five coalitions that have clear correspondents in the Twitter examples but with a less black-and-white view of the issues, as well as some indifference. We labelled the non-indifferent coalitions as RES fans, Pro RES, Tech fans, Broad choice, and Sceptics. We further explored the key themes using qualitative methods by inviting key members of each coalition to exchange opinions in a Delphi forum, as well as interviewing a broad range of individuals from our three case-study areas.

Growth in coal exports used to be a welcome long-term outcome of a successful bipartisan reform of the coal-mining industry in Australia until the mid-2000s. However, the relative dependence of Australia on coal has made it a particularly salient symbol of environmental problems, and its removal is the key rallying point for the RES fans coalition. This is particularly strongly reflected on social-media sites because of a tendency to focus on 'negatives'. Coal is the perfect villain in the story for many people. Nonetheless, other coalitions, except Sceptics, also display a strong preference for 'moving on' from coal.

On the domestic electricity grid, the vast majority of people share the expectations of AEMO and the NSW Government that the contribution of coal will be minimal. In terms of exports, the view is currently complex; but we argue that expectations on the former will soon be transferred to the latter as the domestic transformation assuages some of the concerns about the reliability of renewables (for example, among those advocating for a Broad choice) and climate-change impacts make the urgency expressed by RES fans felt more broadly across the population. Opposition to coal exports will increasingly resemble RES fans' attitudes.

Considering that exports are likely to continue for some time, the way to ensure the broadest coalition behind a low-carbon future for the coal sector is to demonstrate that NSW coal is contributing to climate-change mitigation by maintaining essential industries such as steelmaking and displacing higher-emissions generation. Coal-related, low-carbon technologies such as CCS and hydrogen are not well understood among the public and not discussed prominently even among the relatively well-informed (such as the Science and tech coalition). Attitudes are, on average, neutral to mildly positive in the survey, but they contrast with overwhelmingly positive sentiment for renewables. In direct interactions, people often wondered why something like CCS was required for coal in particular. Its applications in bioenergy for negative emissions were appreciated by those most concerned with climate change; but the notion of 'burning trees' weighed heavily in rejections of the technology. Creating partnerships with coal export destinations that guarantee best use of coal resources with clear targets is essential. This could be the role of a new agency that draws on bipartisan support as the Joint Coal Board did in its day. To guarantee success, a number of trust-building measures will be required.

13 Recommendations

1. Rebuilding trust with local communities and more diverse voices

There is a need to build trust with local communities and regions by making investment and strategic policy decisions that will set NSW on a pathway to build sustainable energy systems to meet the needs of future generations. There appears to be little trust among community members in both government and industry initiatives, and 'coal' is frequently the clear target of criticism. While the coal industry has a long and proud history in NSW and in Australia, political capital has been diminished through years of neglecting opportunities to broaden the energy options. The political conversation needs to change, to bring communities and a diversity of voices into a dialogue about what the future should look like. New large-scale technology projects will have significant local impacts and need to be done in collaboration with local communities and aligned to strategies for building resilient and sustainable futures. Critically, this will need a path forward for a renewable-based energy future that addresses local needs and aspirations, notably the Hunter and Illawarra's concerns with just transitions, and the Far West's remoteness.

2. Better education around technologies related to coal, notably carbon capture and storage

The lack of understanding about CCS is widespread and persistent. Further investment in research and development of such technologies must be paralleled with a neutral, informative educational campaign. While hydrogen has attracted increased attention, this is concentrated on the green-hydrogen opportunities, with CCS (and blue hydrogen) appearing only as a contrast. One reason for this is the lack of large successful CCS ventures that can compete with the barrage of news about new solar- and wind-capacity records and efficiency achievements. CCS must be firmly established as a complementary technology, rather than competing with renewable energy sources that are better known. A communication strategy that showcases the interlinking of various energy technologies, including CCS, and their contribution to a future renewable energy mix is required.

3. Intimately associate coal technologies with renewable energy developments

A wider communication strategy that clarifies the role of coking coal in any renewable energy future needs to be developed. An ongoing and future need for coking coal as part of any renewable energy future can act as a point of conversation on the future role of coal and redress the myth that a renewable future is without mining. Exploring partnerships with coal importers who have committed to decarbonise their use of coal could be a further asset – for example, where importers put aside money and technology to ensure that their operations are carbon-free post-2040, which is a suggested target for the end of unmitigated coal emissions worldwide (IEA, 2021). The Victorian Hydrogen Energy Supply Chain initiative with its links to Japan could also be an inspiration in this regard. This would imply changes to NSW's current hydrogen strategy, which is focused on green hydrogen. However, considering the ambitious aims and the limited surplus available to generate green hydrogen, the blue-hydrogen option may indeed be necessary and this needs to be more clearly communicated.

4. Emphasise the long-term and international significance of CCS research that may be funded by Australia

As per the previous points, coal exports will maintain industries like steelmaking necessary for any sustainable energy transition, and they will be present under almost any conceivable scenario post-2040. CCS is therefore a key technology for the future. Nonetheless, in Australia, associating CCS with coal-fired power stations is unlikely to gain community support and can distract from advancing CCS technology more generally. Investment should be on advancing CCS outside the energy field of coal-fired power and build it up as a link within a carbon-neutral energy future centred around renewable energy technology. A strong research agenda in application of CCS beyond the power sector would shed light on its beneficial use in steelmaking or in negative emissions. Once results are

attained in those areas, revisiting coal CCS for deep decarbonisation in places powered by Australian coal will be a compelling rationale.

5. Invest in a platform to build future consensus, cooperation and collaboration.

Our findings from the Hansard noted the historical significance of the Joint Coal Board. The JCB was a body established as a result of wide consensus across federal and state government working with both industry and the labour movement. Despite modest means, the JCB became a key driver of change in the coal industry by bringing together previously opposing forces. This example serves to illustrate the vital role that government can play to bring about change not just to industry but to communities and the entire NSW economy. Investment in a contemporary iteration of a platform like the JCB will offer fertile ground for future cooperation and collaboration.

14 References

- ABS [Australian Bureau of Statistics]. (2021). Past releases of yearbooks. <https://www.abs.gov.au/>
- Agresti, A. (2010). *Analysis of ordinal categorical data*. John Wiley & Sons.
- Arning, K., Offermann-van Heek, J., Linzenich, A., Kaetelhoen, A., Sternberg, A., Bardow, A., & Ziefle, M. (2019). Same or different? Insights on public perception and acceptance of carbon capture and storage or utilization in Germany. *Energy Policy*, *125*, 235-249. doi:<https://doi.org/10.1016/j.enpol.2018.10.039>
- Ashworth, P., Sun, Y., Ferguson, M., Witt, K., & She, S. (2019). Comparing how the public perceive CCS across Australia and China. *International Journal of Greenhouse Gas Control*, *86*, 125-133. doi:<https://doi.org/10.1016/j.ijggc.2019.04.008>
- Ashworth, P., Wade, S., Reiner, D., & Liang, X. (2015). Developments in public communications on CCS. *International Journal of Greenhouse Gas Control*, *40*(September 2015), 449-458. doi:<http://dx.doi.org/10.1016/j.ijggc.2015.06.002>
- Askland, H., Askew, M., Hanley, J., Sherval, M., Farrugia, D., Threadgold, S., & Coffey, J. (2016). *Local attitudes to changing land use – Narrabri Shire. Full report*. University of Newcastle, NSW Department of Primary Industries. <https://www.newcastle.edu.au/>
- Askland, H. (2018). A dying village: mining and the experiential condition of displacement. *The Extractive Industries and Society*, *5*(2): 230-6
ASONAM2020/ASONAM2020_Proceedings/pdf/papers/139_147_897.pdf
AUSSTATS/abs@.nsw.gov.au/second+level+view?ReadForm&prodno=1301.0&viewtitle=Year%20Book%20Australia~2012~Latest~24/05/2012&&tabname=Past%20Future%20Issues&prodno=1301.0&issue=2012&num=&view=&
- Bailey, M.-S., & N. Osborne. 2020. Extractive resources and emotional geographies: the battle for treasured places in the Gloucester Valley. *Geoforum* *116*: 153-162
- Barberá, P. (2015). Birds of the same feather tweet together: Bayesian ideal point estimation using Twitter data. *Political Analysis*, *23*(1), 76–91.
- Batel, S., Devine-Wright, P., & Tangeland, T. (2013). Social acceptance of low carbon energy and associated infrastructures: A critical discussion. *Energy Policy*, *58*, 1–5.
- Beaumont, P. B. (1975). Conflict in coal: The NSW experience. *Journal of Industrial Relations*, *17*(1), 44–59.
- Bertsch, v., Hall, M., & Fichtner, W. (2016). Public acceptance and preferences related to renewable energy and grid expansion policy: Empirical insights for Germany. *Energy*, *114*, 465–77.
- Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent dirichlet allocation. *Journal of Machine Learning Research*, *3*, 993–1022.
- Boutilier, R. G., & Black, L. (2013). Legitimizing industry and multi-sectoral regulation of cumulative impacts: A comparison of mining and energy development in Athabasca, Canada and the Hunter Valley, Australia. *Resources Policy*, *38*(4), 696–703.
- Boutyline, A., & Willer, R. (2017). The social structure of political echo chambers: Variation in ideological homophily in online networks. *Political Psychology*, *38*(3), 551–69.
- Brett, J. (June 2020). The coal curse. *Quarterly Essay*, *78*. [Restricted access]
<https://www.quarterlyessay.com.au/essay/2020/06/the-coal-curse>
- Bruvoll, A., and Larsen, B. M. (2004). Greenhouse gas emissions in Norway: Do carbon taxes work? *Energy Policy*, *32*(4): 493–505.
- Carey, S., Evans, T. P., & Konisky, D. M. (2018). Adaptation, culture, and the energy transition in American coal country. *Energy Research & Social Science* *37*, 133–9.
- Chinn, S., Hart, P. S., & Soroka, S. (2020). Politicization and polarization in climate change news content, 1985–2017. *Science Communication*, *42*(1), 112–29.
- Clulow, Z., Ferguson, M., Ashworth, P., & Reiner, D. (2021). Comparing public attitudes towards energy technologies in Australia and the UK: The role of political ideology. *Global Environmental Change*, *70*, 102327. doi:<https://doi.org/10.1016/j.gloenvcha.2021.102327>
- Cotton, M., Rattle, I., & Alstine, J. V. (2014). Shale gas policy in the United Kingdom: An argumentative discourse analysis. *Energy Policy*, *73*, 427–38.
- De Francisci Morales, G., Monti, C., & Starnini, M. (2021). 'No echo in the chambers of political interactions on Reddit', *Scientific Reports*, *11*, Article 2818. <https://doi.org/10.1038/s41598-021-81531-x>
- Delina, L. L., & Diesendorf, M. (2013). Is wartime mobilisation a suitable policy model for rapid national climate mitigation? *Energy Policy*, *58*, 371–80.

- Dey, P., Chatterjee, A., & Roy, S. (2018). Knowledge based community detection in online social network. In *Proceedings of the 2018 10th International Conference on Communication Systems & Networks (COMSNETS)*, 637–42. IEEE. <https://ieeexplore.ieee.org/document/>
- DISER [Department of Industry, Science Energy, and Resources]. (2021a). *Australian Energy Update 2021*, Table N (energy exports). <https://www.energy.gov.au/publications/australian-energy-update-2021>
- . (2021b). *Australian Energy Update 2021*, Table P (consumption and production of coal). https://www.energy.gov.au/publications/australian-energy-update-2021__data/assets/pdf_file/0006/336768/CSRRF_Narrabri-Report_December2016_240217_8328287
- DPIE [Department of Planning, Industry and Environment]. (2020). *Electricity Infrastructure Roadmap*. <https://www.energy.nsw.gov.au/government-and-regulation/electricity-infrastructure-roadmap>
- Draper, S., & Lee, M. (1988). The coal industry: The current crisis and the campaign for a National Coal Authority. *Journal of Australian Political Economy*, 23, 45–60.
- Dunlap, R. E., Kent D. V-L, Mertig, A. G., & Jones, R. E. (2000). New trends in measuring environmental attitudes. Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3), 425–42.
- Dwyer, J., & Bidwell, D. (2019). Chains of trust: Energy justice, public engagement, and the first offshore wind farm in the United States. *Energy Research & Social Science*, 47, 166–76.
- Einsiedel, E. F., Boyd, A. D., Medlock, J., & Ashworth, P. (2013). Assessing socio-technical mindsets: Public deliberations on carbon capture and storage in the context of energy sources and climate change. *Energy Policy*, 53(0), 149-158. doi:<http://dx.doi.org/10.1016/j.enpol.2012.10.042>
- Elfvengren, K., Karvonen, M., Klemola, K., & Lehtovaara, M. (2014). The future of decentralised energy systems: Insights from a Delphi study. *International Journal of Energy Technology and Policy*, 10(3/4), 265–79.
- Eriksen, T. H. (2016). *Overheating: An anthropology of accelerated change*. Pluto Press.
- Eyre, F. (1988). *Technology in Australia 1788–1988*. Australian Academy of Technological Sciences and Engineering.
- Feldpausch-Parker, A. M., Ragland, C. J., Melnick, L. L., Chaudhry, R., Hall, D. M., Peterson, T. R., . . . Wilson, E. J. (2013). Spreading the news on carbon capture and storage: A state-level comparison of US media. *Environmental Communication*, 7(3), 336-354. doi:10.1080/17524032.2013.807859
- Gaede, J., & Rowlands, I. H. (2018). Visualizing social acceptance research: A bibliometric review of the social acceptance literature for energy technology and fuels. *Energy Research & Social Science*, 40, 142–58.
- Geist, M. R. (2010). Using the Delphi method to engage stakeholders: A comparison of two studies. *Evaluation and Program Planning*, 33(2), 147–54.
- Geoscience Australia. (n.d.). *Gas*. <https://www.ga.gov.au/digital-publication/aecr2021/gas>
- Gibson, K. D. (1990). Australian coal in the global context: A paradox of efficiency and crisis. *Environment and Planning A: Economy and Space*, 22(5), 629–46.
- Groves, C. (2017). Emptying the future: On the environmental politics of anticipation. *Futures*, 92, 29–38.
- Guo, Y., Ashworth, P., Sun, Y., Yang, B., Yang, J., & Chen, J. (2019). The influence of narrative versus statistical evidence on public perception towards CCS in China: Survey results from local residents in Shandong and Henan provinces. *International Journal of Greenhouse Gas Control*, 84, 54-61. doi:10.1016/j.ijggc.2019.02.021
- Hagenaars, J. A., & McCutcheon, A. L. (2002). *Applied latent class analysis*. Cambridge University Press.
- Hajer, M. A. (1995). *The politics of environmental discourse: Ecological modernization and the policy process*. Oxford University Press.
- Hanteer, O., Rossi, L., D'Aurelio, D. V., & Magnani, M. (2018). From interaction to participation: The role of the imagined audience in social media community detection and an application to political communication on Twitter. In *Proceedings of the 2018 IEEE/ACM International Conference on Advances in SNA and Mining*, 531–4. IEEE. <https://doi.ieeecomputersociety.org/10.1109/ASONAM.2018.8508575>
- Hart, P. S., & Nisbet, E. C. (2012). Boomerang effects in science communication: How motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Communication Research* 39(6), 701–23.

- Hemsley, J. (2019). Followers retweet! The influence of middle-level gatekeepers on the spread of political information on Twitter. *Policy & Internet*, 11(3), 280–304.
- High, M. M., & Smith, J. M. (2019). Introduction: The ethical constitution of energy dilemmas. *Journal of the Royal Anthropological Institute*, 25(S1), 9–28.
- Hobman, E. V., & Ashworth, P. (2013). Public support for energy sources and related technologies: The impact of simple information provision. *Energy Policy*, 63, 862–9.
- Hobman, E. V., & Frederiks, E. R. (2014). Barriers to green electricity subscription in Australia: ‘Love the environment, love renewable energy ... but why should I pay more?’ *Energy Research & Social Science*, 3, 78–88.
- Hornsey, M. J., Harris, E. A., Bain, P. G., & Fielding, K. S. (2016). Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change*, 6(6), 622–626.
- Hudson, M. (2017). Wind beneath their contempt: Why Australian policymakers oppose solar and wind energy. *Energy Research & Social Science*, 28, 11–16.
- Iandoli, L., Primario, S., & Zollo, G. (2021). The impact of group polarization on the quality of online debate in social media: A systematic literature review. *Technological Forecasting and Social Change*, 170, 120924.
- IEA [International Energy Agency]. (2021). *Phasing out unabated coal: Current status and three case studies*. <https://www.iea.org/reports/phasing-out-unabated-coal-current-status-and-three-case-studies/executive-summary>
- IEA [International Energy Agency]. (2022). *Renewables*. <https://www.iea.org/fuels-and-technologies/j.erss.2020.101869>
[j.pubrev.2020.101882](https://www.iea.org/fuels-and-technologies/j.pubrev.2020.101882)
- Jang, S. M., & Hart, P. S. (2015). Polarized frames on ‘climate change’ and ‘global warming’ across countries and states: Evidence from Twitter big data. *Global Environmental Change*, 32, 11–17.
- Kleinberg, J. M. (1998). Authoritative sources in a hyperlinked environment. In *Proceedings of the ninth annual ACM-SIAM symposium on discrete algorithms*, 668–77. Society for Industrial and Applied Mathematics. <https://dl.acm.org/doi/10.5555/314613.315045>
- Landeta, J. (2006). Current validity of the Delphi method in social sciences. *Technological Forecasting and Social Change*, 73(5), 467–82.
- Lapham, J., Palmer, H., & Morris, K. (10 November 2020). *Joel Fitzgibbon and how coal and climate change caused split in Labor ranks*. ABC News. <https://www.abc.net.au/news/2020-11-10/why-hunter-mp-joel-fitzgibbon-quit-shadow-cabinet/12867218>
- Leifeld, P. (2013). Reconceptualizing major policy change in the advocacy coalition framework: A discourse network analysis of German pension politics. *Policy Studies Journal*, 41(1), 169–98.
- Li, R., Crowe, J., Leifer, D., Zou, L., & Schoof, J. (2019). Beyond big data: Social media challenges and opportunities for understanding social perception of energy. *Energy Research & Social Science*, 56. <https://doi.org/10.1016/j.erss.2019.101217>.
- Liebe, U., & Dobers, G. M. (2019). Decomposing public support for energy policy: What drives acceptance of and intentions to protest against renewable energy expansion in Germany? *Energy Research & Social Science*, 47, 247–60.
- Lock, S. J., Smallman, M., Lee, M., & Rydin, Y. (2014). ‘Nuclear energy sounded wonderful 40 years ago’: UK citizen views on CCS. *Energy Policy*, 66, 428–35.
- Lockie, S., Franettovich, M., Petkova-Timmer, V., Rolfe, J., & Ivanova, G. (2009). Coal mining and the resource community cycle: A longitudinal assessment of the social impacts of the Coppabella coal mine. *Environmental Impact Assessment Review*, 29(5), 330–9.
- Lockwood, M. (2013). The political sustainability of climate policy: The case of the UK Climate Change Act. *Global Environmental Change*, 23, 1339–48.
- Loloum T., Abram, S., & Ortar, N. (Eds.). (2021). *Ethnographies of power. A political anthropology of energy*. Berghan Books.
- Lucarelli, B. (March 2011). *Australia’s black coal industry: Past achievements and future challenges* [Working paper]. Program on Energy and Sustainable Development.
- Macdonald-Smith, A. (14 July 2021). 100pc renewables ‘is where we’re heading’: AEMO boss. *Financial Review*. <https://www.afr.com/companies/energy/100pc-renewables-is-where-we-re-heading-aemo-ceo-20210714-p589ie>
- McKinnon, M., et al. (2016). Science, Twitter and election campaigns: Tracking auspol in the Australian federal elections. *Journal of Science Communication* 15(6), 1–22.
- Moon, W.-K., Kahlor, L. A., & Olson, H. C. (2020). Understanding public support for carbon capture and storage policy: The roles of social capital, stakeholder perceptions, and perceived

- risk/benefit of technology. *Energy Policy*, 139, 111312.
doi:<https://doi.org/10.1016/j.enpol.2020.111312>
- Müller-Hansen, F., Callaghan, M. W., & Minx, J. C. (2020). Text as big data: Develop codes of practice for rigorous computational text analysis in energy social science. *Energy Research & Social Science*, 70. <https://doi.org/10.1016/j.erss.2020.101691>.
- Müller-Hansen, F., Callaghan, M. W., Lee, Y. T., Leipprand, A., Flachsland, C., & Minx, J. C. (2021). Who cares about coal? Analyzing 70 years of German parliamentary debates on coal with dynamic topic modeling. *Energy Research & Social Science*, 72. <https://doi.org/10.1016/j.erss.2021.102306>
- Nielsen, J. A. E., Stavrianakis, K., & Morrison, Z. (2022). Community acceptance and social impacts of carbon capture, utilization and storage projects: A systematic meta-narrative literature review. *PLoS ONE*, 17(8 August). doi:10.1371/journal.pone.0272409
- NSW Government. (2021). *Australia's first green hydrogen and gas power plant* [Press release]. <https://www.nsw.gov.au/media-releases/australias-first-green-hydrogen-and-gas-power-plant>
- Olson-Hazboun, S. K., Krannich, R. S., & Robertson, P. G. (2016). Public views on renewable energy in the Rocky Mountain region of the United States: Distinct attitudes, exposure, and other key predictors of wind energy. *Energy Research & Social Science*, 21, 167–79. Optimised.pdf
- Ortega Alvarado, I. A., Sutcliffe, T. E., Berker, T., & Pettersen, I. N. (2021). Emerging circular economies: Discourse coalitions in a Norwegian case. *Sustainable Production and Consumption*, 26, 360-372. doi:<https://doi.org/10.1016/j.spc.2020.10.011>
- Otto, D., & Gross, M. (2021). Stuck on coal and persuasion? A critical review of carbon capture and storage communication. *Energy Research & Social Science*, 82, 102306. doi:<https://doi.org/10.1016/j.erss.2021.102306>
- Papacharissi, Z. (2004). Democracy online: Civility, politeness, and the democratic potential of online political discussion groups. *New Media & Society*, 6(2), 259–83.
- Peel, M. J., Goode, M. M. H., & Moutinho, L. A. (1998). Estimating consumer satisfaction: OLS versus ordered probability models. *International Journal of Commerce and Management*, 8(2), 75–93.
- Rand, J., & Hoen, B. (2017). Thirty years of North American wind energy acceptance research: What have we learned? *Energy Research & Social Science*, 29, 135-148. doi:10.1016/j.erss.2017.05.019
renewables
- Ritter, A., & Bammer, G. (2010). Models of policy-making and their relevance for drug research. *Drug and Alcohol Review*, 29(4), 352–7.
- Rosenbloom, D., Berton, H., & Meadowcroft, J. (2016). Framing the sun: A discursive approach to understanding multi-dimensional interactions within socio-technical transitions through the case of solar electricity in Ontario, Canada. *Research Policy*, 45(6), 1275–90.
- Rothman, S., & Lichter, S. R. (1987). Elite ideology and risk perception in nuclear energy policy. *The American Political Science Review*, 81(2), 383–404.
- Rubin, F. S., Alvim, A. C. F., Santos, R. P. dos, & Ribeiro de Mello, C. E. (2020). Detecting influential communities in Twitter during Brazil oil field auction in 2019. In *Proceedings of the 2020 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2020)*, 897–904. ASONAM. <https://web.ntpu.edu.tw/~myday/doc/s41599-021-00827-5>
- Sabatier, P. A. (1988). An advocacy coalition framework of policy change and the role of policy-oriented learning therein. *Policy Sciences*, 21, 129–68.
- Sabatier, P. A., & Weible, C. M. (2007). The advocacy coalition framework: Innovations and clarifications. In P. A. Sabatier (Ed.), *Theories of the policy process* (1st ed). Westview Press.
- Scelsi, T., Arranz, A. M., & Frermann, L. (2021). Principled analysis of energy discourse across domains with thesaurus-based automatic topic labeling. In *Proceedings of the 19th Annual Workshop of the Australasian Language Technology Association*, 107–18. Australasian Language Technology Association. <https://aclanthology.org/2021.alt-1.11.pdf>
- Scheer, D., Konrad, W., & Wassermann, S. (2017). The good, the bad, and the ambivalent: A qualitative study of public perceptions towards energy technologies and portfolios in Germany. *Energy Policy*, 100, 89–100.
- Scherhauser, P., Höltinger, S., Salak, B., Schauppenlehner, T., & Schmidt, J. (2017). Patterns of acceptance and non-acceptance within energy landscapes: A case study on wind energy expansion in Austria. *Energy Policy*, 109, 863–70.

- Shukla, R., & Swarnakar, P. (2022). Energy justice in post-Paris India: Unpacking consensus and conflict through storylines and discourse coalitions. *Energy Research & Social Science*, 91, 102687. doi:<https://doi.org/10.1016/j.erss.2022.102687>
- Strunz, S. (2014). The German energy transition as a regime shift. *Ecological Economics*, 100(7), 150–8.
- Stutzer, R., Rinscheid, A., Oliveira, T. D., Loureiro, P. M., Kachi, A., & Duygan, M. (2021). Black coal, thin ice: The discursive legitimisation of Australian coal in the age of climate change. *Humanities and Social Sciences Communications*, 8, Article 178. <https://doi.org/10.1057/humanities.2021.178>
- Terwel, B. W., Harinck, F., Ellemers, N., & Daamen, D. D. (2011). Going beyond the properties of CO₂ capture and storage (CCS) technology: How trust in stakeholders affects public acceptance of CCS. *International Journal of Greenhouse Gas Control*, 5(2), 181-188.
- Tranter, B. (2013). The great divide: Political candidate and voter polarisation over global warming in Australia. *Australian Journal of Politics and History*, 59(3), 397-413. doi:10.1111/ajph.12023
- Tranter, B., & Foxwell-Norton, K. (2021). Only in Queensland? Coal mines and voting in the 2019 Australian federal election. *Environmental Sociology*, 7(1), 90–101.
- Tsai, W-H. S., Tao, W., Chuan, C-H., & Hong, C. (2020). Echo chambers and social mediators in public advocacy issue networks. *Public Relations Review*, 46. <https://doi.org/10.1016/j.pubrel.2020.100888>
- Van Rijnsoever, F. J., & Farla, J. C. M. (2014). Identifying and explaining public preferences for the attributes of energy technologies. *Renewable and Sustainable Energy Reviews*, 31, 71–82.
- Van Rijnsoever, F. J., Mossel, A. V., & Broecks, K. P. F. (2015). Public acceptance of energy technologies: The effects of labeling, time, and heterogeneity in a discrete choice experiment. *Renewable and Sustainable Energy Reviews*, 45, 817–29.
- Wagner, P. M., & Ylä-Anttila, T. (2018). Can policy forums overcome echo chamber effects by enabling policy learning? Evidence from the Irish climate change policy network. *Journal of Public Policy*, 40(2), 194–211 .
- Walker, C., & Baxter, J. (2017). Procedural justice in Canadian wind energy development: A comparison of community-based and technocratic siting processes. *Energy Research & Social Science*, 29, 160–9.
- Wallquist, L., Seigo, S. L. O., Visschers, V. H. M., & Siegrist, M. (2012). Public acceptance of CCS system elements: A conjoint measurement. *International Journal of Greenhouse Gas Control*, 6, 77-83. doi:<https://doi.org/10.1016/j.ijggc.2011.11.008>
- Wallquist, L., Seigo, S. L. O., Visschers, V. H. M., & Siegrist, M. (2012). Public acceptance of CCS system elements: A conjoint measurement. *International Journal of Greenhouse Gas Control*, 6, 77-83. doi:<https://doi.org/10.1016/j.ijggc.2011.11.008>
- Wassermann, S., Schulz, M., & Scheer, D. (2011). Linking public acceptance with expert knowledge on CO₂ storage: Outcomes of a delphi approach. *Energy Procedia*, 4, 6353–59.
- Whitmarsh, L., Xenias, D., & Jones, C. R. (2019). Framing effects on public support for carbon capture and storage. *Palgrave Communications*, 5(1), 17. doi:10.1057/s41599-019-0217-x
- Williams, H. T. P., McMurray, J. R., Kurz, T., & Lambert, F. H. (2015). Network analysis reveals open forums and echo chambers in social media discussions of climate change. *Global Environmental Change*, 32, 126–38.
- Wolske, K. S., Raimi, K. T., Campbell-Arvai, V., & Hart, P. S. (2019). Public support for carbon dioxide removal strategies: the role of tampering with nature perceptions. *Climatic Change*, 152(3), 345-361. doi:10.1007/s10584-019-02375-z
- Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, 35(5), 2683–91.
- Zárate-Toledo, E., Patiño, R., & Fraga, J. (2019). Justice, social exclusion and indigenous opposition: A case study of wind energy development on the Isthmus of Tehuantepec, Mexico. *Energy Research & Social Science*, 54, 1–11.

15 Appendices

15.1 Staff

In addition to the authors, Ms Yasmin Box, Mr Kazi Adnan were both engaged as Research Assistants to the project. Mr Grady Fitzpatrick also performed some relevant coding tasks, and Dr Camille Nurka was engaged to proofread the final report. None of them received any qualifications as a result of this engagement.

15.2 Publications

At the time of writing, two papers containing data from the project have been accepted by the journal *Energy Research & Social Science* and are awaiting CINSWF's final green light for publication:

- Martínez Arranz, A. et al. (2022), "United in criticism: The discursive politics and coalitions of Australian energy debates on social media"
- Martínez Arranz, A. et al. (2022), "Mechanisation, wages, and royalties: unpacking coal lock-in through 120 years of parliamentary debates in the world's largest exporter"

15.3 Technical summaries

The following technical summaries are attached:

- Appendix 'Content Analysis'
- Appendix 'Delphi forum'
- Appendix 'Hansard'
- Appendix 'Interviews'
- Appendix 'News'
- Appendix 'Survey'
- Appendix 'Twitter'

SIGN OFF

I, the undersigned, being a person duly authorised by the Grantee, certify that:

- 1 the above information is true and complete;
- 2 the expenditure of the Funding received to date has been used solely on the Project; and
- 3 there is no matter or circumstances of which I am aware that would constitute a breach by the Grantee or, if applicable the End Recipient and Subcontractors', of any term of the Funding Deed.

Signature:

Position:

Name:

Date: