Assessing Wind Energy Acceptance Amongst Landowning Farmers in Alberta, Canada

by

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ABSTRACT

This study explores the acceptance of wind energy amongst rural landowning farmers in Alberta as they are a demographic that will be directly involved in and affected by wind energy development in the province. This thesis project uses data from an online survey completed by 401 Albertan landowning farmers between December 2018 and March 2019. The introductory chapter overviews the social acceptance of wind energy (SAWE) literature, the Albertan energy and wind energy landscape, the project background, and research methodology. In Chapter 2, I use ordered logistic regressions to assess how political ideology, fossil fuel preferences, and beliefs about wind energy impact attitudes towards wind energy (i.e., wind acceptance). I also explore whether wind energy is a politically polarized topic by looking for patterns in wind energy opinions across political divisions. The data suggests wind energy views are not politically polarized nor even polarized within this demographic as few expressed strong opinions for or against this type of energy development. Instead, Albertan landowners appear to take diverse, moderate, and fragmented positions on various aspects of wind energy, a finding that suggests they are open to amending their views. Beliefs about the economic and environmental impacts of wind energy appear crucial in shaping landowners' overall stance on this low-carbon technology. Chapter 3 is an exploratory study investigating the relationship between different beliefs about climate change and wind energy acceptance. Binomial logistic regressions suggest believing in the efficacy of and feeling a sense of responsibility in climate action makes one less likely to oppose wind energy, although perceived social norms had a stronger impact. Additionally, I use an exploratory cluster analysis to identify two main climate beliefs profiles, which I name as the Climate Realists and Climate Skeptics. These analyses suggest climate denial beliefs are common within this demographic, with many expressing

climate denial beliefs that are strong and therefore unlikely to be reformed. Chapter 4 synthesizes insights from the project as a whole and proposes avenues for further energy social science research in Alberta.

PREFACE

This thesis is an original work by Monique Holowach. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name “Land-owner preferences for wind energy development in Alberta,” No. Pro00084046, November 2018 – November 2019. Funding for the project was provided through a Social Science and Humanities Insight Grant (#435-2017-0281).

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ABBREVIATIONS

AESO	Alberta Electric System Operator
CLT	Construal level theory
CTT	Conservative think tank
DM	Denial Machine
ECCC	Environment and Climate Change Canada
FAO	Farmers' Advocate Office
GDP	Gross domestic product
GHG	Greenhouse gas
GOA	Government of Alberta
IC	Interpretive community
IPCC	Intergovernmental Panel on Climate Change
LAA	Legislative Assembly of Alberta
NDP	New Democratic Party
NRCan	Natural Resources Canada
PC	Progressive Conservative
PEP	Primary energy production
REP	Renewable Energy Program
SARET	Social acceptance of renewable energy technologies
SAWE	Social acceptance of wind energy
UCP	United Conservative Party

Chapter 1. Introduction

Globally, both the scientific community and much of the public acknowledge climate change as a serious and pressing issue. It is widely thought that fossil fuels must remain in the ground and that urgently transitioning to low-carbon energy sources is necessary to avoid severe climate outcomes. Despite this widespread agreement, the deployment of promising renewable energy technologies has been stalled by various political, economic, and social factors. Of the latter, local communities have resisted renewable projects in their region, and this opposition has slowed renewable technology diffusion. Community-based, localized, and decentralized energy production may boost renewable acceptance, accelerate deployment, and reduce emissions. While certain energy infrastructures do not lend themselves to this small-scale, decentralized approach—e.g., large nuclear reactors, hydroelectric dams, and refineries for oil and gas—some technologies, like wind turbines, do.

This thesis contributes to the energy social sciences by exploring the social obstacles and possibilities for further wind energy development in Alberta, Canada. Wind turbines are a notably contentious technology, arguably and simply, due to their towering size. As turbines are audible and highly visible, especially across open prairie landscapes, developing local wind projects does not merely involve a deal between a private developer and a rural landowner; rather, it becomes a community affair that raises questions about fairness, norms, identity, and shared values.

Energy social scientists have focused heavily on the factors leading to the acceptance and stark rejection of wind turbines (Fournis & Fortin, 2017). In North America, the social acceptance of wind energy (SAWE) has been under investigation for over thirty years, but despite decades of work, research is still needed (Rand & Hoen, 2017). The successful siting of wind farms in rural areas often hinges on the social specifics of how a project unfolds—particularly regarding aspects of participation, fairness, trust, and the weighing of risks versus benefits. Complexity arises when wind energy gets entangled in politics, gains unfavourable symbolic meanings, clashes with group identity, or threatens a status quo.

Several factors make Alberta a prime context to explore the SAWE and the social acceptance of renewable energy technologies (SARET) more broadly. The SAWE field lacks research on how preferences for other energy sources (e.g., oil and gas) impact wind acceptance (Rand & Hoen, 2017). Alberta is intimately bound to fossil fuels. Compared with other Canadian provinces, Alberta is often an outlier on energy topics (Bratt, 2020) and have the lowest rates of believing in climate change (Mildenberger et al., 2016). Culturally, Albertans are more individualistic and populist relative to citizens in the other prairie provinces (Wesley, 2012). These qualities may function as opposing forces to a low-carbon energy transition. Decarbonization pathways often call for industry regulation, collective action, and changing the status quo—in the name of climate change. For many Albertans, a low-carbon energy transition could be interpreted as a threat to their fossil-fueled, prosperous way-of-life, as well as their culture, values, and collective identity.

Nevertheless, a renewable energy transition is afoot. With many wind projects under construction in Alberta (Government of Alberta [GOA], n.d.-a), rural communities are forming new relationships with this energy technology. This is the time for strategic communication and collaborative planning between government, wind developers, communities, and Albertan landowners. For better or worse, the wind development occurring today will leave decades-long imprints across rural Alberta. Once contracts are signed and turbines are spinning, landowners and their communities are locked into relationships with nearby wind farms—bound by contractual obligations and by the path dependency of physical infrastructure and its lifecycle.

This thesis project explores the SAWE amongst rural Alberta landowners. There is little wind acceptance research in Alberta, with some recent exceptions from Afanasyeva et al. (2022) and Parkins et al. (2021a). However, more insight is needed on the views of rural Albertan landowners, who are gatekeepers to the private land needed for renewable development. While the influence of political ideology on energy development (e.g., Adkin, 2016) and the ways in which energy and climate topics are divisive (Marshall et al., 2018) are well documented in Alberta, less has been said on the interactions of political ideology, climate beliefs, and wind acceptance in this petro-province context.

In this introductory chapter, I introduce the SAWE literature and then set the context for this study: Canada's energy province, Alberta. I overview the energy landscape of Alberta to demonstrate how the province is economically, historically, culturally, and politically bound to fossil fuels, surmising that such a bond might hinder wind acceptance. I present the limited research conducted on wind acceptance in Alberta. I follow with an in-depth explanation of this thesis project, including research gaps, project objectives, and methodological approach—an online survey completed by 401 rural Albertan landowning farmers in 2018–2019.

LITERATURE REVIEW

In this review, I overview the progression of the SAWE field, summarize the current state of the literature, and introduce some ways wind development can impact rural communities.

The Social Acceptance of Wind Energy Literature

Despite the public's high regard for wind energy, many rural communities where turbines are (or could be) have expressed opposition to local wind development, which has slowed the deployment of this low-carbon technology (Ellis et al., 2007; Rand & Hoen, 2017; van der Horst, 2007). Rural communities have expressed many common concerns about hosting wind farms, including visual and noise impacts, health issues, and harms to local ecosystems (Rand & Hoen, 2017). Hearing these concerns, researchers conducting earlier work on the SAWE assumed rural communities were selfish—not wanting to sacrifice their own "backyards" for the broader environment. Over time, however, the literature shifted towards nuanced, theory-driven explanations to better explain the "social gap" (Bell et al., 2013) between high public acceptance and low community acceptance of wind energy.

NIMBY Theory

One of the earlier propositions, the "Not-In-My-Backyard" (NIMBY) theory, was a common explanation for local wind opposition. In the context of the SAWE literature, NIMBYism refers specifically to situations where people are supportive of wind energy in general but simultaneously opposed to nearby projects. Researchers now agree NIMBY theory is too simple to capture the complexity of wind opposition (Rand & Hoen, 2017). For years, the theory has

been considered invalid (Devine-Wright, 2004; Wolsink, 2000), depreciatory (Swofford & Slattery, 2010), and insulting (Jami & Walsh, 2017).

Distance Theories

Another two oversimplified explanations have dotted the SAWE literature. I refer to them as the *distance theories*. The *proximity hypothesis* posits that the people living nearest to turbines will harbour the most negative attitudes, but the theory has mixed evidence and lacks sound theoretical reasoning (Rand & Hoen, 2017). In a similar vein, Wolsink (1988; 1994; 2007a; 2007b) suggested the possibility that distance in *time* (not *space*) determines wind attitudes. The "U-curve" theory arose from Wolsink's reoccurring observation: Communities that had initially positively viewed wind energy would go through a temporary phase of decreased acceptance during the siting and construction of a project. After the wind farm was operational, the community would return to having positive attitudes. Yet, U-curve evidence is conflicting (Mills et al., 2019), and the notion has received thorough critique[1] (Rudolph & Clausen, 2021).

Like NIMBY theory, in pursuit of all-encompassing explanations, distance theories discount local context and grossly oversimplify the complex relationships between rural communities and energy infrastructure. While distance may be a significant factor in some situations, distance (in time or space) is less likely determining SAWE and more likely aggravating other social factors.

Fairness & Trust

Moving towards theory-driven explanations, researchers noticed it was the way wind energy was developed (not *whether* it was developed) that sparked conflict and opposition. Numerous studies have confirmed the importance of fairness in successful wind siting, with both distributive and procedural justice being vital (Christidis et al., 2017; Fast et al., 2016; Jami & Walsh, 2014; Liebe et al., 2017; Walker & Baxter, 2017a, 2017b). Unlike the distance theories,

[1] Rudolph and Clausen (2021) review the U-curve research and find multiple issues, including a lack of distinction between post-project acceptance and other similar looking states (e.g., how acceptance can be mistaken for apathy); not factoring in overarching shifts in socio-political conditions (e.g., how renewable energy is generally becoming more well received anyway); and a lack of long-term, longitudinal studies. Most potently though, they critique the U-curve notion for "assuming, hoping for, working towards or instrumentalising post-construction acceptance" (p.76) rather than developing wind energy so that it entirely circumvents communities having to "get used to it."

the importance of fairness is grounded in social theory (e.g., Tyler, 1994). Similarly, trust is crucial in the acceptance of local wind projects (Gross, 2007) where the relationship between trust and fairness is "complex, ambiguous and interrelated" (Aitken, 2010, p.6066). Trust stems from believing in someone else's competencies and perceiving that their values align with yours (Greenberg, 2014). Attitudes towards local wind projects have been influenced by trust or distrust for various stakeholders, including large energy corporations (Sonnberger & Ruddat, 2017) and government bodies (Shaw et al., 2015).

Place Protective Action

As the SAWE field progressed, the "social gap" in wind acceptance was better explained by drawing from social and environmental psychology. Devine-Wright (2009) proposed a p*lace protective action* framework to explain resistance to local wind projects. Using this lens, wind resistance was repositioned as a psychological, protective response, where individuals were acting out of *identity* with or *attachment* to a place. As Devine-Wright explains, place identity theory posits people have psychological attachments to the physical realm insofar that a place can become part of their self-construct, where individuals may perceive material changes to their landscape or community as a personal threat. Place attachment theory recognizes how people can form emotional bonds to places and that these bonds can be challenged by intrusive energy infrastructure. When the wind literature adopted place-protective action as a guiding framework, wind opposition was finally acknowledged as rational. Driven by a justifiable need for self-preservation, people were simply protecting their identities and a place that they had bonded to emotionally (Devine-Wright, 2009).

Symbolism

A great deal of research has confirmed wind turbines are vehicles of meaning, where their conceptual presence may be more impactful than their physical presence. Wind turbines can harbour positive meanings—bringing to mind a *sustainable future* (Thayer & Hansen, 1988), *progress* (Lee et al., 1989), *clean energy transitions* (Firestone et al., 2015), and *environmental justice* (Phadke, 2010). On the other hand, wind turbines are notorious carriers of unfavourable meanings—often viewed as artificial, industrial technologies invading the "naturalness" or "quaintness" of the rural countryside (Devine-Wright & Howes, 2010; Hirsh & Sovacool, 2013).

In some areas, wind turbines have also become artifacts steeped in political tension. For example, when Christidis et al. (2017) interviewed host communities in Ontario, they found turbines had become symbolic of liberalism and this meaning was unwelcome in conservative, rural spaces. The rural communities perceived inequalities in how the provincial government had treated its rural and urban citizens. These perceived inequalities then fueled opposition back towards the broader idea of wind energy. Wind turbines not only *carried* meaning but *absorbed* it as well—becoming complex symbols of injustice, group conflict, and competing political ideologies.

The Complexity of Wind Energy Acceptance

Importantly, these factors—fairness, trust, place protection, and symbolism—are not isolated from one another when it comes to shaping wind acceptance; they deeply intertwine. To illustrate this point, I offer some examples of how the SAWE field has treated the interplay of sensory disturbances, fairness concerns, and health impacts. Although many people have reported experiencing health issues (e.g., migraines) from living near a wind farm (Onakpoya et al., 2015), evidence of direct health impacts is inconclusive (Rand & Hoen, 2017). Social scientists in Ontario have proposed it is not necessarily the turbines in themselves causing health problems but instead the unfair development processes and their resulting social conflicts (Fast et al., 2016; Walker et al., 2014). In Ontario again, Songsore and Buzzelli (2014) noticed how health concerns, feelings of procedural unfairness, and opposition to recent developments were mentioned hand-in-hand—suggesting such concerns are deeply interrelated. Further, the noise from wind turbines has been found to only annoy community members who are not receiving financial compensation (Pedersen et al., 2009) and those who had started off with negative wind attitudes (Knopper & Ollson, 2011).

Together, these studies highlight how the corporeal experience of living near wind turbines can be shaped by diverse and sometimes indistinguishable social, psychological, and physiological factors. These factors may be so indistinguishable that even community members themselves might struggle to articulate the source of their wind opposition. To account for this complexity, the SAWE field has relied heavily upon qualitative methods and case studies (Rand & Hoen, 2017) because vital nuances will be missed if distilling down human-turbine interactions into five points on a Likert scale.

Where is the Literature Now?

In the North American context, as summarized by Rand and Hoen (2017), the SAWE literature has settled on some overarching conclusions. The acceptance of wind energy into rural communities is often determined by the (perceived and real) localized economic impacts of these projects. Rural communities care greatly about the visual and auditory impacts of wind turbines, but it is when their concerns are dismissed that particularly intense opposition seems to arise. It is *how* a project is developed that determines whether it will be deemed acceptable, where meeting local preferences around fairness and trust is vital. Very importantly, researchers should avoid a positivist mindset by viewing wind opposition not as something to be minimised but as something to be understood (Rand & Hoen, 2017). Last, the factors leading to wind acceptance for one community will not necessarily translate to another (Baxter et al., 2020), a conclusion that calls for region-specific research.

Wind Development & Rural Communities

The literature has revealed many benefits that local wind development can bring to landowners, farmers, and rural communities. Landowners can lease out their land to developers and receive financial compensation in return for hosting the infrastructure on their land. This extra income stream has enabled ranchers to balance their books and afford their rural lifestyle (Brannstrom et al., 2015). Stable, long-term lease payments from hosting turbines have helped farmers re-invest in their agricultural operations and given them the confidence to pass the farm down to their children rather than selling their land (Mills, 2018). In these ways, wind development has the potential to prevent farm conglomeration, keep younger generations in rural areas, and revitalize and stabilize rural populations. Other economic benefits may accrue to entire regions by increasing tax revenue, sparking ecotourism, diversifying local economies, and creating employment opportunities (Rand & Hoen, 2017).

Rural communities have forged new collective identities from local wind projects, although this process can be double-edged—uniting some community members while isolating others (e.g., Andersen et al., 2012). Conflict can emerge if communities are divided by their members' stances on the project, especially when people do not view the other position as valid. For example, rural residents in Wyoming opposed a local wind farm to protect their landscape, but

other community members who were eager for financial benefits perceived their opposition as an elitist attempt to preserve property values and certain conceptions of rural spaces (Olson, 2013).

Local wind development can also catalyze *inter*-community conflict, like rural–urban divisions (Christidis et al., 2017) as energy policies are often set by urban decision-makers. Rural communities have felt "unjustly burdened" (p. 122) by the values and demands of urban centers—with distant policy-makers dictating what rural spaces should *be* and *be used for* (Walker et al., 2018a). Further, in Canada, rural areas tend to lean conservative, while urbanites are situated more to the left (Bittner, 2007). Then, wind development—bound to rural spaces—has the potential to trigger geographic and political divisions, which when stacked atop each other can be extra potent and rigid (Walker et al., 2018b).

STUDY CONTEXT

Energy and the environment are pressing and sometimes divisive topics in Canada (Aguirre et al., 2021), and unsurprisingly so. Fossil fuels have undoubtedly been a vital contributor to national and regional economies. In 2019, the energy sector contributed directly and indirectly to 10.2% of nominal gross domestic product (GDP) (Natural Resources Canada [NRCan], 2020b). Yet, the majority of Canadians believe in climate change and support emissions reduction policies (Mildenberger et al., 2016). Canada has recently pledged to have a net-zero economy by 2050 (Environment and Climate Change Canada [ECCC], 2020). Such a promise will impact different regions of the country divergently because the energy system of each province is determined by its unique geographic, economic, political, regulatory, and cultural conditions (Ferguson-Martin & Hill, 2011). As a result, renewable development in Canada is unlikely to be successful using a one-size-fits-all approach.

The context for this study is Alberta: A prairie province east of the Rocky Mountains, the home of the well-known tar sands, and the energy powerhouse of Canada. In this section, I overview the Albertan energy landscape to establish the province as historically, economically, politically, and culturally bound to fossil fuel extraction. I review Alberta's relationship with wind energy development, particularly focusing on how recent policy changes have led to a wind energy

boom despite a precarious policy environment. Last, I review some recent research on the SAWE in Alberta to highlight gaps in the literature.

Alberta: Canada's Energy Powerhouse

Alberta is known as the energy province for a few reasons. While Canada is well-endowed with fossil fuels, most of these reserves are in Alberta. Canada comes third globally in proven oil reserves (NRCan, 2020b), of which 97% lie in northern Alberta (NRCan, 2020a). At Canada's current rate of natural gas usage, three more centuries of this resource lie dormant under British Columbia and Alberta (Canadian Association of Petroleum Producers, n.d.). Similarly, coal is abundant in the three western provinces, which hold 5.9 billion tons (out of Canada's 6.6 billion tons) of metallurgical and thermal coal reserves (Coal Association of Canada, n.d.).

Alberta towers over the rest of Canada in primary energy production (PEP)[2] by producing 14 EJ of energy potential annually (NRCan, 2020b). For comparison, Saskatchewan, British Columbia, and Quebec rank next in PEP with 10, 3.5, and 1 EJ, respectively (NRCan, 2020b). If you discount uranium extraction, which accounts for roughly 8.5 EJ of Saskatchewan's PEP, the scale of Alberta's energy industry becomes staggering: Alberta's PEP is higher than all other Canadian provinces combined. In the same vein, Alberta's energy sector contributes to national employment and GDP on a scale similar to the remaining energy industries in the country combined[3] (NRCan, 2020b).

Alberta's Energy History

Alberta has a historic bond to fossil fuels. As documented by the Alberta government (GOA, n.d.-c), oil was discovered in Alberta in the late 1800s, but the energy industry had its first boom in 1914 following the tapping of a high-pressure well in Turner Valley. Over 500 businesses rapidly entered the energy industry, and extraction-based settlements popped up across the

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[2] Natural Resources Canada (2020b) defines PEP as raw energy potential extracted from nature annually. Their PEP calculations include uranium mined for export.

[3] According to NRCan (2020b), in 2019, Alberta's energy sector directly contributed $76 billion to Canada's nominal GDP. For comparison, the energy sector across the rest of Canada contributed just $2 billion more. In 2018, 138,372 Albertans had their livelihoods tied to Alberta's energy sector, which again mirrors the employment impact of the energy sector across all other parts of Canada combined: 143,421 jobs.

countryside. In 1947, a large reserve was tapped in Leduc, sending Alberta into a second, more prosperous fossil fuel boom. Alberta's population exploded in tandem with new infrastructure, including highways, wells, pipelines, refineries, and skyscrapers to host new energy businesses. Within a few years, the province had become a global leader in fossil fuel development, and rapid economic growth followed until the 1980s when Alberta's prosperity became compromised by the volatile global oil market. When oil prices tanked, the entire Albertan economy faced a crippling recession (GOA, n.d.-c). Familiar with both oil booms and busts, Albertans noted the importance of a thriving energy industry to their personal and provincial prosperity, and fossil fuels became central to Albertan culture and identity.

Petro-Chemical Culture

Alberta is an interesting context to study energy transitions because Alberta's heritage is bound up with their incumbent energy economy. Fossil fuels have infused into cultural markers and become a prominent part of Albertan identity. For example, Calgary's Heritage Park celebrates Alberta's history with immersive exhibits featuring coal mines and oil derricks (Holmes, 2021). The names of Edmonton's two professional hockey teams—the Oilers and the Oil Kings—highlight an affectionate connection to oil development. Overall, Albertans see themselves as the rightful owners of the province's vast resources and are proud to develop and extract with a "pioneering and entrepreneurial spirit" (Kuteleva & Leifso, 2020, p. 8).

Fossil-Fueled Politics

One telling way to reveal the Albertan ethos is through the imprints of provincial politics on the current energy system. Alberta's energy system developed under conservative leadership and neoliberal policy-making. From 1971 to 2015, the center-right Progressive Conservative Association of Alberta (PCs) maintained a dominant majority. The other leading contenders in provincial elections were the Alberta Liberal Party and the Alberta New Democratic Party (NDP), respectively situated center and center-left, but they held few seats over these 44 years. In the 1990s, amidst the rising popularity of Regan- and Thatcher-inspired neoliberalism, the Alberta government privatized many public services (Adkin, 2016). The energy industry also shifted. From 1996 to 2001, under the PC Premier Ralph Klein, Alberta moved towards a deregulated, open market electricity system.

In Alberta, free-market, neoliberal economics goes beyond policies and energy development. This economic philosophy has also become deeply ingrained and cultural—a notion exemplified when looking at Alberta's relationship to taxation. On a conceptual level, taxation and the provision of public services are somewhat antithetical to neoliberal, free-market values. Compared with other provinces, Alberta is distinguished by its individualism and populism (Wesley, 2012). Both qualities are exemplified in the province's recent attempts to fight a federal carbon tax (Ramsay, 2021). Also, Alberta is the only province without a sales tax and still has the lowest tax rates nationally (GOA, n.d.-b). This "Alberta Advantage" initially referred to the job-creating, economy-boosting benefits of low taxation. Over time, however, the term became synonymous with hard work, prosperity, the oil and gas industry, and the Albertan way of life—and sang subtle praise to the "disciple, virtue, and common sense of free-market economics" (Adkin, 2016, p. 78).

Recent polling suggests free-market ideology, support for oil and gas, and the Albertan identity have been merging—resulting in polarization centered around energy and politics (Santos, 2020). This ongoing cultural and ideological conglomeration complicates the acceptance and adoption of renewable energy. In Alberta, an "energy transition isn't merely a policy question but an existential one because oil and gas are key components of what it means to be Albertan" (Santos, 2020). For comparison, Canadians generally do not exhibit such stark political polarization on energy and climate topics (Bird et al., 2020), but these topics are often heated and divisive in Alberta (Marshall et al., 2018).

Energy Transition Barriers

A low-carbon energy transition and renewable energy adoption in this petro-province may face a unique blend of challenges. The Albertan ethos is neoliberal, individualistic, and populist. These traits can limit a society's ability to imagine—let alone pursue—effective energy transition pathways. Alberta is historically and conceptually rooted in free-market, neoliberal economics, and amending the energy system with carbon taxation and industry regulation runs counter to common values. Individualism can limit the collective imagination to ineffective "solutions" that hinge solely on personal responsibility (Petersen et al., 2019), and a populist province may not feel called towards the collective action required for reaching national GHG reduction targets.

Meanwhile, Canada's emission reduction pledges are unobtainable without significant changes in Alberta.[4]

Wind Energy in Alberta

Wind energy has historically made a small contribution to Alberta's electricity grid. Wind farms were exclusive to the southernmost region of the province until 2011, when wind projects started to pop up in central Alberta (Alberta Electric System Operator [AESO], 2021). At the end of 2020, the installed capacity for wind energy generation was 1,781 MW—just 11% of the province's total installed capacity. Yet, a study by Barrington-Leigh & Ouliaris (2017) suggests Alberta's vast prairies have significant untapped wind potential and estimates that Alberta could meet 24% of its energy demand with wind energy.

Despite the current low capacity for wind energy generation, Alberta was an early adopter of wind energy compared to other provinces. However, the provincial government paid little attention to incentivizing and expanding wind generation (Ferguson-Martin & Hill, 2011) until 2015, when Albertans elected the NDP, interrupting the four-decade conservative streak. That same year, the NDP released the Climate Leadership Plan (GOA, 2018). In tandem with other changes to the energy sector, this plan included a synchronous coal phase-out by 2022 and the "30 by 30" target: having 30% of Alberta's electricity generated by renewable sources by 2030. The NDP tasked the 30 by 30 goal to AESO, which then implemented the Renewable Energy Program (REP).

By 2030, the REP was to add 5,000 MW of renewable energy capacity to the Albertan grid (GOA, 2018b). In 2016, the program implemented a payment scheme (the Indexed Renewable Energy Credit) that offered stable, reliable compensation to energy developers (AESO, n.d.-a). This system incentivized developers to "bid" for contracts by pitching their lowest price ($/MWh) for generating energy from new wind and solar projects. The AESO accepted the most

[4] In April 2021, Canada established a new emissions reduction target of 401–438 megatonnes by 2030, i.e., a 40–45% reduction from 2005 levels (ECCC, 2021). For comparison, in 2019, Alberta emitted 276 megatonnes (Dusyk et al., 2021). Without GHG reductions in Alberta, the province will end up using almost 70% of the national annual carbon budget by 2030.

competitive offers. In tandem, the NDP laid the path for Alberta's energy-only market to shift to a capacity market in 2021, where a capacity market would lessen risks for intermittent energy producers by compensating them for the potential generation their system could offer rather than how much electricity they produced (AESO, n.d.-c). As a result of these policies, in December of 2017, wind energy made headlines as the cheapest electricity from new energy developments in Alberta—at 3.7¢/kWh (Canadian Wind Energy Association, n.d.; Ward, 2017). Through three bidding rounds of the REP, from 2017 to 2019, twelve contracts were signed—set to add 1363 MW (all for ≤$40.14/MWh) of green energy capacity to the grid by June 2021 (AESO, n.d.-b).

In early 2019, Alberta was on track to meet its 30 by 30 goal, but this changed with a shift in government. In April of that year, the new United Conservative Party (UCP) swept the provincial election. Wasting no time, on May 30, the UCP revoked the Climate Leadership Act put forth by the NDP and ended the provincial carbon tax a day shy of its 30-month mark (Legislative Assembly of Alberta [LAA], 2019a). This change was the kick-off to their "summer of repeal," where the UCP rapidly worked to erase the NDP's legislative imprints (Bellefontaine, 2019). Many of these reversals directly impacted the province's energy sector. For example, the REP was ended in June of 2019 (AESO, n.d.-a), while the capacity-market transition was reversed a few months later (LAA, 2019b).

The battle depicted above—this doing and undoing of legislation—exemplifies the role of politics in energy outcomes. Most importantly, it highlights how Alberta presents intense elite partisanship on topics related to energy development, the economy, the environment, and climate—in which opinions about wind energy may have become inadvertently entangled.

Despite these rapid policy changes, wind development is ongoing in Alberta. Wind energy electricity generation is cost competitive with new fossil fuels generators and is expected to become even more competitive with technological improvements (Shaffer, 2021). Alberta is on track to phase out coal-fired electricity by 2023 (Thibault et al., 2021), a change that will open space in the electricity market and on the grid for new renewable generators. While the REP ended in 2019, Alberta's UCP government did not cancel any previously awarded contracts. As such, many wind projects funded through the REP are now in construction or will soon be

operational (GOA, n.d.-a). Given such recent and ongoing wind developments, this is a prime time to study the SAWE in Alberta.

Research on the Social Acceptance of Wind Energy in Alberta

There has been little research on the SAWE in the rural Albertan context with a few recent exceptions. Afanasyeva et al. (2022) documented wind energy perceptions in two counties in central-eastern Alberta in 2017. Their case study involved 30 interviews and also thematic analyses from public hearings on energy development. Local wind projects had sparked community conflict and left those voicing opposition feeling misunderstood. Afanasyeva et al. noted wind energy conversations in rural Alberta were bound to nuanced perspectives about environmentalism, community, landscape values, political views, and farming identity.

Parkins et al. (2021a) used the same data as this thesis project in tandem with results from an embedded survey experiment. The data stems from an online survey completed by 401 rural Alberta landowning farmers from 2018–2019. Parkins et al. used a factorial survey experiment (i.e., vignette experiment) to elicit preferences for different attributes of local wind projects. Their results reveal the particular fairness preferences held by landowners in Alberta. In the experiment, wind acceptance increased when financial benefits were distributed equitably between the hosting landowner and their neighbours. This suggests this demographic sees a need for compensating hosting landowners slightly more than neighbours to accommodate for extra externalities. Procedural justice elements also predicted wind energy acceptance. Farmers cared about transparency and inclusive processes, suggesting they prefer anyone *affected* by a project is informed and welcomed into the decision-making but where people living much farther away cannot dictate project outcomes. The experiment also hints that cooperative-owned wind projects would be more supported than those owned by large companies. The survey is appended (see Appendix A) and has an example vignette.

Additionally, a handful of public reports and think tank documents inform Alberta landowners about the benefits, costs, and procedures involved in hosting wind turbines (Farmers' Advocate Office [FAO], 2017a, 2017b; Pembina Institute, 2017; Weis et al., 2010). Weis et al. (2010) offer a comprehensive guide to assist landowners in their negotiations with wind developers, touching

on topics like competing land uses (e.g., impacts on farm operations), contractual agreements, and ownership structure options.

Importantly, Weis et al. notes how information about compensation rates for individual Albertan landowners has largely gone undocumented. Over a decade later, there is still no easily accessed information about how much individual Alberta landowners generate from hosting turbines. This lack of information may stem from the contracts signed between developers and landowners, as these deals often include non-disclosure clauses (FAO, 2017a). The secrecy mandated by these agreements has the potential to inhibit rural communities from informing each other about compensation rates and financial benefits. As a result, landowners may remain unaware of their options.

There is some public information on the economic benefits of wind development, but it often quantifies regional impacts or employment opportunities instead of landowner compensation. For example, a fact sheet from the Pembina Institute (2017) paints a picture of regional benefits with an example of how the Municipal District of Pincher Creek in Southern Alberta generates a quarter of its revenue from local wind projects. For landowner payments, however, the document points only to how compensation amounts are dependent upon a complex blend of factors like location, proximity to transmission infrastructure, government policies, and turbine characteristics. Some government resources also assist landowners in navigating wind development negotiations but do not offer insight on compensation amounts, instead recommending landowners seek legal advice (FAO, 2017a; 2017b).

Overall, Albertan landowners appear to lack access to information on the financial potential of hosting turbines. Further, with the SAWE research in Alberta still young, energy stakeholders (perhaps unaware of the attitudes and complex ideological factors at play) are less able than they otherwise might be to facilitate wind development in a manner palatable for rural Albertan communities.

PROJECT BACKGROUND

This section overviews the motivations for and objectives of this thesis project. I identify gaps in SAWE literature and unanswered questions about the Alberta context, and accordingly, present three research objectives to address these gaps.

Knowledge Gaps & Motivations

Much research has assessed wind acceptance on a broader level by looking at the views held by the general public (e.g., Sherren et al., 2019) or through qualitative case studies of rural residents living near current or proposed projects (Rand & Hoen, 2017). There has been less focus on documenting the general perspectives of rural landowners—despite them being a demographic "unavoidably entangled" in energy transitions (Burke & Stephens, 2018, p. 89). In Alberta, it is vital to understand the general perspectives of rural landowners because, unlike most Canadian provinces, Alberta has not opened up crown land for wind development (Ingelson, 2018), making privately owned land the only option for large-scale wind projects.

It is still unknown whether Albertan landowners generally perceive wind energy development as a lucrative opportunity and whether the political tensions surrounding other energy preferences have influenced preferences for wind energy as well. Since Alberta is intimately bound to fossil fuels, it is sensible that preferences for the incumbent energy system could challenge wind acceptance because renewable energy could be perceived as a threat to Albertan culture and way of life. Overall, this project can add to the SAWE literature by filling gaps about the Alberta context and, by extension, speak to the human dimensions of low-carbon transitions in petro-culture contexts.

Research Objectives

This project addresses these gaps via three overarching objectives. The first objective is to document the wind energy views held by Albertan landowners and investigate the drivers of overall wind energy acceptance. As part of this objective, I test whether fossil fuel support predicts wind acceptance. The second objective is to evaluate the impact of political ideology on energy preferences, namely by assessing if this demographic has become politically polarized about wind development. The first two objectives are addressed in Chapter 2. In Chapter 3, I discuss the third objective, which is to document the climate change beliefs held by Albertan

farmers and explore which particular notions about climate change may be giving way to wind opposition. My overarching research questions are as follows:

1. Do rural Albertan landowning farmers positively regard wind energy, and why?
2. What climate change beliefs are commonly held by this demographic, and how do these beliefs interact with views on wind energy?

METHODOLOGY

Online Survey

This thesis project uses an online survey as a quantitative approach to allow for a larger sample size and hence a better representation of the target population—rural Albertan landowners. The online survey method was selected to best elicit responses as other methods (like mail-out or telephone surveys) suffer from declining response rates (National Research Council, 2013). The survey data was collected from December 2018 to March 2019, with a survey completion rate of 83%, i.e., 401 out of 485 surveys were completed. The University of Alberta granted human ethics approval for this study (Pro00084046).

Sampling

The online survey was delivered through a panel of agricultural producers managed by Kynetec, a market research firm specializing in agriculture and animal health (Kynetec, n.d.). The decision to use a market research firm and their panel of agricultural producers was made because rural Albertan landowners are a hard-to-reach demographic. They are geographically dispersed and not necessarily easily reached by researchers. Rural landowners are also often farmers—a group that tends to be over-surveyed, subject to survey burnout, and therefore less likely to engage (Glas et al., 2019).

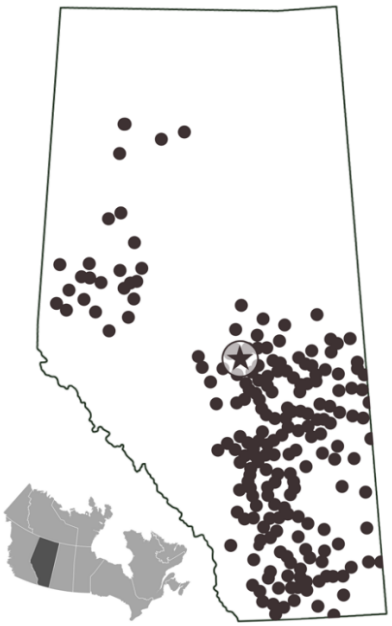
Kynetec invited their panel of Albertan agricultural producers (n = 3000) to participate in the online survey. Respondents were eligible to participate if they self-identified as a resident of Alberta, 18 years or older, and the owner of five or more acres of land in Alberta. The eligible panel members were offered $20 for completing the 20-minute survey to encourage participation, decrease non-response bias, and incentivize truthful responses. To ensure that the

participants were from diverse areas in the province, Kynetec applied sample quotas based on self-reported postal code. Most respondents were from the southeastern quadrant of the province, which is more densely populated than the northern areas (Statistics Canada, 2017). The respondent locations are displayed in Figure 1.

Survey Design

The survey was designed to accommodate and complement Parkins et al.'s (2021a) factorial survey experiment, which aimed to elicit fairness and ownership preferences to assess the social feasibility of community wind energy. Such experiments are lengthy and cognitively challenging tasks (Auspurg & Hinz, 2015). As a result, the remaining survey questions were kept particularly simple, easy to answer, and less time-consuming. The inclusion of the vignette experiment limited survey space to elicit other details or construct more robust Likert scales.

Figure 1. Respondent locations based on center points of self-reported postal code



Note. Map of survey respondents with a star marking Alberta's capital city, Edmonton.

The survey questions were based on a review of the wind energy literature. The survey included questions on environmental values and community identity (Afanasyeva et al., 2022), as well as

trust for various groups, political ideology, and social norms. The survey assessed support for various energy technologies as there is a lack of wind acceptance research accounting for other energy preferences (Rand & Hoen, 2017).

Questions were included in the survey for two reasons: for their potential relevance to the vignette experiment or for their contribution to a broader picture of the wind energy preferences held by landowners. Speaking to the latter, Patel et al. (2020) summarized univariate findings from the survey, including landowners' knowledge about wind turbines, concerns about living near a wind farm, community identity, business model preferences, and environmental values. These variables are not delved into as part of this thesis project. The survey components used in this thesis project include questions on climate change beliefs (Spence et al., 2010), fossil fuel energy preferences (Olson-Hazboun et al., 2018), trust (Shaw et al., 2015), political ideology (Walker et al., 2018b), and social norms (Read et al., 2013). The variables are discussed in the following empirical chapters, with special attention paid to their construction and theoretical relevance.

The survey predominantly used three response scales (1–10, 1–11, and 5-point Likert items) to minimize scale variation and reduce respondent confusion. Most questions appeared in a matrix (tabular) format to decrease survey time and cognitive complexity. Some statements were reverse coded to reduce acquiescence bias. The decision to force answers (no opt-out) was determined on a question-by-question basis. Generally, if the topic involved common knowledge or was personal—meaning that respondents would typically have an opinion—it was considered sensible to force a response (Stockemer, 2019). Yet, even within a confidential survey, some respondents may still avoid disclosing personal information. If a question was likely to elicit false answers in lieu of an opt-out option, a response was not forced to preserve data integrity.

Data Preparation

Kynetec collected the data, which I then reviewed, cleaned, and analyzed on STATA software. The dataset is available for public use on the *Scholars Portal Dataverse* (Parkins et al., 2021b)

Limitations

This survey approach comes with a handful of limitations. For starters, qualitative approaches are more common in wind acceptance research (Rand & Hoen, 2017) for a good reason. Complex realities do not translate well through Likert scales. A survey approach was chosen for this project in order to offer useful generalizations that could, for example, better inform productive interactions between government, wind developers, and landowners.

Given the logistical challenges of connecting with rural landowners, the survey was delivered through an agricultural polling firm. This shifted the demographic under investigation from *rural Albertan landowners* to *rural Albertan landowning farmers*. Throughout this paper, I will refer to the respondents as *landowners* or *farmers*.[5] Importantly, this study may be missing critical input from rural landowners who are not engaged in agricultural activities, and this group may hold differing views from the farming community.

With these limitations in sampling, the findings should be generalized outwards with caution. This study did not produce a perfectly representative sample of Albertan farmers when compared to Alberta census data (as will be discussed in Chapter 2). Further, the sample was vulnerable to participation bias. Landowners who are more inclined towards energy topics may be overrepresented, in addition to people who are more educated, have more free time (e.g., retired farmers), or are more inclined towards civic engagement. As a result, the sample might disproportionately lack landowners who hold middle-ground, neutral positions about energy development and wind energy. Despite these limitations, a non-probability sampling method was necessary to address the research goals and reach this demographic.

DOCUMENT OVERVIEW

In Chapter 2, I document the wind energy beliefs of rural Albertan landowners and assess whether wind energy views are politically polarized in this demographic. Energy topics are often

[5] In Chapter 2, I refer to the sample as *landowners*. In Chapter 3, however, I refer to the sample as *farmers* as I pull more from literature examining farmers' interactions with climate change.

heated and polarized in Alberta (Marshall et al., 2018), and tensions may have implicated renewable energy preferences. To assess political polarization, I divide the sample by political indicators and compare wind views across the groups, mirroring an approach used by Aguirre et al. (2021). I also use ordered logistic regressions to assess the impact of particular beliefs about wind energy, fossil fuel support, and conservative beliefs on wind acceptance.

Chapter 3 is an exploratory study. I assess whether different beliefs about climate change predict degree of being against further wind development in Alberta. After an in-depth review of literature on climate denial, I use five different indicators (five beliefs about climate change) to report on the prevalence of climate denial amongst Albertan farmers. Using multiple binomial logistic models, I regress denialism beliefs on wind energy opposition. Additionally, I mirror approaches from the climate change communication field (e.g., Leiserowitz et al., 2021) by look for belief patterns with the sample via an exploratory cluster analysis, and I make sense these findings by pulling from socio-psychology, namely from Festinger's (1957) well-established theory of cognitive dissonance and construal level theory (CLT) of psychological distance (Liberman & Trope, 2008).

The fourth chapter briefly concludes this thesis project. I summarize the main findings, contributions, and limitations and finish with avenues for further inquiry.

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Chapter 2. The Effects of Political Ideology & Energy Preferences on Albertan Landowners' Wind Energy Views

This chapter documents the wind energy views of rural Albertan landowners and assesses the factors leading to the general acceptance of this technology. I explore whether political ideology, fossil fuel support, and particular beliefs about wind turbines predict wind energy attitudes. Rural landowners are the Albertans who will be most directly involved in wind siting in the province. Local wind projects can benefit landowners and their communities by offering economic benefits. Still, rural Albertans may not welcome these developments if their opinions about wind energy have become negative, extreme, and rigid due to political polarization.

In Alberta, energy is a heated, politically polarized topic (Marshall et al., 2018), within which fossil fuel preferences and political ideology have merged in recent years (Santos, 2020), but it is unknown whether this energy polarization has seeped into rural landowners' opinions about renewable technologies. If their disfavour for wind energy stems from partisan tensions or from unceasing commendation of the status quo energy system, the province could be limited in accessing the private land required for wind expansion. Further, if opinions on wind development are divided along political lines within the landowner demographic, particularly intense conflict could arise. If one neighbour agrees to host turbines while another neighbour with a differing political position is starkly opposed, the towering infrastructure may become a highly visible and abrasive symbol of differing ideologies, identities, and values.

Overall, this chapter asks: Do Albertan landowners generally hold positive perceptions about wind energy, and why? For this analysis, I use ordered logistic regressions to test for predictors of wind acceptance. I also explore whether wind views show evidence of political polarization within this demographic by mirroring an approach used by Aguirre et al. (2021) to assess for polarized opinion patterns in cross-sectional data.

LITERATURE REVIEW

Wind acceptance depends on local context—especially the historical and cultural ties a community has to its energy system (Baxter et al., 2020). There is considerable literature on the

SAWE in North America (Rand & Hoen, 2017) but little on the SAWE in Alberta. As Alberta is a province intimately bound to fossil fuels, research on the SAWE in this context may speak to the complexity of energy transitions in other petro-states. Further, understanding how rural Albertan landowners regard wind energy on a general level can inform development approaches that mitigate community conflict. In this review, I discuss three factors of particular relevance in this context with the potential to sway Albertan landowners' overall attitude toward wind energy: Beliefs about wind energy, support for the incumbent energy system, and political ideology.

Beliefs about Wind Energy

Beliefs about an energy technology can give way to an overall assessment of the technology (an attitude), which can be either positive or negative. Positive attitudes towards wind energy on a general level may lead to active support for a specific local wind project if and when it occurs.

Economic & Environmental Assessments

For wind energy, favourable beliefs about its economic and environmental qualities are most impactful in shaping positive attitudes (Rand & Hoen, 2017). In Texas, rural landowners are overwhelmingly in favour of wind energy and are eager to have turbines on their land because they see hosting turbines as a lucrative opportunity (Brannstrom et al., 2015). Not only do perceived economic benefits improve attitudes toward local wind projects, but they have also been found to outweigh and even diminish perceived negative externalities (Pedersen et al., 2009). However, economic considerations cannot be assumed as a top priority for all communities (Baxter et al., 2013)

Attitudes toward wind energy can also be shaped by beliefs about their environmental harms (Fergen & Jacquet, 2016) and benefits (Walker & Baxter, 2017b), where concerns about local environmental impacts have overshadowed financial considerations (Olson-Hazboun et al., 2016). Communities may perceive the local harms (e.g., ecosystem impacts) of wind development to outweigh the global benefits (e.g., GHG reductions), a phenomenon referred to as the "green on green" argument (Warren et al., 2005). In particular, avian mortality has been one of the most "vociferous" reasons against local wind development, even though technological changes and strategic placement have made bird–turbine collisions negligible relative to other human-caused impacts on avian populations (Sovacool, 2009a). Adding more complexity,

Afanasyeva et al. (2022) suggest environmental assessments of wind energy are deeply nuanced and complex—connecting to identity, place, and ideology.

Sensory Impacts

Visual impacts are perhaps the most cited reason for wind opposition. Not only can turbines disrupt scenic views, but their visual presence can spur adverse emotional reactions by threatening place attachment and place identity (Devine-Wright, 2009), especially when people view their land as "sacred, protected, scenic, or otherwise sensitive" (Pasqualetti, 2000, p. 385). Auditory impacts are another common sensory concern (Rand & Hoen, 2017). The noise produced by the spinning blades can annoy nearby residents and trigger health concerns (Songsore & Buzzelli, 2014). However, the sound produced depends upon the size of the turbines and the placement, so noise is a non-issue for some host communities (Mercer et al., 2017).

Beliefs about Intermittency

Wind energy also garners negative attention for being a non-dispatchable energy generator. Its intermittency has been expressed pejoratively as "unreliability," which carries a connotation of being faulty, unpredictable, and uncontrollable (Devine-Wright & Devine-Wright, 2006; Sovacool, 2009b). With recent technological innovations and carbon pricing, however, the intermittency of renewable generators is no longer problematic; wind-generated electricity has become less costly to manage within a complex grid system due to technological innovations (Shaffer, 2021). Public opinion, however, may lag behind these advances, and intermittent generators may still hold a residual negative assessment for only working *when the sun shines or when the wind blows*.

Incumbent Energy Preferences in Alberta

The SAWE field less commonly accounts for views about other energy sources and their impact on wind acceptance (Rand & Hoen, 2017). In the Alberta context, though, studying this relationship is vital. Alberta is economically, politically, and culturally bound to fossil fuel extraction and sits above abundant oil, gas, and coal reserves.

Recent research and opinion polls highlight the relationship between Albertans' favour of fossil fuels and their support for renewables. Schimpf et al. (2021) found Albertans were less likely to support energy transition policies when they believed the fossil fuel industry would uphold the Albertan economy for many years. These findings show how perceived economic necessity can sway support for renewables and energy transitions more broadly. Their survey results also exemplify how preferences for the status quo can sway future energy pathways. Another survey by the Angus Reid Institute (2021) noted that renewables were widely considered important by Albertans and that few Albertans believe fossil fuels should be the only path forward. The poll found that 33% believed newer energy technologies (wind, solar, hydrogen) should be prioritized, while only 21% deemed conventional energy (oil, coal, gas) development as the most vital moving forward. Nearly half (46%) thought fossil fuels and renewables were equally important. Similarly, the Alberta Narratives Project reported that most Albertans are on board with renewable development because they see a need to diversify the energy sector and the economy; however, the notion of an "energy transition" was poorly received by many Albertans as it implied shifting away from fossil fuels (Marshall et al., 2018).

The studies above suggest that most Albertans favourably regard renewables but are supportive of renewable development only as far as it is an addition to (not a replacement for) their status quo energy system. Albertan's dislike for the notion of "transitioning" may stem from their innate tendencies to prefer current systems and dismiss other possibilities. Under system justification theory, Jost & van der Toorn (2012) theorize that people express unconscious favour toward the status quo, where justifying tendencies increase when the status quo is perceived to be under attack.

Political Polarization & Energy Opinions

There is good reason to suspect wind energy views could have become politically divided in Alberta and amongst rural landowners. Political polarization has been a rising issue in Canada across diverse policy topics, but there has been little research on the polarization of energy and climate opinions (Aguirre, 2020). According to Aguirre et al.'s (2021) recent nationwide survey, Canadians are not as polarized as is commonly thought. On most energy and climate topics, Canadians express diverse, fragmented opinions—not extreme, opposing views.

Alberta, though, is unique. Energy opinions in the province often diverge from the rest of Canada (Bratt, 2020). Albertans express diverse, strong views about transitioning the energy system, where opinions are divided by climate beliefs, occupations, regions, and most heavily by political ideology (Marshall et al., 2018). A recent opinion poll speaks to how energy is at the core of political polarization in Alberta (Santos, 2020). The survey found a growing overlap between Albertans who are right-oriented, conservative-affiliated, hold conservative economic values, are opposed to an energy transition, and identify as definitively Albertan. On the other hand, another cluster of Albertans align with the left of the political spectrum, do not vote conservative, express progressive beliefs, support a low-carbon transition, and identify as Canadian more so than Albertan.

Political polarization around wind development has been well documented in Ontario, Canada. Ontario faced tremendous backlash after its 2009 Green Energy Act. The policy enabled rapid wind expansion across the province by limiting the ability of rural communities to sway decision-making on proposed developments (Ferguson-Martin & Hill, 2011). Conflict and opposition were further exacerbated because the wind controversy was swept up into previously existing rural–conservative versus urban–liberal tensions (Christidis et al., 2017), where rural communities felt the liberal-leaning urban majority held too much power over their rural landscape and their (conservative) communities (Walker et al., 2018b). As a result, many of Ontario's rural residents have acquired intensely negative and likely rigid attitudes towards wind energy. Even if new policies (or other low-carbon energy pathways) could benefit them, many rural Ontarians may remain in stark opposition.

As energy is already a heated, polarized topic in Albertan, it is vital to determine whether and how political ideology has shaped wind energy views. If these opinions become polarized, it may be more challenging for individuals to reform their beliefs later. Rigid, extreme beliefs could limit Alberta's future low-carbon pathways if held by a sizable chunk of the population.

What is Political Polarization?

Polarization can occur across many societal divisions, including between right–left, rural–urban, anglophone–francophone, or between groups based on race, culture, or religion (Aguirre et al., 2021). Then, political polarization is polarization along political lines. I draw on McCoy et al.

(2018), who view political polarization as a process occurring on an aggregate level (i.e., across a society). This definition is relevant to this research context because Albertans have demonstrated a merging of political ideology, social identities, and energy preferences (Santos, 2020). For McCoy et al., political polarization occurs when a society finds itself splitting into (usually) two groups. The intragroup views become more united on multiple policy issues. Meanwhile, the views between the groups become increasingly conflicted as "political identities becom[e] social identities" (p. 22). These opposing clusters of foster a sense of group identity by demarcating the "other" and masking in-group differences. By extension, a society may be cleaved by the intensifying battle of "us" against "them," and this situation can fracture the democratic processes necessary for arriving at constructive policy outcomes (McCoy et al. 2018).

Political polarization is often conceptualized and measured as a process (e.g., McCoy et al., 2018). However, since this study uses cross-sectional data, I mirror Aguirre et al.'s (2021) approach to assessing political polarization as a state. Under a broader project, Positive Energy, Aguirre et al. plan to annually evaluate public opinions on climate and energy to detect polarization in Canada over time. After their first round of data collection, however, they visually assessed for three patterns in the population and across subgroups: polarized opinions (where opinions cluster around extremes), fragmented opinions (where views are diverse, usually dispersed across middle options, and often not held deeply), and opinions aligning towards agreement (Aguirre et al., 2021). Under this approach, political polarization is observed if people with different political ideologies commonly express opposing, extreme stances.

What is Political Ideology?

Stepping back further, assessing political polarization also requires understanding what constitutes political ideology. Drawing from Jost et al. (2009), political ideologies can be referred to as bundles of values, beliefs, and attitudes shared by a group of people, where "different ideologies represent socially shared but competing philosophies of life and how it should be lived (and how society should be governed)" (p. 309). It is theorized that ideologies exist to help us meet three motivations: our *relational* (to have interpersonal connections), *epistemic* (to make sense of the world), and *existential* needs (to feel safe and find personal meaning in life) (Jost et al., 2009).

There are various ways to operationalize political ideology for measurement in survey research. I use three indicators for this study: agreement with belief statements, political orientation, and political affiliation. In addition to values and attitudes, beliefs are conceptualized as distinct components within political ideologies. Beliefs can be regarded as a type of attitude about what is true, where beliefs tend to be long-standing and enduring while attitudes (assessments) are more open to reform (Rydgren, 2017). I use five belief statements as indicators of conservative political ideology. Next, political orientation refers to where one's ideological beliefs sit relative to the beliefs of others, usually using the notion of a left–right spectrum (Kroh, 2007). The "left" reflects valuing change and equality, while the "right" refers to an ideological position preferring tradition and that is content with current levels of equality (Jost et al., 2009). Political (party) affiliation captures a sense of group membership and speaks to the relational motivations behind ideologies.

RESEARCH OBJECTIVES & QUESTIONS

This chapter has two objectives. The first objective is documenting the wind energy views held by rural Albertan landowners and assessing what might be shaping their perception of this technology. The second objective is exploring whether political ideology may have affected attitudes towards wind energy insofar that this demographic has become politically polarized on the topic. Put plainly, this chapter asks: How do Alberta's rural landowners generally regard wind energy, and why? The guiding research questions are as follows:

1. Do rural Albertan landowners positively regard wind energy, and what beliefs do they hold about this low-carbon energy technology?

2. Does this demographic show patterns of political polarization around their wind energy views?

3. How does this demographic perceive wind energy relative to other energy sources?

4. What factors predict Albertan landowners' level of wind acceptance (i.e., their overall attitude towards wind energy)?

METHODOLOGY

To answer these questions, I use data from an online survey delivered by an agricultural market research firm. The survey was completed by 401 landowning Albertan farmers between December 2018 and March 2019. The sample demographic was selected for two reasons. First, rural landowners will be the Albertan demographic most directly involved in provincial wind siting. Second, a large-scale study of rural landowners would be logistically challenging to conduct without using a pre-established panel of agricultural producers. Thus, this sample of *landowning farmers* is used as a reflection of the views of *rural Albertan landowners.* Throughout this chapter, I will refer to the respondents as *landowners*. The survey is attached in Appendix A, and Chapter 1 elaborates on survey design and sampling.

Empirical Approach

This analysis has three parts. First, I report on wind energy beliefs using univariate statistics. Next, to assess if wind energy is a politically polarized subject, I use Aguirre et al.'s (2021) approach of looking for opinion patterns, which is visualized in Appendix B.

Third, I use ordered logistic regressions to determine predictors of wind acceptance. According to Fullerton (2009), there are two main decisions for selecting an appropriate ordered regression model: setting the dependent variable cut points and deciding where to relax or constrain the parallel odds assumption. First, by various metrics, the data suggests the dependent variable (wind acceptance) has three statistically meaningful categories that are inherently ordered (as demonstrated in the results). Further, I use cumulative cut points for the dependent variable. This decision stems from a conceptual assumption that wind acceptance could constitute an unobservable, underlying continuous variable that is being represented by ordered categories (Williams, 2016). Secondly, I use partial proportional odds models (when needed) for balancing model parsimony and accuracy (Fullerton, 2009).

Variables

Below, I review the variables included in this analysis, including their construction and their relevance to the SAWE literature and Albertan context. The key variables of interest are beliefs about wind energy, fossil fuel support, and political ideology. The models also account for social norms of wind support, trust for various energy actors, and concern for climate change.

Dependent Variable: Wind Energy Acceptance

In the regressions, the dependent variable is wind energy acceptance. Respondents were asked if they agree or disagree that “there should be more wind energy in Alberta,” with answers recorded on 5-point Likert scales (1 = *Strongly disagree*, 5 = *Strongly agree*). This question elicits a more general, passive “acceptance” of wind energy because the respondents are not reflecting on a specific project nor are they expressing behavioral intentions or actions (Batel et al., 2013). The sample is sorted into three “levels” of wind acceptance (oppose, neutral, and support).

Beliefs about Wind Energy

The same response scale collected beliefs about five negative externalities commonly associated with wind energy (Rand & Hoen, 2017). The survey asked for agreement or disagreement that wind turbines "spoil the beauty of natural landscapes" (*unaesthetic*) and are "too noisy" (*noisy*). Respondents were asked how strongly they agreed or disagreed with the statement, "since the wind is not always blowing, we should not waste our time putting up turbines" to assess whether they view intermittency as an irredeemable flaw (*unreliable*). Responses to the next two (reverse coded) statements indicate beliefs about the economic and environmental aspects of wind turbines. The survey asked whether "a wind farm would be a good thing for [the respondent’s] county's local economy" (*not economical*). Last, the statement, "wind turbines are an environmentally friendly technology," was left intentionally broad to elicit overall assessments of how wind energy impacts global or local environments (*not environmental*).

Energy Source Preferences

Respondents were asked whether they "support or oppose further development of the following energy sources in Canada." Responses were collected on 5-point Likert scales from *Strongly oppose* (1) to *Strongly support* (5). For this question, the specification, "in Canada," was added to put focus to the energy source itself (instead of prompting reflection about local feasibility). Other studies have measured energy preferences similarly (e.g., Sherren et al., 2019). For later regressions, a fossil fuel support scale ($\alpha = .66$) was made from the average of three variables: support for coal, natural gas, and Albertan oil. These three variables only had a few missing variables (*I don’t know*), so I recoded these responses as neutral.

Political Ideology Indicators

The survey collected three indicators of political ideology: agreement with conservative belief statements, political orientation, and political affiliation.

Conservative Beliefs

The survey asked for agreement or disagreement with five beliefs statements, with responses on Likert scales ranging from *Strongly disagree* (1) to *Strongly agree* (5). The factors underlying conservative ideology are not consistent across cultures (Corner et al., 2014), so I aimed to create a scale using five components of conservative ideology of relevance to the Alberta context. All five statements were phrased as statements about the energy sector in order to discreetly elicit conservative beliefs.

The survey elicited beliefs about government spending and industry regulation as indicators of neoliberal ideology, which became a facet of Canadian conservativism in the 1990s (Adkin, 2016). Underlying neoliberalism is a belief that government actions adversely impact personal freedoms and the economy (Farney & Rayside, 2013). Respondents expressed *anti-public spending* beliefs through agreement with the statement, "less spending of public money in the energy sector will be better." *Anti-regulation* preferences were indicated by opinions on whether "government regulations should be kept to a minimum in the energy industry." In a similar vein, I also measured *individualism* as it is a defining feature of Alberta's political ethos (Wesley, 2012). Individualism can stall energy transitions and climate action because individualistic cultures more commonly downplay climate change (Komatsu et al., 2019). The survey asked whether respondents prefer policies that improve collective wellbeing even if that means they personally "get a slightly worse deal." Next, I broadly assessed beliefs about land rights, personal freedoms, and autonomy through the *pro-property rights* statement: "People should always have the right to refuse nearby energy projects, especially if it could impact them." Fifth, *anti-change* beliefs were measured through the disapproval of "big, fast changes to Alberta's energy system," which speaks to the traditionalism that is a near-consistent component of conservativism across cultures (Corner et al., 2014). Traditionalism involves a desire to maintain the current way of life and its social order, i.e., a preference for the status quo. In Alberta, strong traditional values may

explain why some Albertans resist changes to the current fossil-fueled energy system or why they are less inclined towards newer renewable energy technologies.

Political Orientation

As another indicator of political ideology, respondents reported their political orientation on an 11-point, left–right spectrum, ranging from "very left-wing" (-5) to "very right-wing" (+5) with a neutral center (*Neither left nor right).* According to Kroh (2007), this scale is ideal for measuring political orientation for a handful of reasons. In general, the left–right concept is commonly used and easily understood by survey respondents, while the simplicity of the scale minimizes participant error. Also, a zero midpoint allows respondents to self-identify as neutral, indifferent, centrist, or being outside of the left–right political spectrum (Kroh, 2007). The left–right (or liberal–conservative) spectrum is a common indicator of political ideology for survey research in the energy social sciences (e.g., Olson-Hazboun et al., 2018; Sherren et al., 2019).

Political Affiliation

The respondents selected the political party that "best represents their views, whether or not [they] vote," with the response options as *NDP*, *Liberal*, *Conservative*, *Green*, *Other*, *Prefer not to say,* or *Don't know.* Although these political parties are different entities at provincial and federal levels, the response details were intentionally vague. This openness would allow respondents to refer to, for example, conservative parties in general or a particular conservative party. In the Albertan and Canadian context, a respondent who self-reported a conservative affiliation would likely feel that one, some, or all of the following parties best reflect(ed) their values: the Conservative Party of Canada, the United Conservative Party of Alberta, the Progressive Conservative Party of Alberta, or the Wildrose Party of Alberta.

Other Variables: Trust, Social Norms & Climate Change Concern

Other variables were included in this analysis as they are well-established predictors of wind energy acceptance. Respondents rated their trust for different energy stakeholders on a scale from 1 (*Fully distrust*) to 10 (*Fully trust*). This distrust–trust semantic differential scale allows for quick measurement (Chin et al., 2008) of multidimensional concepts (Verhagen et al., 2015).

An indicator for social norms of wind support was recorded on a Likert scale from 1 (*Strongly disagree*) to 5 (*Strongly agree)*. Social norms are beliefs about what others *think* and *do*—injunctive and descriptive norms, respectively (Cialdini et al., 1991). According to the theory of planned behaviour, social norms are reliable predictors of behavioral intentions and subsequent actions (Ajzen, 1991), including engaging in pro-environmental behavior (Farrow et al., 2017), supporting energy transitions (Chan et al., 2022), and standing up against local wind projects (Read et al., 2013). Respondents expressed subjective (i.e., perceived) social norms about wind energy support through agreement about whether their "local community would be excited about a wind farm."

Using the same Likert scale, the survey measured risk perception of climate change via agreement with being “very concerned about climate change.” Some studies have linked climate concern and climate beliefs to favour for renewable energies (e.g., Spence et al., 2010), while others have reported a weak relationship (e.g., Olson-Hazboun et al., 2016), which suggests that how these factors interact is context dependent.

RESULTS

Sample Characteristics

To assess the representativeness of the sample, farm characteristics and demographics measures were compared against the 2016 Census of Agriculture (Government of Alberta 2018; Statistics Canada 2016) (see Appendix C). The overwhelming majority (97%) of the sample self-identified as a primary decision-maker on their farm. Farming was the main source of household income. The majority of respondents (85%) generated over half of their household income from farming, while 67% made over three quarters of their income on-farm. The sample was comprised of farmers who primarily grew crops (52%), raised livestock (12%), or had a mixed operation (37%). Farm sizes ranged from 13 acres to 30,500 acres. The sample’s average farm size (M = 2983 acres) doubled the average Albertan farm (M = 1237 acres). However, the sample had large outliers due to a heavily right-skewed distribution. The median farm size (1672 acres) of the sample was more similar to the Albertan average. Shifting to demographics, the sample’s age range (55–64 years) matched the average age of Albertan farm operators (56 years). In Alberta, in 2016, 69% of farm operators were male, and 31% were female. The sample was then

moderately representative of Albertan farm operators, with 90% male and 10% female respondents. The higher proportion of males in the sample may stem from the higher likelihood of an Albertan farm being run by a solo male operator. If randomly sampling farms, there is a slim chance (7%) that an Albertan farm is operated by a solo female and a 50% chance it is operated by a solo male operator.[6] Although three out of ten registered farm operators in Alberta are female (GOA, 2018a), the likelihood of contacting a female registered farm operator would be *less* than 30% if randomly sampling farms. Overall, the sample was not perfectly representative of rural Albertan farmers but had some similarities by age, gender, and farm size. Importantly though, the sample was overwhelmingly male, which inhibited this study from detecting the possible interplays of gender and climate beliefs.

Univariates

Appendix D offers a summary of univariate statistics for variables in this analysis. Below, wind beliefs and energy preferences are further assessed via the distribution of responses. This reveals the prevalence of strong beliefs (*Strongly agree/support* and *Strongly disagree/oppose*), which can serve as indicators of political polarization and rigid opinions.

Political Ideology

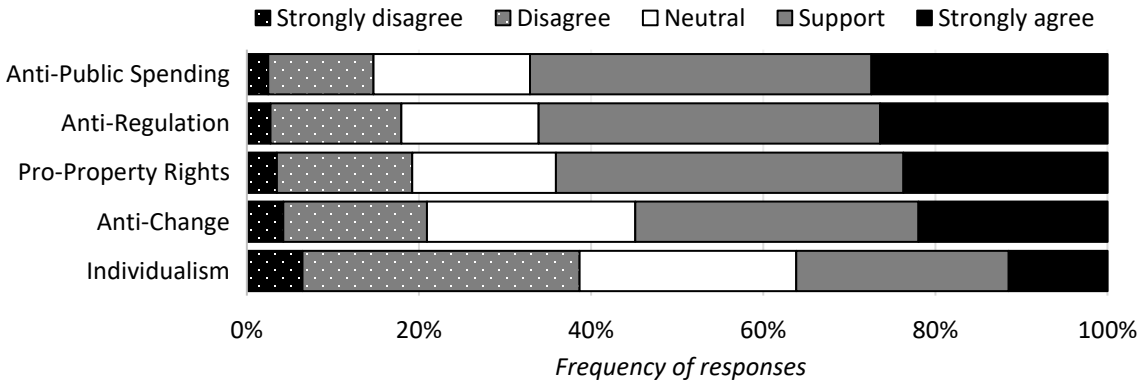
By all three indicators of political ideology (beliefs, orientation, and affiliation), the sample did not express great political diversity. Many respondents expressed conservative, right-oriented political ideology, which is not unexpected for a rural sample.

Figure 2 visualizes how over half of the respondents agreed with the conservative belief statements. As an exception, the individualism statement had only a third of the sample in agreement. These five beliefs did not load into a conservative belief scale ($\alpha = .38$). The low

[6] These likelihoods were calculated using data from the 2016 Census of Agriculture (GOA, 2018a). In 2016, there were 57,605 farm operators in Alberta, where each farm can have up to three registered farm operators. In Alberta, there were 40,638 farms, and of those farms, 40% had only one operator. The remaining 60% of farms had two or three registered operators. For the solo operator farms, males and females represented 88% and 12% of the operators. For the multi-operator farms, it was 56% and 44%, respectively.

internal consistency suggests these beliefs are not reflecting a single latent variable, so the five belief variables are used separately in later modeling.

Figure 2. Agreement with conservative beliefs



Note. $N = 401$. Respondents were asked whether they agree or disagree with five statements indicating elements of conservative political ideology.

Turning to political affiliation, the majority of respondents expressed an association with a conservative political party ($n = 281$). Few indicated affiliation with other parties: *NDP* ($n = 17$), *Liberal* ($n = 12$), *Green* ($n = 4$), or *Other* ($n = 13$). Importantly, this question had a high opt-out rate. Nearly one out of five respondents did not indicate a party affiliation and instead opted out by selecting *Prefer not to say* ($n = 52$) and *I don't know* ($n = 22$).

For political orientation, the sample lacked left-oriented respondents. When placing themselves on a left–right spectrum, 53% placed themselves as "right-wing," 26% used the middle option, a mere 7% indicated they were "left-wing," and the remaining 14% opted out (*Prefer not to say*).

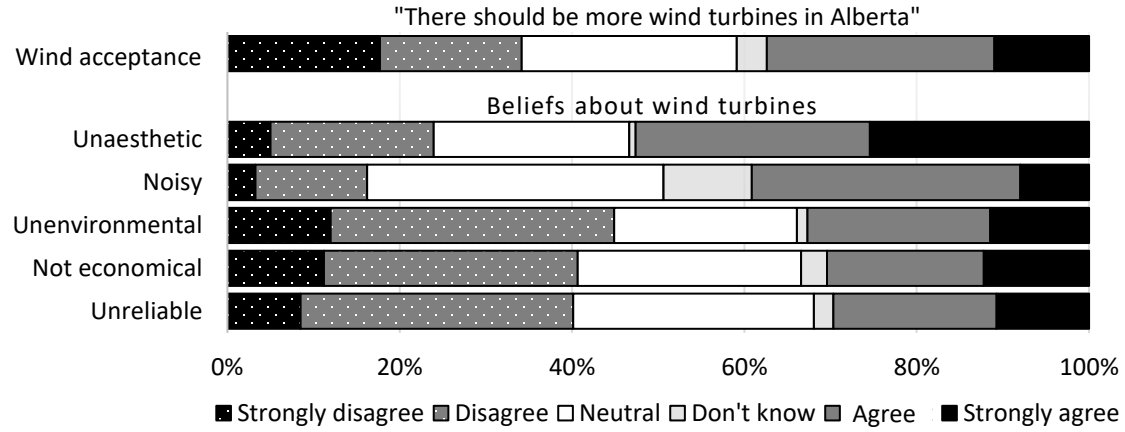
Given the uneven distribution for the affiliation and orientation responses, I transformed both variables into dichotomous indicators. I divided affiliation into two groups: respondents who explicitly expressed conservative affiliation ($n = 281$) and respondents associated with a different party or who were uncertain ($n = 68$). For political orientation, the sample was split into the right-oriented group ($n = 212$) and the neutral–left group for those who gave a neutral, left, or

uncertain answer (n = 133). For both orientation and affiliation, "prefer not to say" was treated as missing.

Wind Energy Views

First, this study asks how Albertan landowners generally regard wind energy and what beliefs are commonly held about this technology. Figure 3 visualizes the wind preferences and beliefs held by the sample. The sample took diverse, fragmented positions on whether there should be further wind energy development in Alberta. Their answers were spread out with 18% strongly disagreeing, 16% disagreeing, 25% staying neutral, 26% agreeing, 11% strongly agreeing, and only 3% opting out (*I don't know*).

Figure 3. Wind energy acceptance and beliefs



Note. N = 401. Respondents were asked whether they agree or disagree with six statements indicating wind acceptance and beliefs about wind turbines.

While over a third of the sample was accepting of wind development, many saw wind energy as having downsides. Very notably, sensory impacts (*unaesthetic* and *noisy*) were most frequently scored as problematic. Over half of the sample (53%) disliked the appearance of wind turbines. Auditory disturbance was the next top issue with over a third (39%) expressing wind turbines were "too noisy." Compared to the other four questions, auditory impacts elicited the most uncertainty, where nearly half of the respondents (45%) stayed neutral or opted out. The other wind energy aspects were slightly less contentious than the sensory impacts. About a third of

respondents perceived wind turbines as not environmental (33%), unlikely to offer local economic benefits (30%), and flawed due to intermittency (30%).

For the six wind energy statements, the response rate was high despite the ability to opt out, suggesting the vast majority is familiar enough with wind energy to hold opinions on various aspects of the technology. Yet, most landowners do not seem greatly opinionated on the subject. In fact, the sample largely expressed "moderate" beliefs about wind energy as 76% of responses used mid-scale options (*Disagree*, *Neutral*, and *Agree*). The remaining 24% of responses indicate strongly held, "extreme" beliefs (*Strongly disagree/agree*). Since polarization is indicated by extreme views, these results already hint that wind energy is not a polarized topic within this demographic.

Energy Preferences

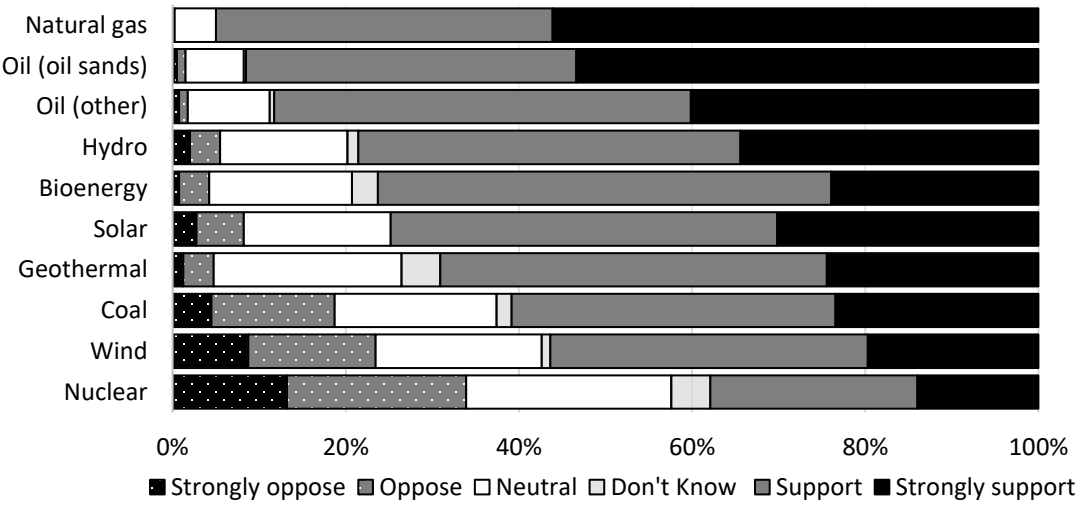
Next, this study explored wind acceptance in relation to preferences for other energy sources. As shown in Figure 4, the sample largely aligned towards support and strong support for further development of most energy sources in Canada, but wind energy was one of the least preferred. Despite the opt-out option, the response rate was consistently high (varying only between 92.7–99.8%), so the respondents appear familiar enough with diverse energy sources to offer an informed opinion.

For the non-renewable energy sources, the sample aligned towards strong favour for natural gas and oil. For natural gas, the overwhelming majority (95%) wanted more development. The vast majority of the sample also wanted to expand the oil industry of the Albertan oil sands (92%) and in other places (88%). These high rates of support came with minimal opposition. Less than 0.2% and 2% of the sample was against oil and gas development, respectively. Coal and nuclear, however, were more contentious— with only 61% and 38%, respectively, in support.

The sample largely expressed favour towards renewable energy as well, albeit not as strongly as for oil and gas. Hydroelectric was most preferred with 79% in support of further development in Canada—followed closely by bioenergy (76%), solar (75%), and geothermal (69%). Wind energy trailed behind other renewables (56%). Two sample tests of proportions reveal significantly fewer respondents support wind energy compared to geothermal ($z = 3.72$, $p < .001$). Therefore, compared to the other renewable options, wind energy is significantly less

preferred by Albertan landowners. Importantly though, few respondents (9%) expressed strong opposition to wind development. While wind energy may be one of the least preferred energy sources, the technology does not elicit starkly negative assessments on this broad level.

Figure 4. Preferences for different energy sources



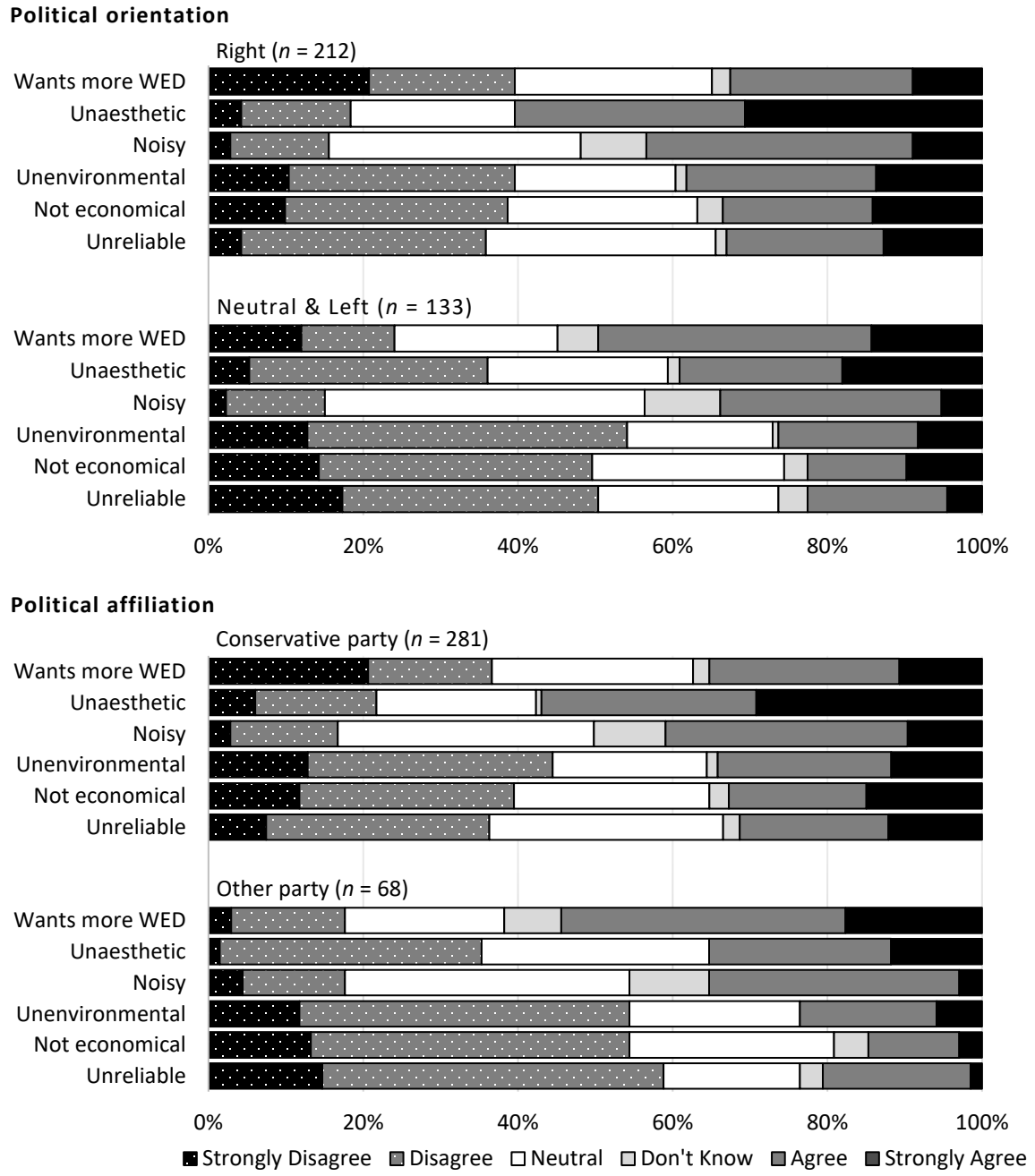
Note. $N = 401$. Respondents were asked for their level of support for further development of different energy sources in Canada.

Assessing Political Polarization

Next, I asked whether wind energy is a politically polarized topic within this demographic. Drawing from Aguirre et al.'s (2021) approach, for political polarization to be evident, opinions need to vary across political division insofar that one group frequently expresses an "extreme" negative opinion (*Strongly disagree*) while the other group frequently expresses an "extreme" positive view (*Strongly agree*).

Figure 5 displays the spread of views across political divides. First, using political orientation, the right-oriented group displayed fragmented views on whether there should be more wind energy in Alberta. The neutral–left group aligned towards slight agreement. This finding supports that wind energy is not a politically polarized topic for this demographic.

Figure 5. Wind energy views by political orientation and affiliation groups



Note. WED = Wind energy development. For political orientation, neutral and left includes responses from -5 to 0 (*Very left* to *Neither left nor right*). Right scores ranged from +1 to +5, where +5 was *Very right*. For affiliation, non-conservative affiliation included *NDP*, *Liberal*, *Green*, and *Other*. *Prefer not to say* responses were treated as missing for orientation (n = 56) and affiliation (n = 52).

Moving to the five wind energy beliefs, the right group aligned towards strong agreement that wind turbines spoiled the rural landscape, while the neutral–left respondents aligned towards disagreement. Despite this difference, the two groups did not display polarization here because both groups had similar instances of strong disagreement. Next, the two groups aligned in their views on whether turbines were an auditory disturbance. Both groups largely expressed moderate views and were commonly neutral or uncertain. With so few "extreme" responses, polarization is not evident for opinions on auditory impacts either. For the last three variables (*not environmental, not economical,* and *unreliable*), the two groups displayed similar patterns, but the right group displayed more fragmentation compared to the neutral–left who aligned slightly towards disagreement. Figure 5 also displays the distribution of opinions when the sample is split by political affiliation, where, unexpectedly, the distributions mirror the political orientation patterns. Overall, the sample does not present evidence of political polarization when segmented by political orientation or affiliation.

Predictor Variables & Wind Acceptance

To simplify the dependent variable (wind acceptance) and create groups of similar sizes, the sample was split into three levels: oppose (n = 137), neutral (n = 114), and support (n = 150), where the neutral group includes the few uncertain respondents (*I don't know*). As an assumption of an ordered logistic regression, the dependent variable categories must have an inherent order. Therefore, I tested for an ordered nature of the dependent variable by contrasting the independent variables across the three wind acceptance levels.

Table 1 reveals significant relationships between wind acceptance and political affiliation and orientation. Right-oriented respondents were more frequently opposed to wind and less commonly in support. The same pattern occurred for the conservative-affiliated respondents. Chi-Square Tests of Independence with a Bonferroni adjustment ($p < .008$) confirmed these trends. Both the conservative-affiliated (X^2 (2, N = 349) = 11.17, p = .004) and the right-oriented respondents (X^2 (2, N = 345) = 12.05, p = .002) had statistically significant differences in their distribution across the three acceptance levels.

Table 1. Political affiliation and orientation sorted by wind acceptance level

	Position on further wind development in Alberta *f* (%)							
Political variables	Oppose		Neutral		Support		Total	
Party affiliation	**115**	**(33%)**	**98**	**(28%)**	**136**	**(39%)**	**349**	**(100%)**
Conservative	103	(37%)	79	(28%)	99	(35%)	281	(100%)
Other	12	(18%)	19	(28%)	37	(54%)	68	(100%)
Orientation	**116**	**(34%)**	**82**	**(27%)**	**135**	**(39%)**	**345**	**(100%)**
Right	84	(40%)	59	(28%)	69	(33%)	212	(100%)
Neutral/left	32	(24%)	35	(26%)	66	(50%)	133	(100%)

Note. $N = 401$. Percentages may not add to 100% due to rounding.

To further justify the ordered nature of the dependent variable, I compare the averages of other predictor variables across the three wind acceptance levels (see Appendix E). There is a clear and unsurprising trend. The respondents opposed to wind averaged the lowest scores for climate concern, trust (in renewables, government, and scientists), and perceiving social norms of wind support. This group also averaged the highest scores for all five conservative belief variables, trust in the fossil fuel sector, and fossil fuels support. Conversely, the "support" group expressed the complete opposite profile, while the "neutral" group consistently averaged a score between the support and oppose groups. These results confirm an ordered nature to the dependent variable and justify the choice to use ordered (instead of multinomial) logistic models.

Ordered Logistic Regressions

In Tables 2 and 3, below, the dependent variable is wind acceptance. Table 2 was used for deciding which political ideology indicators should be included in the final models, while Table 3 presents the final models with all predictor variables. In both tables, Equation 1 presents the effects of the predictor variables on the likelihood of a respondent demonstrating the lowest level of wind acceptance (opposed), relative to being at a higher level (neutral or supportive). Equation 2 presents the likelihood of a respondent being opposed or neutral, relative to being supportive of wind energy. All variables in the models were checked for multicollinearity using Spearman's regressions (Appendix F).

Table 2. Ordered logistic regressions of political indicators by wind acceptance

	Eq. 1 = Oppose vs Neutral/Support. Eq. 2 = Oppose/Neutral vs Support			
Variables[a]	Model 1	Model 2	Model 3	Model 4
Right orientation	–.72*** (.21)			–.51* (.25)
(vs. not right)				
Conservative affiliation		–.85** (.26)		–.32 (.30)
(vs. other)				
Conservative beliefs				
Anti-public spending			–.24* (.10)	–.18 (.11)
Anti-regulation			–.34** (.10)	–.30** (.12)
Pro-property rights			–.38*** (.09)	–.34** (.10)
Anti-change			–.60*** (.10)	–.52*** (.11)
Individualism			–.16† (.09)	–.13 (.10)
Cut point (Eq. 1)	–1.41 (.24)	–1.14 (.18)	–6.97 (.73)	–6.64 (.79)
Cut point (Eq. 2)	–.22 (.23)	.01 (.17)	–5.53 (.69)	–5.28 (.75)
Number of respondents	345	349	401	317
Log-likelihood	–369.2	–374.7	–387.1	–304.3
Pseudo R-sq	.016	.015	.116	.116

Note. Political orientation = right (1) versus neutral/left (0). Political party affiliation = conservative (1) versus all other affiliations (0). Beliefs run from *Strongly disagree* (1) to *Strongly agree* (5). Models present unstandardized coefficients with standard errors in parentheses.

[a] Eq. 1 equals Eq. 2 for all variables.

†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

In Table 2, no variables violated the parallel odds assumption, so Equation 1 and 2 are equal. All variables indicative of conservative political ideology (i.e., being right-oriented, having a conservative party affiliation, and expressing more agreement with conservative beliefs), significantly predicted lower wind acceptance—as noted by their negative coefficients. In Model 1, right-oriented respondents were more likely to have a lower perception of wind energy; however, in Model 4, political orientation dropped in significance. Similarly, having a conservative affiliation increased the likelihood of being less accepting of wind energy, but this variable lost significance with the addition of the belief statements in Model 4. A Bonferroni-adjusted Wald test confirms Model 4 does not have a significantly better fit than Model 3 (X^2 (2, $N = 317$) = 7.11, $p = .029$), suggesting only the five belief variables should be included in the

final models. Further, when the orientation and affiliation variables were placed into more complex models (together or separately), they were insignificant, did not improve model fit, and reduced the sample size by up to 20%. For these reasons, I excluded them from further analysis.

In Table 3, the models were loaded sequentially with the other variables: climate concern (1–5), fossil fuel support (1–5), trust for energy stakeholders (1–10), exposure to norms of wind support (1–5), and beliefs about wind energy (1–5). Brant's test ($p < .05$) revealed two variables in violation of the parallel odds assumption: the *anti-change* belief and norms of wind support. Accordingly, Table 3 uses partial proportional odds models to relax the parallel odds assumption for only those two variables (Eq. 1 ≠ Eq. 2). All other variables are constrained across dependent variable cut points (Eq. 1 = Eq. 2).

Table 3 speaks directly to my research question: What might be shaping landowners' general acceptance of wind energy? The five conservative ideology beliefs are significant in the first model. All variables had an inverse relationship with wind energy support. Respondents were more likely to have a higher level of wind acceptance (e.g., being in support or neutral) if they ranked lower in the conservative beliefs. However, the significance of these beliefs diminished as other predictors were included. By Model 4, the only statistically significant (albeit not strongly significant) variable was the anti-change belief and only for Equation 2 ($\beta = –.42$, $p < .020$). This finding is interesting because it suggests having higher preference for the status quo did not specifically predict being opposed to wind energy (Eq. 1) but did predict not being in support (Eq. 2).

For climate concern, in the first model, respondents became more likely to have a higher level of wind acceptance as their concern score increased ($\beta = .35$, $p < .001$), which is not surprising. However, climate concern was only predicted in the first model—suggesting that Albertan landowners' overall views on wind energy are not driven by their risk assessments about climate change.

Table 3. Ordered logistic models with partial proportional odds predicting wind acceptance

	Eq. 1 = Oppose vs Neutral/Support. Eq. 2 = Oppose/Neutral vs Support β (SE)							
Variables	Model 1		Model 2		Model 3		Model 4	
Conservative beliefs								
Anti-public spending	−.19†	(.10)	−.19†	(.11)	−.14	(.12)	−.10	(.15)
Anti-regulation	−.25*	(.11)	−.13	(.11)	−.06	(.12)	−.00	(.15)
Pro-property rights	−.41***	(.09)	−.35***	(.10)	−.17†	(.10)	.04	(.14)
Anti-change (Eq.1)	−.38**	(.12)	−.19	(.13)	−.02	(.14)	.10	(.20)
Anti-change (Eq.2)	−.57***	(.12)	−.41***	(.12)	−.34*	(.13)	−.42*	(.18)
Individualism	−.17†	(.09)	−.10	(.10)	−.10	(.10)	−.15	(.13)
Climate concern	.36***	(.10)	.16	(.11)	.09	(.12)	.08	(.15)
Fossil fuel support	.00	(.17)	.24	(.19)	.25	(.21)	.29	(.28)
Trust variables								
Oil/gas industry			−.33***	(.07)	−.31***	(.07)	−.17†	(.09)
Renewables industry			.40***	(.07)	.33***	(.08)	.07	(.10)
Government			.06	(.06)	.02	(.07)	.05	(.08)
Scientists/academics			.06	(.06)	.10†	(.06)	.02	(.08)
Norms: Wind support (Eq.1)					1.30***	(.18)	.84***	(.25)
Norms: Wind support (Eq.2)					.76***	(.15)	.15	(.22)
Wind energy beliefs								
Noisy							−.20	(.19)
Not environmental							−.80***	(.16)
Unreliable							−.41**	(.16)
Unaesthetic							−.31*	(.15)
Not help economy							−.93***	(.17)
Constant (Eq. 1)	4.73***	(1.11)	2.23†	(1.24)	−2.29	(1.43)	6.58**	(2.04)
Constant (Eq. 2)	3.91***	(1.09)	1.37	(1.22)	−1.68	(1.40)	7.59***	(2.01)
Number of respondents	401		401		401		349	
Pseudo R-sq	.135		.192		.273		.475	
AIC	777.6		735.6		668.5		438.8	
BIC	817.5		791.5		732.4		519.8	

Note. AIC = Akaike information criterion. BIC = Bayesian information criterion. Variables run from 1 (*Strongly disagree/oppose*) to 5 (*Strongly agree/support*) except for trust, which runs from 1 (*Fully distrust*) to 10 (*Fully trust*). Models present unstandardized logit coefficients with standard errors in parentheses. Eq. 1 = Eq. 2 for all variables except anti-change and norms. †p<.10. *p<.05. **p<.01. ***p<.001.

In Table 3, fossil fuel support was not significant in any of the models. It is possible the measurement or construction of this variable is not accurately reflecting energy preferences. More likely though, fossil fuel support and wind acceptance may have lacked a relationship because this demographic is so overwhelmingly in favour of fossil fuels. Had this been a general population survey (with diverse views), an inverse relationship between fossil fuel and wind preferences may have been found.

In Models 2 and 3, industry trust variables were significant predictors ($p < .001$). In Model 3, as trust in the fossil fuel sector decreased ($\beta = –.31$) or as trust in the renewable sector increased ($\beta = .33$), a respondent was more likely to have a higher level of wind acceptance. However, trust factors lost predictive power by the final model when wind energy beliefs were added. This suggests wind energy beliefs have, in part, already been shaped by the respondent's trust or distrust of energy industries. The models did not reveal a strongly significant relationship between wind acceptance and trust for government or for scientists and academics.

At first glance, there appears to be an interesting relationship between social norms of wind opinions and wind acceptance. In Model 3, when respondents were exposed to more positive views of wind energy, they were significantly more likely to sort into higher levels of wind acceptance themselves—as indicated by strongly significant ($p < .001$) positive coefficients in both equation 1 ($\beta = 1.30$ and 2 ($\beta = .76$). Yet, in Model 4, higher social norm scores did increase the likelihood of not opposing wind ($\beta = .84$, $p = .001$) but did not specifically increase the likelihood of a respondents sorting into the highest level (support) of wind acceptance ($\beta = .15$, $p = .489$). However, this relationship is likely due to distribution of the social norms scores as few respondents agreed (18%) or strongly agreed (2%) their community would want a local wind farm.

The five wind beliefs were included in the fourth model, which had the best balance between model complexity and explanatory power (with the lowest AIC and BIC scores). Compared to the other predictor variables, wind energy beliefs appear most impactful or most directly related to landowners' overall wind attitude. Environmental ($\beta = –.80$, $p < .001$) and economic assessments ($\beta = –.93$, $p < .001$) were strongly significant. The beliefs about wind energy being unreliable ($\beta = –.41$, $p = .009$) and unaesthetic ($\beta = –.31$, $p = .039$) were also significant,

although at a lower significance level. For these four variables, as their scores increased (i.e., as assessments were more negative), respondents were more likely to sort into a lower wind acceptance level, as expected. Negative assessments about auditory impacts did not evidently play a role in shaping wind acceptance ($\beta = -.20$, $p = .281$).

DISCUSSION

As one research question, this study asked whether wind energy was politically polarized. The sample did not present evidence of political polarization, most simply because the respondents overwhelmingly expressed moderate opinions on wind energy. Further, the sample was highly conservative-affiliated, but since the respondents held diverse opinions about wind development. If this topic was politically polarized in the broader Albertan population, we might expect such a conservative-leaning sample to be more unified in their views. Then, the results also hint that wind attitudes may not have gotten swept up into the province's partisan tensions around energy topics.

These simple findings are important for a few reasons. When a population becomes polarized on a topic, opinions harden. Beliefs can cement in the face of conflict and can become enduring through reaffirming norms (Rydgren, 2017). This study brings good news. Since the rural Albertan landowner demographic has fragmented, moderate views about wind energy, with appropriate regulations and policies, attitudes towards wind energy can still improve.

That said, wind acceptance did vary by all political ideology indicators. Both the right-oriented and conservative-affiliated groups averaged lower wind acceptance, which aligns with other Canadian survey studies (Donald et al., 2021; Chappell et al., 2020). Also, the respondents who sorted in the "opposed" group averaged higher scores for the conservative ideology statements. This finding further highlights the need for constructive, culturally appropriate energy development strategies in the province. Even though wind energy is not currently politically polarized, it appears vulnerable to polarization. If rural landowners get the short end of the stick with upcoming wind energy projects, those poignant experiences could simultaneously spark regional (rural versus urban) and political (UCP versus NDP) divisions.

Another aim of this study was to document the beliefs that Albertan landowners hold about wind energy. The sample was spread out on their wind beliefs regarding sensory impacts, inherent intermittency, environmental qualities, and economic potential—and again generally expressed moderate opinions. Over half of the respondents agreed that wind turbines "spoiled" the rural landscape, and just shy of half agreed turbines were too loud. This finding is not unexpected as visual and auditory impacts are common points of contention with wind turbines. However, for these landowners, sensory qualms do not appear as important in shaping overall wind acceptance compared to economic and environmental factors.

Economic assessments were strongly significant in the models, which suggests wind acceptance in Alberta will hinge on whether landowners perceive wind development to be economically beneficial. Province-wide polarization may be circumvented if landowners are better informed about the financial benefits of hosting turbines on their land. However, only four out of ten respondents agreed that a nearby wind farm would benefit their regional economy. This common perception might stem from a lack of public information about compensation rates and access to this information might boost support.

Environmental beliefs were important as well. Level of wind acceptance was significantly predicted by whether the technology was viewed as more or less "environmentally-friendly." Importantly, though, only one out of every ten strongly agreed that wind turbines were an environmental technology. Future research is needed to understand how landowners are forming these assessments. It is possible that anti-wind talking points from media sources have portrayed wind turbines as ineffective due to intermittency and hence a waste of resources—just a mental sidestep from "environmentally un-friendly." Also, landowners may be using green on green reasoning (Warren et al., 2005) and have reservations about turbines for their impact on local ecosystems.

As expected, perceived social norms were the most potent predictor of wind acceptance. Social norms are a well-established predictor of beliefs and behaviours; however, the beliefs held by others can be misinterpreted. For example, the respondents might have underestimated the level of wind support around them. In this study, the average landowner expressed that their community would not want a local wind farm, but the sample averaged a neutral position for

further development in Alberta and a positive view for further development in Canada. Since perceived social norms predicted wind acceptance, if rural landowners more accurately knew how their communities felt, the sample's overall wind acceptance may have been higher.

I also investigated whether five conservative beliefs predicted wind views. Out of these, only one predicted wind energy opposition: the *anti-change* belief, which can serve as in indicator of traditionalism or preferences for the status quo. While other studies have also proposed it is the traditionalism within conservative ideology hindering wind support (Bidwell, 2013; Chappell et al., 2020), I must be cautious in claiming evidence of this same link. The notion of an "energy transition" is divisive in Alberta because it is associated with environmentalism and the replacement of fossil fuels (Marshall et al., 2018). The anti-change statement used in this survey mirrors the notion of an energy transition. The anti-change statement was worded as such to discreetly elicit conservative beliefs within a survey focused on energy topics; however, the statement may have become a questionable indicator of traditionalism by carrying heated connotations attached to energy transitions.

Somewhat surprisingly, fossil fuel support did not predict wind attitudes. There could be a few reasons. The sample expressed overwhelming favour for oil and gas, but they were not primed to consider trade-offs. Realistically, expanding development of one energy source will result in developing less of another. Future studies may want to factor in trade-offs when assessing the relationship between status quo energy preferences and renewable technologies—for instance, by having respondents rate their top choices or reveal preferences through choice experiments. Additionally, the measure for fossil fuel support may not be capturing the complexity of how petro-state contexts shape energy preferences. It could be particular beliefs *about* the incumbent energy system—e.g., that the fossil fuel system has many years of economic prosperity left (Schimpf et al., 2021) or that oil and gas are environmentally friendly (Kuteleva & Leifso, 2020)—playing larger roles in how renewable energy is perceived.

Wind energy preferences were also compared against preferences for other energy developments, and the sample was generally supportive of most energy sources. Natural gas and oil development had the samples' overwhelming approval. The high support for further oil and gas development is not surprising. The sample expressed high trust for the fossil fuel industry, which

makes sense given Alberta's cultural and economic ties to fossil fuels. There was also broad agreement that Canada should harness more energy from hydro, biofuel, solar, and geothermal resources. It appears that rural Alberta landowners are alike the Canadian public in their positive regard for renewable development (Aguirre et al., 2021; Donald et al., 2021).

The sample least preferred further coal, wind, and nuclear energy expansion. Wind energy was significantly less supported than the other renewables, which suggests it is regarded differently than the other "green" technologies. It is possible that the lower regard for wind energy may stem, in part, from Alberta's recent boom in wind development, as support for renewables has been found to be lower in provinces with recent renewable development (Donald et al., 2021). Some Albertan landowners and rural communities have had poor experiences with recent wind development (e.g., Afanasyeva et al., 2022). Their experiences, paired with the bad press about wind energy in Ontario, may be contributing to lower favor for wind energy by rural landowners in Alberta.

Limitations & Future Research

While wind energy was not found to be politically polarized, the lack of evidence may stem from the political ideology measures. First, the sample lacked political diversity—skewing heavily towards right-wing and conservative respondents. In other words, few respondents self-reported as left-oriented or as affiliated with a non-conservative party. This lack of diversity made it difficult to assess differences across political groups. After all, you cannot contrast views held across the political spectrum without sufficient representation from both sides. Further, the political variables were limited because a sizable proportion of the sample opted out of the political questions or gave responses that could have multiple meanings. For political orientation, for example, about a quarter of respondents placed themselves exactly mid-spectrum (*Neither left nor right*), but it is unknown whether these respondents are apolitical, centrist, or not giving a truthful response. It also possible the political preference questions were too personal to elicit reliable data in this research context. In Alberta, energy is a contentious topic. As shown in the data, this demographic expressed low trust in scientists and academics. Respondents may have been uncomfortable divulging such highly personal information (about a controversial topic, nonetheless) for academic use.

Five beliefs were used as indicators of political ideology with the intention of constructing a brief Albertan conservativism belief scale. However, the five items did not produce a useable scale (a = .38), suggesting they did not reflect one underlying latent variable. Without this scale, the third and final measure of political ideology was not helpful in detecting polarization.

Even though polarization was not detected, I would caution against inferring wind energy is entirely free from polarization. Political polarization would be better assessed using longitudinal data to detect changes over time. This study used cross-sectional data, and as such, cannot speak to whether polarization is on the rise, decreasing, or not changing. Future studies could approach this topic similar to how Positive Energy will be conducting annual nationwide polling on energy and climate opinions (Aguirre et al., 2021; Bird et al., 2020).

Turning to the models, as a reminder, they do not confirm a causal link between predictor variables and wind acceptance. The models had much unexplained variance, indicating that the drivers of wind acceptance in rural Alberta are more complex than could be accounted for in this study. These results would be best used to guide further research on how renewable energy technologies are viewed by Albertan landowners. Future studies may want to account for region-specific factors, such as proximity to fossil fuel industries (Olson-Hazboun et al., 2018). Albertans living in the northern part of the province (where fossil fuel industry is more concentrated), may be more protective of the status quo energy system.

Last, the results of this study should be generalized outwards with caution. The sample was not representative of rural Albertan landowners as the respondents were predominantly older, conservative-leaning males, so gender dimensions were unexplored. Females tend to have higher support for low-risk renewables (e.g., Olson-Hazboun et al., 2016, 2018), and a more representative sample may have shown higher regard for wind energy and lowered support for fossil fuels.

CONCLUSION

This study explored the wind energy views and energy development preferences held by rural Albertan landowners and looked for evidence of political polarization. The findings look like good news. The topic of wind energy was not evidently politically polarized nor even polarized

amongst Alberta's rural landowners. Instead, the sample revealed fragmented, moderate (and therefore likely malleable) opinions, but the landowners opposed to wind were also most often conservative, which highlights how wind energy may still be vulnerable to polarization. This study did not find that support for conventional energy sources diminished wind acceptance; however, future studies could assess energy preferences using trade-offs (e.g., using choice experiments) to assess energy preferences more realistically. Last, the landowners rated wind energy as second to last against other energy sources. Their relatively low favour for wind energy is unfortunate as rural communities stand to gain the most from local wind development, both for their own personal finances and for community-wide benefits.

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Chapter 3. Climate Change Beliefs & Wind Energy Opposition

Alberta makes an interesting context for exploring climate change denial as this province has intimate economic, political, and cultural ties to fossil fuels. In Alberta, discussions about climate change and energy development are often politically polarized, tense, and subsequently avoided (Marshall et al., 2018). With their economy heavily dependent on emissions and extraction, Albertans could easily perceive a low-carbon energy transition as a threat to their culture and way-of-life. Farmers and their livelihoods will especially (if not already) face hardships dealing with extreme weather events like droughts. Yet, the reality of climate change can be a difficult notion to accept.

Although the public largely supports wind energy, wind turbines are placed in rural areas, where the support of host communities is vital to moving projects through. In Alberta, wind development on private lands requires the landowner to sign off on the project. Often, their agreement hinges on the landowners being financially compensated to overcome associated externalities, like visual and noise impacts. If rural landowners are not informed about the monetary benefits of hosting turbines (e.g., due to a lack of public information), they may miss this potential revenue stream. Yet, some landowners may not see a need for low-carbon energy technologies if they deny the existence, severity, or anthropogenic nature of climate change. Then, regardless of monetary compensation, they still may resist local turbine development, which positions climate denial beliefs as a potential barrier to energy transitions.

Research at the intersections of wind acceptance and climate denial in Alberta requires urgency as these topics could be vulnerable to rigid polarization. Climate beliefs have become intensely politicized and polarized in the United States (McCright & Dunlap, 2011). Places with strong fossil fuel industries and conservative populations appear most vulnerable to climate denial narratives (Dunlap & Jacques, 2013). Albertans, and rural Albertans in particular, could be susceptible to adopting climate denial beliefs. Alberta generally exhibits lower belief in the realness and causes of climate change relative to other provinces, and this is especially true for in rural areas and for northern communities near the oil sands (Mildenberger et al., 2016). Rural conservatives have also been noted as the Albertan demographic that more commonly rejects the notion of climate change (Marshall et al., 2018).

Alberta's wind energy future hinges on support from its rural population. Alberta has experienced some political tensions and community opposition regarding wind development (e.g., Afanasyeva et al., 2022), but the pushback has been minuscule compared to the conflict in other places like Ontario. Proactively preventing rigid climate denial is an urgent task because once ideas are established and reinforced by social norms, belief reform is difficult (Bardon, 2019; Myers et al., 2013).

This chapter investigates the connection between climate change beliefs and wind energy opposition amongst rural Albertan landowning farmers. For this exploratory analysis, I use a cluster analysis to identify clusters within the sample and binomial logistic regressions to assess the impacts of different climate beliefs on wind opposition.

LITERATURE REVIEW

In this literature review, I cover the fundamentals of denial and establish it as a psychological coping mechanism used to avoid discomfort arising from holding incompatible beliefs. I review different terminologies for the rejection of climate change and establish that climate change *denial* is the most suitable term for this phenomenon—not climate change *skepticism* or *uncertainty*. Then, I present the common typologies of climate denialism from the literature. I use the notion of *interpretive communities* (ICs) as an explanation for why different climate beliefs will cluster in cognitively compatible ways. Last, I discuss climate belief trends in Alberta and amongst Albertan farmers.

Climate Change Denial

What is Denial?

On a psychological level, climate change denial is motivated no differently than other instances of denial. Denial is a common psychological phenomenon where one rejects information—despite overwhelming evidence that it is true—to avoid negative emotions (Bardon, 2019). According to Festinger's well-established theory of cognitive dissonance, when an individual encounters new information that conflicts with their previously held thoughts, that individual can enter a state of cognitive dissonance: an uncomfortable, anxious state of not having a grasp on reality (Festinger, 1957; Jylhä, 2016). To mitigate these unpleasant emotions, individuals can

unconsciously dismiss or modify incoming information to maintain their current understanding of reality (Bardon, 2019). As such, denial is a coping mechanism used to mitigate negative emotions like threat and anxiety. These emotions can easily arise, for example, when one's identity is challenged or when the future feels uncertain and daunting (Bardon, 2019).

It is theorized that denial occurs through two mechanisms: *motivated cognition* and *rationalization* (Bardon, 2019). First, motivated cognition is an unconscious process where new information is absorbed. Next, *rationalization* occurs on a more conscious level to defend the deeply held beliefs that were acquired via motivated cognition. These two mechanisms in tandem are sensibly referred to as *motivated reasoning*. Importantly, the reasoning is unknowingly motivated not by a quest for truth but for achieving favourable outcomes, like feeling morally worthy or protecting a shared identity (Bardon, 2019).

What is Climate Change Denial?

Although there are various definitions, in this paper, climate change denial refers to the rejection of objective information regarding the Earth's atmospheric warming. Of course, the notion of objectivity is debatable. Yet, the existence, anthropogenic nature, and severity of climate change are beyond well-supported empirically. The documents produced from the Intergovernmental Panel on Climate Change (IPCC) exemplify the highest standards of global cooperation in evidence-based knowledge creation (Jasonoff, 2012). A recent IPCC (2021) report on the physical science of climate change states clearly that it "is unequivocal that human influence has warmed the atmosphere, ocean and land" (p. 5) … "at a rate that is unprecedented in at least the last 2000 years" (p. 7) and perhaps unprecedented in "many thousands of years" (p. 9). The report makes clear how climate impacts are "already affecting many weather and climate extremes in every region across the globe" (p. 10) and have already affected "every inhabited region" (p. 12). If objectivity is the amalgamation of collective knowledge and observation, then climate change is objectively here, now, and real. As such, in this paper, climate denial change denial refers broadly to situations where beliefs are held about climate change that are misaligned with the overwhelming majority of credible, scientific evidence about the global rise in GHG emissions.

Establishing Terminology: Denial, Skepticism & Uncertainty

It is essential to establish conceptual boundaries for the non-acceptance of objective information about climate change. The literature explains this rejection with a handful of seemingly synonymous terms, often used interchangeably, including climate change *skepticism*, *uncertainty*, and *denial*. Poortinga et al. (2011) point out some nuances across these terms. They explain *skepticism* denotes a rejection of mainstream climate science and that feeling *uncertain* refers to having a low conviction in climate change's realness, potential impacts, or causes. As such, I assert that climate *denial* could conceptually encapsulate *skepticism* and *uncertainty* as they both involve some degree of not accepting a widely accepted, well-evinced reality. Further, climate *denial* describes this widespread phenomenon better than climate *skepticism* because skepticism implies having doubts but being open to reform based on receiving new, credible information (Jylhä, 2016; Washington & Cook, 2011). As far as scientific standards are concerned, the evidence that backs the realness, severity, and urgency of climate change is highly credible. By comparison, the sources justifying the "climate hoax" position often lack peer-review (Dunlap & Jacques, 2013) and are mired in the conflicts of interest of corporately linked authors (Jacques et al., 2008). For this paper, I continue using the terms *climate denial* or *climate denialism* because "denial" is the most accurate term for this contemporary phenomenon.

The Roots of Climate Denial

Climate denialism has been explored from many angles, and myriad psychological, social, cultural, and political drivers for the phenomenon have been offered. I review work from the various disciplines that have, in their own ways, examined and explained the roots of climate denial. I start with individual-level explanations drawing from social psychology. I move towards interpersonal reasons (norms, culture) and then touch on political factors—namely, the influence of fossil fuel companies and the American conservative movement in sparking widespread climate denial (Dunlap & McCright, 2011).

Emotional Coping with the "Wickedness" of Climate Change

A perception exists that climate denial stems from ignorance or lack of information. However, as denial is a common mechanism for emotional regulation, denying climate change is sensible from a psychological standpoint. Acknowledging that the global climate is shifting can give rise

to uncomfortable feelings (Norgaard, 2006; Ojala, 2012). Denial is more likely to be applied when feasible solutions are not evident, spurring an overwhelmed and hopeless emotional state (Bardon, 2019). The scale, urgency, and "wickedness" of climate change—in juxtaposition with lagging political action—can leave people without the ability to envision or have faith in viable solutions. Since climate change is a problem to which people contribute, the realities of a warming planet can foster fear, guilt, and shame—emotions that can demotivate climate action (Chu & Yang, 2019). Further, when environmental topics become politically polarized, climate beliefs can merge with group identity. New information about climate change may then be perceived as a threat and trigger self-protective motivated reasoning. From a psychological standpoint, the prevalence of climate denial makes sense because the inherent qualities of such a "wicked" problem produce negative emotions and warrant the deployment of emotional coping strategies (e.g., denial).

Core Values, Worldviews, Personality Traits & Demographics

Another prominent branch of the climate change literature has examined how individual-level characteristics give way to climate beliefs. The impact of demographics on climate beliefs varies across different populations (Poortinga et al., 2019), but in general, people who are male, older, and less educated are most likely to reject the notion (Poortinga et al., 2011).

However, other studies suggest demographics are not actually driving this relationship, and instead, personal values and ideology are mostly filtering how the incoming information about climate change is interpreted and absorbed (Kahan et al., 2012; Whitmarsh, 2011). Deeply held core values and worldviews tend to be highly predictive of climate beliefs and concern (Poortinga et al., 2019). Those that rate higher in self-transcendence (Corner et al., 2014), humility (Sibley et al., 2011), and egalitarianism (Kahan et al; 2012) more commonly believe in and feel concerned about climate change.

The Abstract & Psychologically Distance Nature of Climate Change

The inherent qualities of climate change make for a topic that is not easily comprehended. First, as Weber (2016) succinctly explains, climate change is an "abstract statistical phenomenon, namely a slow and gradual modification of average climate conditions, and thus a difficult phenomenon to detect and assess accurately based on personal experience" (p. 125). Climate

change is then vulnerable to denial because it is not easily or accurately confirmed through one of our main epistemological techniques: learning through personal observation. Without direct, personal feedback shaping beliefs about climate change, the phenomenon may be easily dismissed or construed in an abstract manner (Weber, 2016).

Building on this idea of abstract thinking, climate beliefs have been explored in light of construal level theory (CLT) of psychological distance. Liberman & Trope (2008) posit, in part, that climate change is commonly comprehended using high-level, abstract thinking. In other words, the notion of climate change is not construed (i.e., received, processed, and rendered in the mind) in a manner motivating climate action. Instead, people perceive climate change to be psychologically distant from themselves (i.e., from their self-construct). As a result, people believe that climate change is less likely to occur (*hypothetical distance*) or bring personal consequences (*social distance)*, and especially that it is a future problem (*temporal distance*) occurring in other places (*spatial distance*) (Gifford et al., 2009). It is theorized that when climate change is construed in one of these four abstract ways, through *abstraction transfer*, their high-level thinking can shift into the other dimensions (Chu & Yang, 2019; Liberman & Trope, 2008). For example, if one does not believe climate change will happen soon, they may then also regard it as less certainly going to occur or have personal consequences.

Socially Organized Denial

While much research has examined climate denial on an individual level and from a psychological angle, Norgaard (2011) posits that climate denial is cultural and interpersonal—a *socially organized denial*. She theorizes people ignore climate issues because they are merely following norms of appropriate emotional responses, standard conversational content, and direction of limited attention. Collective climate inaction (or *social inertia*) is then a rational, protective response—preventing the "cultural trauma" of a large-scale, uncomfortable disruption to way of life (Brulle & Norgaard, 2019). Her notion of socially organized denial helps make sense of the well-observed gap between widespread awareness of climate change and lagging action.

Political Ideology & the Influence of the "Denial Machine"

Despite many other explanations for why people deny various aspects of climate change, one of the clearest links with and strongest explanations for climate denial is political ideology. In a 2016 meta-analysis involving almost 200 polls and studies across 56 nations, Hornsey et al. established that values, ideologies, worldviews, and political orientation were most predictive of climate beliefs—completely overshadowing factors like education, gender, and subjective knowledge. Importantly, voting for conservative parties (political affiliation) had the strongest link to climate denial.

The link between political ideology and climate denial makes sense in light of the origins of climate denial. While climate denial has social and psychological explanations, it is well documented that fossil fuel companies first sowed the seeds of climate denial in the American public (Dunlap & McCright, 2011; Mann, 2021; Oreskes & Conway, 2010; Washington & Cook, 2011). Climate denial was then further propagated by a complex network of actors within the American conservative movement (Brulle, 2014; 2019).

In the 1970s, American oil companies funded their own "scientists" and conservative think tanks (CTTs) to skew public opinion on climate change in order to stymie environmental protections (Dunlap & Jacques, 2013). Together, these actors—including industry leaders, politicians, and CTTs—formed (what has been named) the *Denial Machine* (DM) (Dunlap & McCright, 2011). The DM undermined climate science by attacking the integrity of climate scientists, cherry-picking data, creating biased and incomplete narratives, and applying rhetorical techniques (Washington & Cook, 2011). The DMs most effective tactic was targeting climate science at its Achilles heel: its inherent uncertainty, and for this, CTTs were the "ideal vehicle" (Dunlap & Jacques, 2013, p. 701). CTTs claimed that climate science was ill-conceived or inherently flawed as it had not yet brought forth conclusive answers. This tactic, referred to as "manufacturing uncertainty" (Oreskes & Conway, 2010), was remarkably successful because the American public already held a widespread misconception that scientific studies should produce knowledge with certainty (Capstick & Pigeon, 2014). The DM successfully convinced, confused, divided, and disheartened enough of the public to forestall environmental protections and industry regulations. While the DM originated in the United States, its messages were not confined to national borders. Denial information from CTTs was reproduced and spread internationally by

non-corporately linked individuals, and in particular, these messages flourished in countries with strong fossil fuel sectors and conservative politics (Dunlap & Jacques, 2013).

The original DM tactics, like manufacturing uncertainty, are now less useful for delaying climate action. With the realness of climate change being "unequivocal" (IPCC, 2021), companies and CTTs can no longer publicly challenge climate science without threatening their credibility. Instead, to maintain societal climate inaction, DM actors have now shifted to using tactics of deflection, delay, division, despair mongering, and doomism to trigger hopelessness and apathy, (Mann, 2021).

Common Typologies

Scholars have classified common manifestations of climate denialism into simple schemes. Capstick and Pidgeon (2014) argue there are two main forms of climate denial.[7] The first, *epistemic skepticism*, involves doubting the physical and scientific realness of climate change. The second, *response skepticism*, consists of doubting the effectiveness of proposed solutions, e.g., transitioning to renewable energy. Another popular scheme comes from Rahmstorf (2004), who noticed three common patterns:[8] denying the realness (the *trend*), denying the anthropogenic causes (the *attribution*), or denying the severity (the *impact*) of climate change. Last, for Cohen (2001), climate denial falls into three common forms. Denial can involve outright rejection of truth (*literal),* manipulating truth or creating alternate meanings from it (*interpretive),* or hiding truth to forestall action *(implicatory)*. These three categorization schemes are frequently used in the literature and reflect common conceptions of climate denial.

Petersen et al. (2019) coined *ideological denialism* as the masking of contradictions to maintain the status quo. In the climate conversation, ideological denial persists as the widespread failure to respond to the root causes of the crisis, which they identify as the growth-dependent economy. Under such a broad conceptualization, the "spectrum of climate denial" (Norgaard, 2019) is

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[7] Capstick and Pidgeon's (2014) scheme actually refers to climate "scepticism [*sic*]" not climate *denial*. Although they rigorously test and categorize the manifestations of climate skepticism, they do not define skepticism more specifically than just the possessing of doubts. As such, I use their dualism as a climate change *denial* scheme since, following Jyhlä's (2016) logic, climate denial is the most accurate term for this contemporary phenomenon.
[8] Rahmstorf (2004) is also referring to *skepticism,* but their scheme applies just as well to *denialism*.

expanded. Many people would now be considered climate deniers—including left-leaning, renewable-supporting techno-optimists. Even the most climate-conscious, well-intentioned people may be unknowingly churning out denialism—just of a lesser recognized flavour.

As supported by this literature review, climate denial can appear in many forms and involves a blend of myriad beliefs, rather than merely the absence or presence of a belief that climate change is real. Climate beliefs can involve notions about climate change's realness, causes, severity, or impacts (e.g., temporal, spatial, and personal). For a few examples, climate denial beliefs could be expressed when people say that climate change "is a hoax," "is a natural occurrence," "is a future problem," "will not be an issue here," or "will not impact me." Additionally, climate beliefs can pertain to beliefs about the solutions for climate change, like whether mitigation or adaptation is necessary or effective, or about who is responsible for the crisis and for reducing emissions.

Interpretive Communities: Clusters of Climate Beliefs

Since individuals simultaneously hold multiple beliefs about the broader topic of climate change, their beliefs will likely be logically compatible to avoid the discomfort of cognitive dissonance (Festinger, 1957). There is evidence that climate beliefs often cluster into discernible patterns, where people with similar lived experiences and worldviews tend to have similar bundles of climate beliefs, and this clustering of beliefs may be explained by the notion *of interpretive communities* (ICs) (Leiserowitz, 2005; Poortinga et al., 2011). When first conceptualized by Stanley Fish for the literary field, an IC demarcated a group of readers of similar lived experiences who interpret literature from a shared subjectivity (Fish, 1980). This well-borrowed term has moved across disciplines with slight variations in its usage and definition. The journalism field readily adopted the lingo and redefined an IC as "a collectivity of people who share strategies for interpreting, using, and engaging in communication about a media text or technology" (Lindlof, 2002, p. 64). This broadened conceptualization is more sensibly applied to the clustering of climate views.

In the climate change communication field, numerous studies support the notion of ICs and the clustering of climate beliefs. Leiserowitz and other researchers have used empirical analyses to uncover ICs that hold different bundles of climate beliefs. When studying climate risk

perceptions in America, Leiserowitz (2005) found two ICs within his sample. T-tests revealed the ICs as distinct groups based on respondents' similar sociodemographic characteristics, risk perceptions, worldviews, and emotive reactions to climate information. The identified ICs were on opposing ends of the climate spectrum. The "naysayers" saw climate change as representing little to no danger, while the "alarmists" had high-risk perceptions. Extrapolating from the polling data, these two ICs would comprise 7% and 11% of the US population, respectively (Leiserowitz, 2005).

Drawing from the study above, starting in 2008, in nation-wide surveys of the United States, researchers have used segmentation analyses to identify climate belief ICs that have held up for 12 years through repeated testing (Leiserowitz et al., 2021). Their analysis used 36 variables measuring aspects like climate beliefs, policy preferences, and behaviours (Leiserowitz et al., 2021). Through latent class analysis, they sorted the American public into six unique groups: the Alarmed, Concerned, Cautious, Disengaged, Doubtful, and Dismissive. Similarly, an Australian study by Ashworth et al. (2011) used a cluster analysis to identify four belief clusters, which were named accordingly as the Engaged, Concerned/Confused, Doubtful, and Disengaged. Their cluster analysis made use of nine multi-item scales to represent two dimensions: climate knowledge (three scales) and climate concern (six scales). Also in Australia, Hine et al. (2013) used a latent class analysis and accounted for values, attitudes, beliefs, and emotional reactions. They found five statistically meaningful belief profiles in the broader population: the Alarmed, Concerned, Uncertain, Doubtful, and Dismissive. These groupings were validated by their ability to predict policy preferences. This same approach has been successfully replicated outside of Western cultures as well. In India, Leiserowitz et al. (2013) found six distinct clusters in the population: the Informed, Experienced, Undecided, Unconcerned, Indifferent, and Disengaged.

Importantly, different populations had their own set of climate belief profiles emerge. The overarching schemes offered by Capstone and Pidgeon (2014), Rahmstorf (2004), and Cohen (2001)—although they offer neat and tidy ways to make sense of climate denial—may be oversimplified categories, especially as discourse around climate change is in flux. For example, as the impacts of climate change become increasingly pressing, beliefs profiles like the Indifferent and the Disengaged in India may start to shift towards being more Alarmed and Concerned. Additionally, newer narratives from the DM and fossil fuel companies have the

potential for swaying the climate belief profiles of a population. They could potentially shift people towards being Indifferent or Disengaged via justifying high-carbon lifestyles or by triggering apathy. This speaks to how climate belief clusters are both population- and context-dependent. By identifying the specific ICs for different populations, researchers can reveal how climate beliefs are formed, and perhaps more importantly, this insight can inform targeted information campaigns (Hine et al., 2013).

Wind Energy & Climate Denial

To understand the SAWE, climate beliefs need consideration. Renewable energy topics are conceptually entangled in climate beliefs. Climate change is the overarching driver for transitioning to these low-carbon technologies, and low-carbon transitions threaten the future of the fossil fuel industry. There is evidence the DM has reduced public support for renewable energy by depicting these technologies as unnecessary, ineffective, and inherently flawed due to intermittency (Lamb et al., 2020; Mann, 2021). However, it cannot be assumed that climate denial has or will diminish renewable support in all contexts. For example, Jepson et al. (2012) reported that rural Texan communities simultaneously support local wind development while exhibiting strong *environmental skepticism*: a deeply held belief that "that global environmental change has been misrepresented, fabricated, and exaggerated" (p. 852). In their study, they found that strong support for wind energy coexisted with environmental skepticism and outright denial of the realness of climate change. This speaks to how the relationship between climate beliefs and renewable support may vary for different groups and contexts.

Study Context: Climate Beliefs in Alberta, Canada

This study looks at the impacts of particular climate beliefs on wind acceptance amongst rural Albertan farmers. Understanding the views of this demographic is vital because they are the demographic that will have much say in how wind energy development unfolds in the province. Rural land is needed for expanding renewable energy development, and private landowners are the gatekeepers. Also, rural communities will be disproportionately impacted by climate change while also being on the fighting lines of climate adaptation (Vodden & Cunsolo, 2021). By knowing the predominant climate beliefs of Albertan farmers, policy-makers will be better equipped to communicate about the risks of climate change and the necessity of climate

adaptation. If renewable development or other climate mitigation efforts are pushed onto farmers in an unfavorable manner, it could potentially turn them off from climate adaptation initiatives.

Climate beliefs vary by region and province in Canada, with both rural areas and Alberta being flagged as hot spots for climate denial. According to recent estimates from Mildenberger et al. (2016), across Canada, urban areas tend to believe in anthropogenic climate change more so than rural populations. Electoral districts where fossil fuel extraction and development are concentrated, particularly the oil sands areas in northern Alberta, report lower rates of belief in the anthropogenic nature of climate change. Mildenberger et al.'s data also reveals differences in provincial averages, with Alberta almost always ranking last (Université de Montréal, n.d.). They estimated only 70% of Albertan's acknowledge the earth is warming, compared to 83% of Canadians. However, a mere 42% of Albertans attribute atmospheric warming to human activities, in contrast with 60% of Canadians. Similar trends exist for other climate beliefs as well. Fewer Albertans anticipate climate change will impact them personally (34%) and have noticed climatic shifts affecting their province already (56%), relative to 47% and 70% of Canadians. Interestingly, Alberta has the highest agreement that "instead of trying to stop climate change we should focus on adapting," with 47% on board compared to national agreement sitting at 38% (Université de Montréal, n.d.). Climate denial beliefs are evidently common in Alberta, especially in its rural areas and in communities dependent on fossil fuel industries.

Climate Beliefs of Albertan Farmers

Studies have explored the types of climate change beliefs held amongst Albertan farmers and reported attribute denialism is common while trend denialism is rare. In a recent survey of 301 farmers, Davidson et al. (2019) inquired about climate beliefs and climate adaptation practices. The farmers commonly expressed reservations around whether and how much humans could be shifting global temperatures, with 10% believing that climate change was anthropogenic, 36% believing it was half anthropogenic and half natural, and 28% believing climate change is a primarily natural occurrence. The remaining farmers (19%) did not think there was enough evidence yet to know, and few (2%) outright denied that climate change was happening.

Another study by Fletcher et al. (2021) used interviews and an ethnographic approach to document the common climate beliefs of Albertan agricultural producers. They found these

farmers expressed a range of views, but it was rare for them to outright reject the realness of climate change. Few farmers also fully accepted the anthropogenic attribution. Instead, most settled into three middle positions. Many had personally witnessed and accepted that the climate was shifting but did not ascribe attribution, while some acknowledged the climate was shifting but believed it was due to natural occurrences. The last group was characterized by their confusion and uncertainty about climate change.

Both Davidson et al.'s and Fletcher et al.'s studies speak to how Albertan farmers show a high willingness to engage in climate adaptation. In fact, in both studies, many farmers had already incorporated climate adaptation practices into their agricultural operations because these practices positively impacted the health of their land and their bottom line. However, such high rates of attribute denialism hint that Albertan farmers might be less willing to engaged in climate *mitigation*—for instance, by adopting or supporting renewable energy. If farmers do not believe climate change is due (at least, in part) to rising GHG emissions from human activity, they may not see a need to reduce emissions via adopting or vouching for low-carbon technologies.

Establishing Dimensions of Climate Denial Beliefs for the Alberta Context

Although myriad beliefs about climate change can exist, this study narrows in on just five beliefs due to survey length limitations. The five variables are *concern* about climate change, *certainty* of its realness or causes, anticipation of *local impact,* belief in the *efficacy* of climate action, and belief in having collective *responsibility* to reduce emissions. The first three climate beliefs are backed up as "objective truth" through recent IPCC reports. The last two, however, need further justification as to how and why they can serve as measures of climate denialism.

Regarding the *responsibility* dimension, an individual might fully believe that climate change is occurring but refute they have any responsibility in the matter. So, I include the notion that dismissing responsibility can constitute denialism. I assert that anyone whose activities have resulted in the emission of carbon—especially those who can also exert some political influence (e.g., by voting)—is implicated in the climate crisis. Many countries and their citizens have emitted nearly negligible GHG emissions, so the following argument may not pertain to them. Canadians though, particularly Albertans, have a high standard of living and high carbon emissions. In 2018, Canada contributed 1.5% of global GHGs—ranking as the 10th highest

emitting nation (ECCC, 2021). Yet, Canada only harbours 0.48% of the global community—ranking 39th in population size[9] (Worldometers, n.d.). In Alberta, per capita GHG emissions are *three times* the national average[10] (Canada Energy Regulator, 2021) with no immediate signs of slowing down. Relative to the other provinces, Alberta has had the greatest increase in emissions (up 17%) from 2005 to 2015 and now contributes to over a third of national emissions (Dusyk et al., 2021).

Of course, quantifying and assigning responsibility for climate change is a complex subject, but the verdict for Alberta is rather clear: Albertans have greatly benefited from their fossil fuel economy via employment, low taxes, and (on average) a high standard of living. Therefore, as I have argued above, if an Albertan maintains their province should not have to reduce emissions, this constitutes climate denial via dismissal of involvement and responsibility—or in other words, "moral disengagement" from the climate reality (Stoll-Kleemann & O'Riordan, 2020).

Last, within the Alberta context, I also assert that climate denialism can include a belief that reducing domestic GHG emissions is futile or inconsequential. According to the International Energy Agency, it is still possible for the global community to achieve net-zero by 2050, although the path there will be "narrow and extremely challenging" (2021, p. 3). Even if the best possible scenario (1.5°C of warming) is overshot, every bit of prevented warming is crucial. Every additional 0.5°C of warming will bring significantly more frequent and extreme weather events (IPCC, 2021). If left fully uncurbed, catastrophic warming of up to 3.3°C to 5.7°C could occur by the end of the century (IPCC, 2021). As such, for this paper, viewing climate action as pointless also constitutes a climate denial belief.

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[9] Calculated using global and Canadian population data from July 2020 (Worldometers, n.d.)

[10] To clarify, Albertan's themselves do not necessarily have outrageously lavish "carbon footprints" relative to other Canadians; in Alberta, the oil and gas industry is responsible for 51% of provincial emissions (Dusyk et al., 2021).

RESEARCH QUESTIONS

For this chapter, my central inquiry revolves around climate beliefs and their potential impacts on wind opposition in rural Alberta. The main research questions are as follows:

1. What beliefs are rural Albertan farmers holding about various of aspects of climate change, or more specifically, which climate denial beliefs are most prevalent for this demographic?

2. Are there any patterns in rural Albertan farmers' climate beliefs, and in particular, do their climate beliefs form distinguishable clusters?

3. Which particular climate beliefs appear most influential on wind opposition?

METHODOLOGY

Online Survey of Albertan Farmers

This analysis uses the same data set as Chapter 2, which came from an online survey of 401 rural Albertan landowning farmers in 2018–2019. The research methodology, including survey construction, survey delivery, and sampling criteria, is detailed in the first chapter. In Chapter 2, I present the sample characteristics to assess for representativeness against the Albertan farmer population (Appendix C). The sample was not perfectly representative of the Alberta farmer population but does show similarities to on-farm primary decision-makers by age, farm size, and gender (see Chapter 2).

Empirical Approach

First, I use an exploratory Ward cluster analysis to segment the sample into groups based on their five climate beliefs. This agglomerative hierarchical cluster analysis minimizes variance between groups through the sequential pairing of similar data points (Kaufman & Rousseeuw, 1990). In other words, I group each respondent with the person who shares the most similar set of climate beliefs to them, cluster them together, then group their cluster to its next nearest cluster, and repeat until there are two groups. In the climate change communication field, cluster and segmentation analysis are commonly used methods for the identification of ICs (e.g., Leiserowitz

et al., 2021). Secondly, I use binomial logistic regressions to assess the impact of different climate change beliefs on being opposed to wind development.

Variables

The key variables of interest are the five climate beliefs, trust for different energy stakeholders, and social norms of wind support. Below, I outline the variables included in this analysis, their construction, and their relevance to wind acceptance and the Alberta context.

Dependent Variable: Wind Opposition

In the binomial logistic regressions, the dependent variable is wind opposition. Respondents were asked if they agree or disagree that "there should be more wind energy in Alberta," with answers recorded on a 5-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*). These responses were converted into a dichotomous dependent variable, where *strong disagreement* and *disagreement* demarcate wind opposition.

Climate Change Beliefs

There are many possible manifestations of climate-related beliefs, yet I inquired about only five due to survey length limitations. These five beliefs were selected for two reasons. As discussed in the literature review, these beliefs demonstrate theoretical relevance to shaping wind opposition. Secondly, these beliefs are relevant to the Alberta context without being too specific. Respondents were asked if they agree or disagree using a 5-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*).

Climate concern for was used as an indicator of risk perception via the statement, "I am very concerned about climate change." Low climate risk perception can demotivate climate action (Leiserowitz, 2006) and be indicative of psychological distance—in particular, *social distance* (Liberman & Trope, 2008). Measuring *certainty* about climate change can reflect reservations about climate science and the influence of the DM (Dunlap & McCright, 2011). Recent studies suggest trend denialism is rare amongst Albertan farmers, but attribute denialism is prevalent (e.g., Davidson et al., 2019). To be conscious of survey space, both attribute and trend denialism were captured in one statement: "We still do <u>not</u> know for sure whether climate change is real or caused by humans." Next, a belief that climate change will have a *local impact* speaks to the

farmer experience. Farmers are a demographic likely to notice and be impacted by weather shifts. When a farmer anticipates or acknowledges local climatic changes, they could be expressing *psychological nearness* to climate change, which, theoretically speaking, could motivate climate action according to CLT of psychological distance (Liberman & Trope, 2008). I also measure a belief in the *efficacy* of climate action, as not believing in climate solutions has been found to correlate with lower concern (Capstick & Pidgeon, 2014). The statement uses renewable adoption as an example of climate action: "Alberta adopting renewable energy will help reduce climate change impacts." Last, I measure a sense of shared *responsibility* for taking climate action: "Alberta has a responsibility to greatly reduce its CO2 emissions." In the same vein as the *efficacy* variable, the respondents are primed for broader reflection—though not on whether they are personally responsible or whether their own actions are effective. A low score for this belief may indicate moral disengagement (Stoll-Kleemann & O'Riordan, 2020).

Trust, Norms & Other Factors

Trust factors commonly influence the outcomes of local wind siting (e.g., Gross, 2007). The respondents were asked whether they "trust or distrust" various potential stakeholders involved in energy developments, including their local community, the oil and gas industry, the renewables industry, the government, and scientists or academics. Trust was rated from 1 (*Fully distrust*) to 10 (*Fully trust*). For social norms, respondents agreed or disagreed with the notion that their community is supportive of local wind development using a 5-point Likert scale. The construction and rationale for these variables is offered in Chapter 2.

Demographic and ideology factors were excluded from this analysis for a few reasons. The sample lacked diversity in gender (90% male) and political ideology (mostly conservative-affiliated and right-orientated respondents). Given these limitations, this analysis better reflects the predictors of wind opposition amongst male, conservative rural Albertan landowning farmers.

RESULTS

Climate Beliefs

Table 4 displays the means and standard deviations for the five dimensions of climate beliefs. The average scores were relatively neutral but leaned toward denialism on four variables. On average, the sample was not *concerned* about climate change, slightly *uncertain* about its realness or its causes, in doubt about the *efficacy* of renewables, and not feeling a sense of collective *responsibility* on this issue. Conversely, the average respondent had slight anticipation of *local climate impacts*.

As per the theory of cognitive dissonance, I hypothesized that the farmers' climate belief dimension scores would correlate because one's beliefs tend to be logically compatible to avoid emotional discomfort. As anticipated, the five dimensions produced a climate belief scale with high internal reliability ($\alpha = .837$).

Table 4. Descriptive statistics for five climate change beliefs

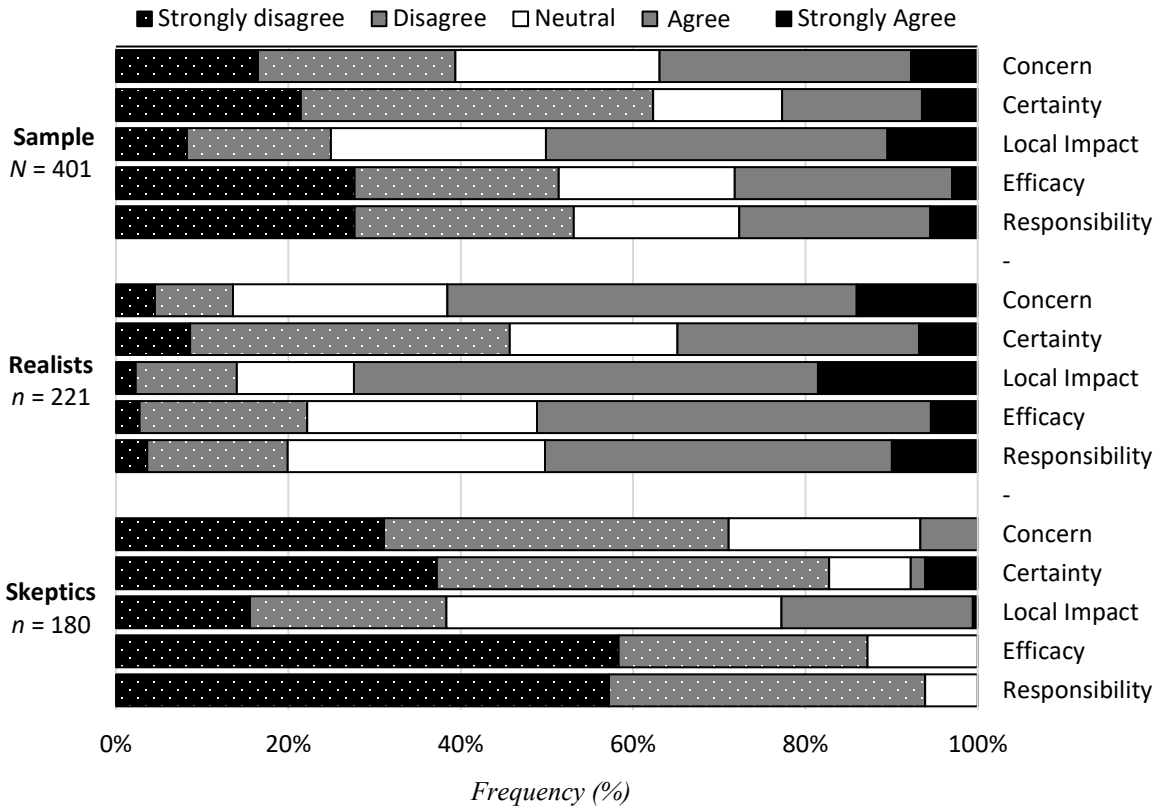
Climate belief variables	*M*	*SD*
Climate belief scale – the average of the five beliefs	2.73	.93
Concern – for climate change	2.89	1.22
Certainty – about the realness or cause of climate change	2.45	1.18
Local impact – belief that Alberta will be impacted	3.27	1.11
Efficacy – belief that renewables can reduce climate impacts	2.52	1.22
Responsibility – belief that Albertan should reduce emissions	2.52	1.26

Note. $N = 401$. *M* = Mean. *SD* = Standard deviation. Recorded on Likert scales from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

I used an exploratory Ward cluster analysis to segment the sample into groups based on their five climate beliefs. Through a visual inspection of the dendrogram, two main groups were evident. Splitting the sample further would result in less distinction between the clusters. Given their profiles, I named them in relation to each other as the *Climate Realists* ($n = 221$) and *Climate Skeptics* ($n = 180$). The realist group on average holds beliefs more in line with climate science. The Skeptics hold beliefs that are more aligned with climate denial.

Figure 6 visualizes the spread of climate beliefs for the sample and between the two groups. Denialism beliefs are indicated by strong disagreement or disagreement. For the full sample, the three most prevalent forms of denial beliefs pertained to the certainty, efficacy, and responsibility dimensions. Most respondents (63%) disagreed that the realness and human causes of climate change had been determined. Over 50% of the sample disagreed with the statements on the efficacy and responsibility of climate action.

Figure 6. Distribution of climate beliefs for the full sample, the Realists, and the Skeptics



Around half of the Realists were concerned (62%) about climate change, thought that renewable energy would help reduce climate impacts (51%), and felt that Alberta had a responsibility to reduce emissions (50%). For comparison, few to no respondents in the Skeptics group held positive climate beliefs for concern (7%), efficacy (0%) or responsibility (0%). Most Realists (73%) anticipated impacts to Alberta, relative to 23% of the Skeptics. Respondents across both groups frequently expressed uncertainty, but the Skeptics were more frequently and more strongly uncertain about realness or anthropogenic origin. The average Realist did not express

extreme beliefs. Instead, they overwhelmingly opted for moderate responses (*disagree, neutral,* or *agree*). On the other hand, the Skeptics generally expressed denialism beliefs more strongly. Of a notable exception, the Skeptics did not strongly oppose the notion of local climate impacts, with 40% of the group selecting the middle option.

Table 5 displays Spearman's correlations between the climate beliefs for the full sample, the Realists, and the Skeptics. For the full sample, all climate beliefs were positively and significantly correlated, and most were of mid-high to high strength. Climate *concern* was strongly correlated with beliefs about *local impacts* (r_s = .64, p < .001), the *efficacy* of renewables (r_s = .58, p < .001), and in having a *responsibility* to reduce emissions (r_s = .66, p < .001). The variables for *efficacy* and *responsibility* were strongly correlated (r_s = .72, p < .001).

Table 5. Spearman's rank correlations for five climate belief dimensions

Climate beliefs	Sample	Concern	Certainty	Local impact	Efficacy
Concern	**Full**				
	Realists				
	Skeptics				
Certainty	**F**	**.42*****			
	R	.35***			
	S	*.09*			
Local impact	**F**	**.64*****	**.43*****		
	R	.61***	.45***		
	S	*.37****	*.14*		
Efficacy	**F**	**.58*****	**.37*****	**.44*****	
	R	.29***	.10	.14*	
	S	.27***	*.26****	*.28****	
Responsibility	F	**.66*****	**.36*****	**.53*****	**.72*****
	R	.40***	.15*	.34***	.40***
	S	*.35****	*.08*	*.34****	*.39****

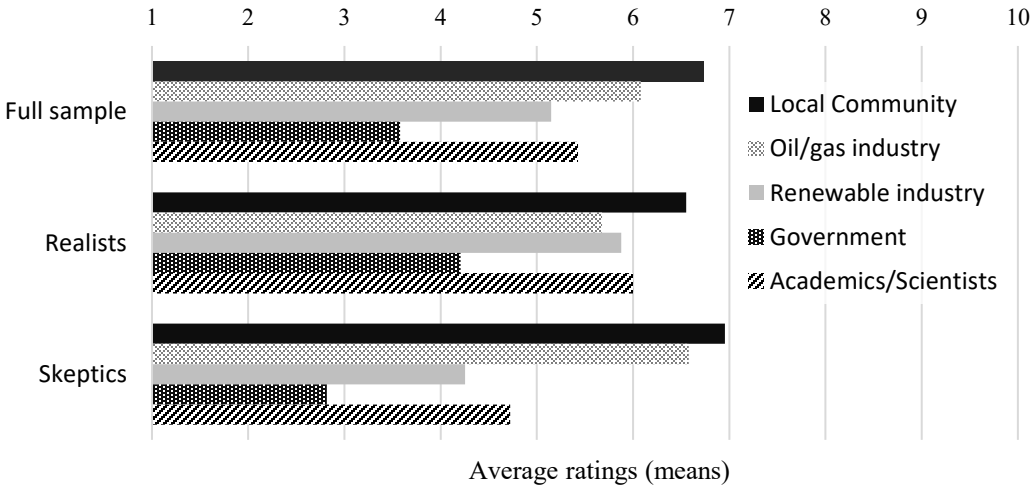
*p < .05. **p < .01. ***p < .001.

When looking only at the Climate Realists in Table 5, a few relationships lost significance or dropped in strength notably: *certainty-efficacy* (r_s = .10, p = .125), *certainty-responsibility* (r_s = .15, p = .031), and *local impact-efficacy* (r_s = .14, p = .039). Even within the Realist grouping,

there still appears to be variation in their bundles of climate beliefs. Also, the Realists had a strong positive correlation between their *concern* and *local impact* rankings ($r_s = .61$, $p < .001$). This relationship could hint that the Realists are more concerned because they believe they will be affected. Alternatively, the inverse may be true. Farmers may have noticed new climatic events and had their worries intensified by these experiences. For the Skeptics, their climate beliefs covaried differently from the Realists in a few ways. The Skeptic grouping had no evident relationship for *certainty* with *concern* ($r_s = .09$, $p = .242$) or with *responsibility* ($r_s = .08$, $p = .316$). They also had a weak, barely significant link between *certainty* and *local impact* ($r_s = .14$, $p = .066$). Overall, the Skeptics correlations were low-mid strength and most often weaker than those expressed by the Realists.

Figure 7 reveals how trust varies across energy stakeholders. On average and unexpectedly, the sample placed the most faith in their local community. Interestingly, the fossil fuel industry was the next most trusted group, followed by scientists and the renewable sector. Government was least trusted. As confirmed by independent sample t-tests, the Skeptics had significantly higher trust for the fossil fuel sector ($t_{399} = -4.35$, $p < 0.001$), but the Realists averaged higher trust for the renewable sector ($t_{399} = 8.46$, $p < .001$), government ($t_{399} = 6.87$, $p < .001$), and academic and scientists ($t_{399} = 5.62$, $p < .001$).

Figure 7. Average trust ratings for various energy stakeholders



Note. 1 = *Fully distrust*; 10 = *Fully trust*.

Predicting Wind Opposition

To assess the impacts of different climate beliefs on wind energy opposition, I use binary logistic regressions with a dichotomous dependent variable (1 = oppose; 0 = neutral/support). All independent variables were assessed for collinearity with Spearman's correlations (Appendix G). Due to their high correlation (r_s = .72), the *responsibility* and *efficacy* variables were averaged and combined. I use three different indicators of climate beliefs: climate belief scale (average of the five beliefs), the Realist/Skeptic groups (0/1), or the five climate belief variables (1–5). Other variables include trust for different energy actors and norms of wind energy support.

In Table 6, the first three models compare the three indicators of climate beliefs in predicting wind opposition with all approaches producing significant results ($p < .001$). Using the climate belief scale, every increase up the scale decreased the log odds by 1.220 of being opposed. When using the Realist versus Skeptic grouping, the log odds of a respondent being against wind energy increased by 1.996 if they were a Skeptic. Of the four belief dimensions, only the *efficacy-responsibility* variable was significant, where every unit increase lowered the log odds of being opposed by 1.017.

Models 4 and 5 account for the effects of trust for different energy actors and social norms. Being a Skeptic was again a significant predictor of opposition (β = 1.016, $p <.001$) as was having lower *efficacy-responsibility* beliefs (β =−.702, $p < .001$). Model 5 outperformed Model 4, suggesting the individual belief dimensions are slightly more accurate in predicting wind opposition than the Skeptic/Realist division. In Model 5, respondents were more likely to oppose wind when they had higher faith in the fossil fuel industry (β = .221, $p = .008$) or lower trust in the renewables industry (β = −.194, $p = .033$) and with scientists (β = −.161, $p = .033$). Social norms had the strongest predictive power across the last four models. The more strongly a respondent believed that the people around them supported wind, the less likely they would be against it.

The last two models add a new trust factor: the difference between respondents' trust for the fossil fuel sector versus their trust for scientists. The data suggest that farmers with wider gaps (i.e., higher fossil fuel trust and lower science trust) are more likely to be against wind development (β = .191, $p < .001$).

Table 6. Binomial logistic regressions predicting wind opposition

	Opposed to further wind energy development in Alberta (vs. being neutral or in support)						
Variables	M1	M2	M3	M4	M5	M6	M7
Climate beliefs variables							
Climate belief scale (1−5)[a]	−1.220***						
Climate Skeptics *(vs Realists)*		1.996***		1.016**		1.334***	
Climate belief dimensions							
Concern			.005		.222		.211
Certainty			−.113		−.090		−.109
Local impact			−.068		.009		−.015
Efficacy-responsibility			−1.017***		−.702***		−.833***
Trust (1−10)							
Oil & gas industry				.228**	.221**		
Renewables industry				−.213*	−.194*		
Government				−.072	−.058		
Scientists/academics				−.141*	−.161*		
Oil industry vs. scientists[b]						.187***	.191***
Norms of wind support (1−5)				−1.277***	−1.257***	−1.379***	−1.338***
Constant	2.492***	−1.705***	2.153***	2.518***	4.178***	1.788***	4.003***
Number of respondents	401	401	401	401	401	401	401
Log likelihood	−215.06	−217.76	−207.08	−158.27	−155.66	−161.97	−158.61
Pseudo R-sq	.165	.154	.196	.385	.395	.371	.384

Note. Models present unstandardized coefficients.

[a] Average of the five climate change beliefs. [b] Calculated from trust for oil industry minus trust for scientists/academics.

*p<0.05, **p<0.01, ***p<0.001.

DISCUSSION

Overall, the aim of this study was to document the climate beliefs held by rural Albertan landowning farmers and assess the impact of these beliefs on wind opposition. Using five different climate beliefs statements, the results suggest climate denial beliefs are prevalent in Alberta's farming community. On average, half of the responses came back indicating "denialist" positions of being uncertain and unconcerned about climate change, of not believing in the efficacy of climate action, and of lacking a shared responsibility to reduce emissions.

Many farmers strongly expressed denialist beliefs, but few strongly expressed "realist" beliefs. For the Albertan farming community, some degree of climate denial is likely here to stay. In general, beliefs become rigid when they are intensely held and also when confirmed by social norms (Rydgren, 2017). It appears a sizable chunk of Albertan farmers have become firmly established in certain climate denial beliefs and are therefore unlikely to revise these beliefs.

Both *epistemic* and *response* denial (Capstick & Pidgeon, 2014) appear common for Alberta farmers. For response denial (doubting the effectiveness of climate action) half of the respondents disagreed that renewable energy adoption could play a role in reducing the impacts of climate change. Importantly though, this particular question (for the *efficacy* variable) may have been confusing for some respondents since using renewable energy does not *directly* reduce climatic impacts. It is through switching to low-carbon energy sources that the severity of future climate impacts can be *reduced*. It is possible the ambiguity in the question could have increased disagreement with the efficacy statement.

Regarding e*pistemic* denial, six out of ten farmers agreed that "we do <u>not</u> know for sure whether climate change is real or caused by humans." In fact, only 6% of the sample strongly felt that climate change was both real and anthropogenic. For many Albertan farmers, climate science seems "unsettled." Importantly though, the *certainty* question in the survey was a tad double-barrelled by asking in the same breath for perceived certainty about the realness *or* anthropogenic causes of climate change. If these two facets of certainty had been measured separately—as per Rahmstorf's terminology (2004)—the rates of *trend* and *attribute* denialism could have been distinguished. However, drawing from other studies, the sample was more likely expressing attribute denialism with rare instances of trend denialism. Most Canadians and

Albertans believe the global temperature is warming (Mildenberger et al., 2016), and outright denial of climate change amongst Albertan farmers is rare (Davidson et al., 2019). Further, there is mixed evidence on whether attribute denial matters for climate action. For example, Sibley & Kurz (2013) found that when people believed climate change was real, they were more likely to engage in climate action, but an added belief in its anthropogenic nature did not significantly boost climate action any further. Conversely, Vainio & Paloniemi (2011) found attribute beliefs were strongly predictive of climate action.

Despite the mixed evidence, the prevalence of attribute denialism in this sample might not be problematic. Farmers are already engaging in pro-environmental activities to improve the health of their land and for economic gain (Davidson et al., 2019; Fletcher et al., 2021). These findings also lead to the same proposition offered by Arbuckle et al. (2013): Climate adaptation programs for farmers might be more appropriate and effective if they do not focus on educating farmers on the scientific causal links of climate change (e.g., its anthropogenic nature). Instead, Arbuckle et al. recommends that these programs promote the local environmental benefits of on-farm climate action. Albertan farmers might be receptive to hearing about the economic benefits of adopting low-carbon energy generators (from solar, wind, or biomass), and how they could use this extra income to ready their operations for upcoming climate impacts.

About half of the farmers did not view renewable energy adoption as effective climate action, and only 3% *strongly* believed the same. In the same vein, Marshall et al. (2018) found that most of their Albertan respondents did not believe that renewable energy could fill the role of fossil fuels—not just for energy usage but for upholding their livelihoods. Their interviewees doubted that job in the renewables industry would pay well and expressed concern about skill transferability in a new energy economy. Many of their respondents also believed that global oil demand would be increasing for many years anyway. Similarly, a nationally representative survey by Donald et al. (2021) found that across Canada there is high support for renewable energy development but also a widespread disbelief that it will not actually help reduce emissions. It appears that the farmers' low belief in the efficacy of renewable energy is not exceptional to this demographic.

The third form of Rahmstorf's denialism—doubting the *severity* of CC—appears to be reflected in the sample through the indicator for risk perception: concern about climate change. Roughly, for every ten farmers, four agreed that they felt "very concerned," four disagreed, and the remaining two were neutral. These numbers are not far off province-wide risk perceptions. Marshall et al., 2018 reported that most Albertans do not see climate change as urgent, and two-thirds believe in it but are simultaneously unconcerned. For farmers, in particular, the low concern is interesting because their livelihoods are tied to climatic conditions. In the coming years, the agricultural sector will be increasingly challenged by intense droughts, livestock mortality due to extreme heat, the spread of invasive pests, and diminished soil health, in addition to many other factors (Government of Canada, n.d.). The sample's low risk perception highlights how many Albertan farmers may not be fully aware of or already preparing for what is to come. This could warrant outreach programs to ensure farmers have access to information and financial capital to ready their operations.

It is important to note that the measure of risk perception has limitations. The survey asked for agreement with being "very concerned" about climate change. This language may have been too strong for some people, who would have otherwise agreed to being "concerned" or "slightly concerned." A better indicator for risk perception would have been simply asking the respondents if they were "concerned about climate change."

As a notable finding, despite the low concern, roughly half of the farmers anticipated climatic impacts in Alberta. The local impact variable was the only belief where the sample averaged a "realist" mindset (instead of averaging a "denialist" score).

There are likely a few reasons why this farmer demographic is open to the possibility of local impacts while also leaning towards climate denialism in other regards. First, in Alberta it is not uncommon for people to believe that climate change has or will have a local impact (Marshall et al., 2018; Mildenberger et al., 2016). Secondly, the respondents are farmers who, by nature of their livelihood, are intimately connected to weather patterns and climatic shifts. While it is easier to deny abstract, psychologically distant notions, they may not be able to rationalize away new material conditions that affect their land and their farming practices. Likely even the most strongly denialist farmers have already observed some climatic changes, because over the last

half century, the Alberta climate has shifted in a way that would be noticeable to agricultural workers. For example, in some areas, farmers in Alberta now have more frost-free days and a growing season lengthened by up to five weeks (Kienzle, 2018). As such, many farmers may struggle to maintain particular denialist beliefs about climate change—namely, that it is a *socially* and *spatially* psychologically distant event. In this way, their lived experience may serve as a leverage point, where their material, first-hand experiences could foster psychological nearness to climate change insofar that they construe it as personally and locally relevant. Then, following Liberman and Trope (2008), through abstraction transfer, climate change may seem more urgent and real (*temporal* and *hypothetical* nearness, respectively), which could elevate concern and desire to engage in climate action. Importantly, this psychological process would be more likely to occur for those with a Climate Realist profile.

On the other hand, it is not a given that noticing local impacts will result in changes to other climate beliefs. Pulling from psychological theory, the Skeptic farmers in this study would be less likely to use abstraction transfer when encountering weather oddities because they have already formed *strongly* held denialist beliefs, which are less easily reformed. Instead, through motivated reasoning (Bardon, 2019), the new climatic conditions can be interpreted in a manner that minimizes cognitive dissonance and preserves prior beliefs. In fact, there is evidence that some Albertan farmers have noticed climate shifts but still maintain other "denialist" beliefs. Marshall et al., 2018 found that rural conservatives in Alberta rejected the notion of climate change and instead asserted that Albertan weather was inherently dynamic and extreme. Fletcher et al. (2021) also reported some Albertan farmers had observed and accepted climate change but did not ascribe anthropogenic causes. The farmers being discussed here by Marshall et al. and Fletcher et al. seem to reflect more of the Skeptic profile found in this study than that of the Realists.

Another aim of this study was to assess whether the farmers' climate beliefs arranged in logically compatible patterns and if there were distinct belief profiles in this demographic. As mentioned above, this study identified two clusters of respondents: the Climate Realists and the Climate Skeptics. This clustering pattern may reflect two main interpretive communities existing within the rural Alberta farmer demographic. The Realist-Skeptic grouping was also a successful predictor of wind energy opposition, where a Skeptic respondent was more likely to be against

wind development. Given the predictive power of this grouping, it could suggest a meaningful demarcation of two different interpretive communities in this broader demographic. However, caution should be taken in this interpretation as this study was exploratory and only used five variables to create these ICs.

This study also explored whether climate denialism could be fueling wind energy opposition, and, if so, asked which particular climate beliefs were most impactful. Two of the farmers' climate beliefs—regarding the *efficacy* and *responsibility* of climate action—went hand-in-hand. Their strong correlation suggests that these two beliefs could be conceptually linked for these farmers. This combined variable was the only climate belief predicting wind opposition. The results suggest Albertan farmers will be less receptive to wind energy if they do not see it as an effective climate solution and if they do not feel a sense of shared responsibility for taking climate action. The other three beliefs (*concern*, *certainty*, and *local impact*) were not evidently shaping wind energy opposition.

The sample had the highest trust for the fossil fuel industry, and then (in order) less trust for the renewable energy industry, the government, and academics or scientists. The farmers with more faith in the fossil fuel industry or less in scientists were more likely to oppose wind energy. The larger the difference between their trust for the fossil fuel industry and their trust for scientists, the more likely they would be opposed to wind in Alberta. While there could be myriad reasons for this finding, it could cautiously hint at influence from the DM's anti-science messaging.

As a methodological contribution, this study can offer the five-item climate change belief scale as an effective but brief way to measure overall climate beliefs. Most respondents were found to hold logically compatible climate beliefs, although the relationships between certain beliefs were less strong for subsections of the sample. As such, using multiple indicators of climate change beliefs proved important. If this study had only used one dimension of climate beliefs (e.g., only risk perception) it would have missed the relationship between climate beliefs and wind energy views.

Limitations

This study just scratched the surface in documenting the climate beliefs of Albertan farmers. Only five variables for climate beliefs were measured due to survey space limitations. This

leaves out many factors that are likely influencing how Albertan farmers construe climate change. For example, this study did not account for diverse climates across Alberta. Some farmers may live in areas with more variable climatic conditions, and this first-hand experience may have influenced their climate beliefs and their *psychological nearness* to this abstract, global phenomenon.

Another limitation of this analysis is the exclusion of political indicators despite political ideology, energy development, and climate change beliefs being undoubtably all wrapped up in the same conversation. However, political variables were excluded for a few reasons. First, the sample lacked political diversity, with mostly right-wing or conservative respondents. Without a full spectrum of views in the sample, it was hard to detect the impacts of political factors on wind views.

While less of a limitation and more of a consideration, causality cannot be inferred in this analysis. It seems intuitive that lower belief in the efficacy of renewables would contribute to wind opposition, but this relationship could go both ways. Farmers may have encountered wind turbines on wind-free days and concluded that their intermittency makes them ineffective for power generation and climate action. It is possible the farmers' low trust for scientists has paved the way for climate denial or for lowering renewable support. Farmers may have had negative experiences with other climate adaptation and mitigation programs, if scientists, academics, or government groups "pushed" climate science onto them. In short, this study raises more questions than it answers about the interactions between the renewable energy views and climate beliefs of Albertan farmers.

CONCLUSION

This study reveals that Albertan farmers hold a range of views on climate change but that climate denial beliefs are also highly prevalent. This study suggests that, compared to other Albertans and Canadians, this demographic is more doubting of the anthropogenic nature of climate change and has lower risk perceptions about climate change in general. These particular beliefs, however, were not evidently affecting farmers' views about wind energy. Instead, this study found evidence that farmers are more likely to hold negative attitude towards wind energy when

they do not see it as an effective climate solution and when they do not feel a sense of shared responsibility to reduce emissions. This assessment of the climate beliefs of Albertan farmers can be used to make government communications more strategic and targeted. For example, a readily acceptable discourse with farmers could likely center around how local climatic changes may impact farm operations. On the other hand, farmers may be turned off by campaigns that center around "settling the science," emphasize GHGs over dollars, or insinuate that Albertans are responsible for climate change.

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Chapter 4. Conclusion

This thesis documented the wind energy views of rural Albertan landowning farmers and assessed what might be shaping their general disposition towards this technology. I asked: Do Alberta's rural landowners positively regard wind energy, and how are their climate change beliefs, preferences for fossil fuels, and ideologies playing in? This final chapter summarizes and concludes this thesis project. I synthesize the main findings and contributions to the SAWE literature and to the Alberta context. I review study limitations before ending on avenues for further inquiry.

KEY FINDINGS

Chapter 2 investigated the impacts of political ideology on wind energy acceptance. As a key finding, rural Albertan landowners were not evidently politically polarized—nor even polarized—on the topic of wind energy. Their opinions about wind energy came back as moderate, fragmented, and diverse, with the majority shying away from extreme stances. This suggests Albertan landowners are not cemented in their opinions and are still open to amending their attitudes towards wind energy.

The above presents an opportunity for Alberta but comes with a sense of urgency. While wind preferences were not evidently partisan, conservative ideology correlated with lower acceptance and less favourable attitudes. The successful siting of upcoming wind developments in Alberta is critical because, at worst, poorly executed projects could trigger rigid, province-wide division. If rural landowners get the short end of the stick with current projects, Alberta’s rural, more conservative demographic could align towards disfavour of wind energy. As noted in Ontario, when divisions occur and stack across political and geographic lines, polarization can be extra potent, rigid, and problematic (Walker et al., 2018b). For Alberta, the further polarization of energy-related topics could spark unnecessary social conflict, challenge effective decision-making, diminish trust in democratic processes, and stall Alberta's low-carbon energy transition.

This study also notes the importance of environmental and economic assessments in shaping wind acceptance. Even though many landowners had grievances about the look and sound of

turbines, if they perceived wind energy as lucrative and environmentally friendly, the sensory impacts of turbines might not matter. Albertan landowners likely need better access to information about compensation payments, as there is little public information. Landowners may not be aware of how much they could receive from hosting turbines. This information asymmetry puts them in a vulnerable position when negotiating with wind developers and signing contracts that will span decades. Also, while the data suggests environmental assessments are vital for wind acceptance, how these landowners construct their environmental assessments about different energy technologies is under-explored. Notably, only one out of ten respondents strongly agreed that turbines were environmentally friendly. It is possible Albertan landowners perceive localized environmental impacts (e.g., avian mortality) as problematic qualities of this energy infrastructure.

Another noteworthy but unsurprising finding was the link between traditional values (i.e., status quo preferences) and lower wind acceptance. The exact reasoning is unclear; however, this link could stem from inherent tendencies to justify the status quo (Jost & van der Toorn, 2012) or from Albertan's cultural bond to oil and gas. Changes to the energy system may be perceived as a threat to Albertans, who have so far had their economic prosperity highly dependent upon the province having a healthy fossil fuel industry.

Regarding preferences for different energy sources, the landowners aligned towards support for most energy projects. Natural gas and oil were the top choices with nearly no opposition, where the overwhelming majority was also on board with renewable development. I did not find evidence that support for fossil fuels diminishes wind energy acceptance. Still, this relationship may not have been evident because the respondents did not have to consider trade-offs. Had the respondents (for example) been tasked with ranking their preferred energy sources, this may have revealed a relationship between fossil fuel support and wind opposition. Further, particular beliefs about Alberta's fossil fuel industry may be more impactful in shaping renewable energy support, like believing that oil and gas will uphold the economy for years to come (Schimpf et al., 2021).

Chapter 3 was an exploratory analysis focused on the impacts of different climate change beliefs on wind opposition. Importantly, for this study, I defined climate denial beliefs quite broadly,

referring to any notions about climate change misaligned with the overwhelming majority of scientific evidence regarding its realness, causes, and impacts (IPCC, 2021). Additionally, I argued that, for Albertans in particular, climate denialism extends to not believing in the efficacy of or shared responsibility for climate action.

Under this definition, this study supports that climate denial beliefs are prevalent among Albertan landowning farmers, where many see climate science as "unsettled." Over half of the farmers did not think the realness or causes of climate change had reached a firm scientific conclusion. Drawing from other studies (e.g., Davidson et al., 2019; Mildenberger et al., 2016), these farmers were likely expressing *attribute* denialism, where they have doubts about the *causes* of climate change (not its *realness*). Fortunately, other studies suggest attribute denialism is not as problematic as trend denialism in hindering climate action (e.g., Sibley & Kurz, 2013), and in fact, many Albertan farmers are already willing participants in climate adaptation and mitigation efforts (Davidson et al., 2019; Fletcher et al., 2021).

Also, in Chapter 3, inspired by the climate change communication field (e.g., Leiserowitz et al., 2021), I identified two ICs of climate beliefs (Realists and Skeptics) using an exploratory cluster analysis, where this division successfully predicted whether a respondent opposed further provincial wind expansion. I looked for these patterns in climate beliefs because, following Festinger's (1957) theory of cognitive dissonance, people tend to hold cognitively compatible beliefs to avoid cognitive dissonance. I anticipated the respondents would assemble into clusters of climate beliefs, where the sentiments within each group would be logically consistent. Overall, the Realists were more likely than the Skeptics to be concerned, anticipate local impacts, believe that climate impacts can be reduced, and feel a sense of collective responsibility to act—yet they did not *strongly* hold these climate beliefs. The Skeptics, on the other hand, expressed many strong denialist beliefs. Out of the 180 respondents sorted into the Skeptic group, half strongly disagreed that renewable adoption could mitigate climate change, and half strongly asserted that Alberta did not have a responsibility to reduce emissions. Nearly four out of ten expressed with conviction that climate science was still unsettled. Evidently, a sizable proportion of this demographic appears to have settled into strongly held climate denial beliefs. As stronger beliefs are more deeply held and endurant (Rydgren, 2017), climate change

information campaigns may not be impactful on Alberta rural landowners unless such messages are carefully tailored to this demographic or to segments of it.

That said, one climate belief was relatively high for both groups: the belief that climate change will affect Alberta. Overall, half of the sample anticipated local climatic impacts. This finding suggests that Alberta's farmers have already noticed climatic shifts, which is sensible given that the Alberta climate has shifted significantly over the last sixty years (Kienzle, 2018). Drawing from CLT of psychological distance (Liberman & Trope, 2008), these farmers may be construing climate change with *psychological nearness*, even though many had other climate beliefs that seem more psychologically distant. It is possible that through *abstraction transfer*, firsthand impacts with climate impacts could serve as a leverage point for farmers—shifting their overall perception of climate change towards *psychological nearness*. For example, if farmers view climate change as a problem for their farm operations (*spatial* and *social nearness*), through abstraction transfer, they may start to construe it also as more real and urgent (*non-hypothetical* and *temporal nearness*).

CONTRIBUTIONS TO PRACTICE & THEORY

As its most pragmatic offering, this project can inform strategic communication between government, energy developers, rural communities, and landowners. Rural Albertan landowners will likely be most receptive to hearing about the economic rewards of hosting wind turbines. This demographic might also hold misconceptions about the environmental qualities of wind turbines, which could boost acceptance if addressed. Focusing on these topics will likely be productive as the sample predominantly expressed moderate opinions about wind energy, suggesting they are open to reforming their stance on wind development.

This study also reinforces that the way in which energy transition topics are communicated (e.g., by the media and politicians) will be vital for preventing social conflicts, mitigating further polarization around energy opinions, and keeping effective energy transition pathways open. In this province, the fossil fuel development and the status quo energy system are tied to Albertan identity (Santos, 2020). Communications that pit renewables against fossil fuels could exacerbate social divisions and be unhelpful for moving forward low-carbon policies.

A sizable chunk of respondents held strong (and likely rigid) climate denial beliefs. It would be challenging and probably unproductive to try and warm these Albertans up to renewables via climate science lessons. Government programs could quickly erode buy-in if they push renewables on rural Albertans on the grounds of emissions reduction. In particular, if government programs call on Alberta farmers to participate in climate mitigation and adaptation out of moral responsibility, they may turn off otherwise-willing participants from their programs. Like others (Arbuckle et al., 2013; Davidson et al., 2019), this study speaks to how agricultural and rural climate initiatives might be more successful if they skip the GHG talking points and focus on the financial aspects and benefits to the farm.

Alberta's rural and agricultural communities are on the front lines of climate change. With their livelihood bound to their land, its health, and its outputs, farmers will be deeply impacted by extreme weather, droughts, and increasingly variable climatic patterns. As the owners and stewards of large tracts of land, farmers are also crucial actors in mitigation and adaptation efforts. Adaptation actions can bring localized benefits (e.g., drought tolerance), but mitigation is primarily motivated by global benefits, namely GHG reductions. Asking farmers to bear costs of both adaption and mitigation raises questions about justice and power relations as rural communities tend to be hit hardest by climate and energy policies (Vodden & Cunsolo, 2021). Climate communication strategies calling for Alberta farmers to engage in climate action out of collective, moral responsibility may exacerbate perceived inequalities and social tensions along rural and urban divides.

Turning to a methodological contribution of this study, in Chapter 3, climate beliefs were measured with a 5-item scale that produced a high internal consistency. This scale could be reused as an effective, brief measure for a multi-dimensional assessment of climate beliefs. Studies often use a single variable to measure overall climate belief—e.g., only using risk perception (climate concern). However, in Chapter 3, having a lower risk perception was not predictive of wind opposition. If risk perception had been the only indicator of climate beliefs, the link between climate beliefs and wind opposition would have been missed. Additionally, using multiple belief dimensions allows for clustering respondents into more meaningful groupings, e.g., using the Realists/Skeptics demarcation instead of splitting respondents into Concerned/Unconcern or Certain/Uncertain groups.

STUDY LIMITATIONS

This research project used a survey approach—bringing strength in numbers but coming with a handful of limitations. A survey could reach many for generalizability. Yet, the sample was not entirely representative and was vulnerable to participation bias, so generalizing outwards should be done with caution. The results likely better represent male, landowning Albertan farmers than landowning Albertan farmers or rural Albertans.

Surveys also restrict how respondents can express their opinions. As noted by Batel et al. (2013), wind energy views are commonly measured in simple dichotomy—in particular, support versus opposition and acceptance versus non-acceptance—with the SARET field lacking consistency in empirical usage. Throughout this paper, for readability, I referred to different levels of wind acceptance as *support*, *neutral*, and *oppose*; however, I find it important to clarify that, following Batel et al., this study was assessing wind *acceptance* (how wind energy is perceived passively on a broad level), not wind *support* (active agreement with a specific or non-hypothetical wind project). This study does not speak to how landowners would feel about a wind farm popping up next door. Additionally, Batel et al. point out how there are more ways in which respondents can regard wind projects, like viewing them with excitement, indifference, or apathy, and this study did not capture these nuances.

The study was limited in its analytical capacity to assess the political polarization of wind acceptance and the ICs of climate beliefs. First, cross-sectional data cannot reveal whether wind energy is becoming more or less polarized. A longitudinal analysis would offer a more nuanced take on political polarization by treating it as a *process* (not a *state*). So, for this study, I mirrored Aguirre et al.'s (2021) cross-sectional data approach by visually inspecting the opinion distribution across lines of political ideology.

Second, in Chapter 3, I identified the Realist and Skeptic groups with a cluster analysis involving just five climate belief variables, but many more "dimensions" of climate beliefs can exist. Studies in the climate change communication field typically include more variables in their cluster analyses, such as behaviours, worldviews, values, and emotional reactions to climate change (e.g., Leiserowitz et al., 2021). Thus, the Realist versus Skeptic notion would be best used to *inspire* further attempts at identifying ICs for this demographic.

Another limitation of this research project was that the impacts of political ideology (Chapter 2) and climate beliefs (Chapter 3) on wind acceptance were assessed independently. I made this decision because the political ideology data was limited due to sample homogeneity and opt-out responses. There were few respondents to represent the left side of the political spectrum. Also, many respondents placed themselves as neither left-wing nor right-wing, but such a response may have multiple meanings (e.g., centrist, apolitical, or protest voting). That said, other studies have established a strong link between political factors and climate beliefs (Hornsey et al., 2016; Poortinga et al., 2019). It would be wise for researchers to account for both climate beliefs and political ideology in tandem when assessing wind acceptance, especially in petro-province contexts like Alberta.

FUTURE RESEARCH

Energy Politicization

While this study investigated political *polarization*, in Alberta, it would be wise to also examine the *politicization* of energy. Politicization is the "act of marking, or naming, something as political" (p. 21, italics removed) insofar that a thing, topic, or idea becomes recognized and discussed as a matter of politics (Wiesner, 2021). While this study did not detect political polarization around wind energy views, energy is generally a politically divided and heated conversation in the province (Marshall et al., 2018). This begs the question of whether Albertan culture and values are driving this tension, as it is possible that discourse from political elites may be more heated and divisive than the views held by the public. As discussed in Chapter 1, Alberta experienced a rivalrous 'doing and undoing' of legislation' in 2019, when the provincial government transferred to a new party, and energy was often at the heart of these changes and tensions. This very well could have pulled energy topics further into the political realm. It is worth exploring whether the politicization of energy and elite-level rhetoric is fueling public division more so that incompatible opinions, values, or identities across Alberta's rural–urban or right–left segments.

Ownership & Trust

Researchers could dive more deeply into ownership preferences by expanding on the work of Parkins et al. (2021). Since landowners expressed high trust for the fossil fuel sector, they may

be more accepting of wind projects owned by large, familiar oil and gas corporations more so than wind farms developed by foreign international firms or government-led or -owned projects. Local cooperative ownership may also foster positive relationships between rural communities and low-carbon transitions. With energy extraction so central to Alberta's history, culture, and identity, it is possible the same sense of entrepreneurial pride could be engendered if communities own, manage, and profit from renewable energy infrastructure. Community-owned wind energy has the potential to meet both the economic and cultural needs of Albertans, and its potential warrants further investigation in this context, as well as consideration from policy-makers.

Oil & Gas Narratives

Studies should also better explore how support for renewables is shaped by beliefs about oil and gas in Alberta. This study did not find a link between fossil fuel support and wind acceptance, but recent studies and polls (Santos, 2020, Schimpf et al., 2021) suggest these preferences would often be in conflict. This link could be assessed with choice experiments or ranking questions to factor in trade-offs, which would offer a more realistic assessment of preferences. Also, many narratives used to bolster the conventional energy system have done so by lowering the perceived necessity of renewables (Mann, 2021). For example, one residual question from this study revolves around how farmers assess energy technologies as being "environmentally friendly." In particular, it would be helpful to know if myths about wind energy or narratives about fossil fuels being ethical, clean, and green (Kuteleva & Leifso, 2020) have diminished the perceived need for renewables.

Accounting for Technological Innovation

While this study is oriented around the SAWE, some insights may speak to the SARET and the social acceptance of *new* energy technologies in Alberta. Given the rapid innovation in the energy space, studies on the SARET in Alberta and Canada would be wise to include social perceptions of newer energy technologies. For a few examples, new interprovincial transmission lines have been deemed necessary for achieving a net-zero electricity grid in Canada (Gorski et al., 2021). Still, new grid infrastructure (akin to wind turbines) comes with visual impacts and may face public pushback. Advancements in hydrogen technology and carbon capture could

hinder wind support as these innovations offer alternatives to deriving power from highly visible infrastructure. Rural, isolated communities stand to benefit from small modular reactors (SMRs). In Alberta, though, nuclear power has long been a quiet topic,[11] and the provincial government only recently committed to inter-provincial investments to advance the technology (Kost, 2020). Despite the potential benefits of SMRs, this study found nuclear energy was the least preferred energy source for rural landowners.

The technical possibilities for the Albertan energy system have greatly expanded, but these options may remain limited without social acceptance. Future studies on the SAWE and SARET in Alberta would be wise to explore in tandem the social acceptance of and beliefs about other energy technologies and innovations, including SMRs, high voltage transmission lines, carbon capture and storage, and hydrogen.

[11] Alberta's last public engagement and report on nuclear came out over a decade ago (Nuclear Power Expert Panel, 2009).

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Appendices

Appendix A – Questionnaire

Study title: Landowner preferences for wind energy development in Alberta

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Research Study

The purpose of this survey is to find out what rural Albertan landowners think about local energy infrastructure development—and wind turbines in particular. Information from this study may assist policy makers so that future energy projects can better serve rural communities.

This thesis research project is being conducted by a master's student of Rural Sociology at the University of Alberta. This project is funded by the Social Sciences and Humanities Research Council (SSHRC).

Survey Information

In this survey, we will ask for your opinions and knowledge about the energy industry and about wind energy. We will also ask you a series of questions about local wind energy development and how acceptable it would be to you under different conditions. There will also be questions about:

- your land,
- your relationship to your land and community,
- your thoughts on the economy, government, environment, and energy industry,
- and your values.

Time Commitment

You can take as much time as you need to complete this survey. We estimate that the survey will take you 20 minutes to complete.

Voluntary Participation

Participation in this study is voluntary. You may decline to answer questions even if participating in the survey. You may decide to withdraw from this study at any time by exiting out of the survey, and your data will not be collected. As no personal identifiers are attached to your data, you will not be able to withdraw from the study after you hit the "submit" button at the end of the survey.

Compensation

Monetary compensation for completed surveys will be administered directly through Kynetec. There are no other direct benefits to be expected from completing this survey.

Confidentiality & Data Security
Your responses will be confidential. Only the researchers listed above, and the Research Ethics Board at the University of Alberta will have access to the data. The researchers will never have access to any identifiable information such as your name, email address or IP address. All data will be stored in a password protected electronic format for at least 5 years. There are no costs and no reasonable, foreseeable risks from participating in this survey. Your answers will be used for research purposes only.

Ethics Approval
The plan for this study (Pro00084046) has been approved by a Research Ethics Board at the University of Alberta. If you have any questions about your rights or how research should be conducted, you can call (780) 492-2615. This office is independent of the researchers.

If you have any questions about this study, please contact the research team. Their contact information will appear again at the end of the survey.

Please select your choice below.

By clicking on the "agree" button below, I indicate that:

- I have read the above information, and
- I voluntarily agree to participate in this survey.

If I do not wish to participate in the research study, I will exit the survey by clicking "disagree."

Do you agree or disagree to take part in this voluntary research study?

Agree	Disagree

Section 1
In this first section, we will ask you questions about your land and the energy infrastructure on your land.

Q1. What is the full postal code of your farm (e.g., T2B 3K4)?

__ __ __ __ __ __

Q2. What is the total size of your farm?

____ acres

Q3. Are you a primary decision maker for this farm operation?

- ❑ Yes
- ❑ No

Q4. Do you have any of the following energy installations on your land? Check all that apply.

- ❑ Wind turbines

- ❑ Solar panels
- ❑ Biodigesters
- ❑ Oil and/or gas infrastructure
- ❑ None of the above

Q5. How likely are you to install renewable energy technology on your land (e.g., wind turbines or solar panels)?

- ❑ Very likely
- ❑ Likely
- ❑ Unlikely
- ❑ Very unlikely

Section 2
In this section, we will ask for your opinions on energy development.

Q6. In general, to what extent do you support or oppose further development of the following energy sources in Canada?

	Strongly oppose	Oppose	Neither support nor oppose	Support	Strongly support	I don't know
Oil (from oil sands/ tar sands)	❒	❒	❒	❒	❒	❒
Wind	❒	❒	❒	❒	❒	❒
Hydroelectric	❒	❒	❒	❒	❒	❒
Geothermal	❒	❒	❒	❒	❒	❒
Nuclear	❒	❒	❒	❒	❒	❒
Coal	❒	❒	❒	❒	❒	❒
Solar	❒	❒	❒	❒	❒	❒
Bioenergy (from wood, waste, plants, alcohol fuels)	❒	❒	❒	❒	❒	❒
Oil (from sources other than oil sands/tar sands)	❒	❒	❒	❒	❒	❒
Natural gas	❒	❒	❒	❒	❒	❒

Q7. In general, how important are topics relating to Alberta's energy sector to you?

Not at all Important	Slightly Important	Moderately Important	Very Important	Extremely Important
❑	❑	❑	❑	❑

Section 3

In this next section, we will present you with six hypothetical scenarios about wind energy development in your county/municipality. These scenarios are randomly generated. Carefully read each scenario and rate it based on how acceptable or unacceptable it seems to you.

Example Question:

Given this situation and the assumptions stated before, how acceptable or unacceptable does this wind energy development sound to you?

Completely Unacceptable				Neither acceptable nor unacceptable						Completely Acceptable
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5

Completely Acceptable means the scenario seems 100%, perfectly acceptable to you.
Complete Unacceptable means the scenario seems 100%, perfectly unacceptable to you.

Although these are hypothetical scenarios and some may not seem like "real" options, please respond as if you were actually in that situation. The results from this section may be used to guide policymakers and help make Alberta's energy system work better for rural communities.

Please read carefully

You may have more thoughts on wind energy, and we will be asking you more about that later in the survey. For the purposes of this scenario task, please assume that any concerns related to financial feasibility, impacts on the environment and wildlife, and human health will NOT be an issue.

In other words, these described wind farms will be safe (for humans and animals), profitable, and have enough wind.

Also, for these scenarios, assume the following benefits:

- A local wind farm will generate local tax revenue for your county/municipality,
- Landowners hosting wind turbines will receive substantial lease payments.

Please keep these assumptions in mind as you rate the scenarios. You will NOT be able to go back and change your answers.

(Each scenario is on a new page, and respondents cannot go back and change their answers)

Scenario 1

Insert randomly selected vignette (e.g., There is an opportunity for a local cooperative to develop a wind farm on your neighbours' property (5 km away). For projects like this, other residents living nearby will all receive some compensation based on their proximity to the turbines. All county residents will be invited to express concern about the project. Meanwhile, details about the lease payments and compensation amounts will be available to anyone directly affected by the project.)

Given this situation and the assumptions stated before, how acceptable or unacceptable does this wind energy development sound to you?

Completely Unacceptable					Neither acceptable nor unacceptable					Completely Acceptable
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5

Scenario 2

Insert randomly selected vignette

Given this situation and the assumptions stated before, how acceptable or unacceptable does this wind energy development sound to you?

Completely Unacceptable					Neither acceptable nor unacceptable					Completely Acceptable
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5

[Repeat for Scenarios 3-6]

All in all, how difficult or easy was it to rate these scenarios?

Very difficult					Neither difficult nor easy					Very Easy
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5

Would you like to explain a bit about why these scenarios were difficult or easy for you to rank?

- ❑ Yes (explain): _____
- ❑ No

Section 4
Next, we want to know more about your thoughts on wind energy and wind turbines.

Q8. Tell us about your experience with wind turbines. Please check all that apply.

- ❑ I have seen/heard a wind turbine before
- ❑ I have been approached by a wind energy developer
- ❑ There are wind turbines near my farm
- ❑ I see or hear wind turbines often
- ❑ I have seen, read or heard a lot about wind turbines in the news

❑ I have heard a lot about wind turbines from friends, family, or members of my community ❑ None of the above

Q9. In general, how much do you know about wind energy/wind turbines?

❑ Nothing at all	❑ A little bit	❑ A moderate amount	❑ Quite a bit

Q10: How much do you agree or disagree with the following statements about wind turbines?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	I don't know
Wind turbines are too noisy	❒	❒	❒	❒	❒	❒
Wind turbines are an environmentally friendly technology	❒	❒	❒	❒	❒	❒
Since the wind is not always blowing, we should not waste our time putting up turbines	❒	❒	❒	❒	❒	❒
Turbines spoil the beauty of rural landscapes	❒	❒	❒	❒	❒	❒
A wind farm would be a good thing for my county's local economy	❒	❒	❒	❒	❒	❒
There should be more wind turbines in Alberta	❒	❒	❒	❒	❒	❒

Q11. We have some questions about wind energy and wind turbines. After you select true or false, indicate how confident you are with your answer.

	True	False	Not at All Confident	Somewhat Confident	Very Confident
10% of bird deaths in Canada are caused by wind turbines	❒	❒	❒	❒	❒
In their lifetime, wind turbines will <u>only</u> produce as much energy as it took to manufacture, transport and build them	❒	❒	❒	❒	❒
In Alberta, wind is the cheapest way to generate electricity, even cheaper than natural gas	❒	❒	❒	❒	❒
The majority of Canadians do not support wind energy development	❒	❒	❒	❒	❒

Q12. Imagine that some wind turbines were going to be developed within one kilometre of your property. How concerned or not concerned would you be about the following aspects. Please state your level of concern on a scale from 1 to 10.

	Not at all concerned									Extremely concerned	I don't know
	1	2	3	4	5	6	7	8	9	10	
Effect on property values	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Visual Impacts	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Noise or auditory Impacts	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Effects on local environment/ecosystems	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Community/neighbour conflict	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Impact on farming/ ranching practices	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Changes to electricity prices	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Decommissioning of old/ageing turbines	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Health and/or safety	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Fairness of the development processes	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Fairness of the compensation payments	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒

Section 5
Thinking about our energy system more broadly, we want to know your thoughts about Alberta's energy industry, the government, and the economy in general.

Q13. How much do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

I support policies that do what is best for everyone, even if it means I get a slightly worse deal	❒	❒	❒	❒	❒
People should always have the right to refuse nearby energy projects, especially if it could impact them	❒	❒	❒	❒	❒
Alberta should continue to grow the oil and gas industry	❒	❒	❒	❒	❒
The forces of supply and demand work best, so government regulations should be kept to a minimum in the energy industry	❒	❒	❒	❒	❒
As a general rule, less spending of public money in the energy sector will be better	❒	❒	❒	❒	❒
Alberta should strive to have more renewable energy	❒	❒	❒	❒	❒
I support large-scale, fast changes to Alberta's energy system	❒	❒	❒	❒	❒

Section 6
Here, we want to find out how you think about different organizations and groups.

Q14. How much do you trust or distrust the following groups, generally speaking?

	Fully distrust									Fully trust
	1	2	3	4	5	6	7	8	9	10
Your local community	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
People, in general	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
The oil & gas industry	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Renewable energy industry	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Government	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒
Scientists/Academics	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒

Q15. Businesses and organizations can come in many different forms. Tell us how much you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Cooperatives are an inefficient business model in today's marketplace	❒	❒	❒	❒	❒
My local government should not take on any big projects that might be risky, like owning energy infrastructure	❒	❒	❒	❒	❒
I don't see any issue with getting our energy from private utility companies. They get the job done	❒	❒	❒	❒	❒
I'd rather be part of a cooperative than buy from a private company, even it wasn't as good of a deal for me	❒	❒	❒	❒	❒
The bigger the business, the less they care about the little guys	❒	❒	❒	❒	❒
Local energy projects should involve our local government so that the county as a whole can benefit	❒	❒	❒	❒	❒

Section 7
Now, some questions about how you view your land and the natural world.

Q16: How much do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My land is a big part of my identity	❒	❒	❒	❒	❒
The wildlife on my property is less important than my crops or livestock	❒	❒	❒	❒	❒
I protect the health of my land to the best of my ability	❒	❒	❒	❒	❒
My farming practices conflict with nature	❒	❒	❒	❒	❒
I would be upset if my land was changed greatly	❒	❒	❒	❒	❒
I am concerned about how humans are affecting natural environments around the world	❒	❒	❒	❒	❒

We will all be affected by issues like plastic pollution and global species loss	❒	❒	❒	❒	❒
Our planet will be fine—we do not need to "protect" it	❒	❒	❒	❒	❒
I am proud to call myself an environmentalist	❒	❒	❒	❒	❒

Q17: How much do you agree or disagree with the following statements about climate change?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am very concerned about climate change	❒	❒	❒	❒	❒
We still do not know for sure whether climate change is real or caused by human	❒	❒	❒	❒	❒
Climate change will not be an issue here in Alberta	❒	❒	❒	❒	❒
Alberta adopting renewable energy will help reduce climate change impacts	❒	❒	❒	❒	❒
Alberta has a responsibility to greatly reduce its CO2 emissions	❒	❒	❒	❒	❒

Section 8
In this section, we want to know what you think about your local community (i.e., your neighbours and other people in your municipality/county).

Q18: Reflecting on the community near your property, how much do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel strongly attached to the community I live in	❒	❒	❒	❒	❒
There are many people in my community who are similar to me	❒	❒	❒	❒	❒
I often talk about my community as being a great place to live	❒	❒	❒	❒	❒
My local community is an important part of who I am	❒	❒	❒	❒	❒

People here are indifferent about supporting local enterprises	❒	❒	❒	❒	❒
For the most part, my local community would be excited about a new wind farm	❒	❒	❒	❒	❒
I would be considered rude if I didn't talk to my neighbours before making decisions about my land that could affect them	❒	❒	❒	❒	❒
Farmers in this county greatly disapprove of people who take more than their fair share	❒	❒	❒	❒	❒
Poor stewardship of one's land is greatly frowned upon here	❒	❒	❒	❒	❒
In this community, it doesn't matter as much about *how* a decision is made, rather only that the outcome is fair	❒	❒	❒	❒	❒

Section 9
This is the final section. We will ask you a few questions about yourself. This demographic information helps us know that we have collected a broad range of perspectives from rural Albertans.

Q19: Your gender

- ❑ Male
- ❑ Female
- ❑ Prefer not to say

Q20: Your age

- ❑ 18 to 24
- ❑ 25 to 34
- ❑ 35 to 44
- ❑ 45 to 54
- ❑ 55 to 64
- ❑ 65 to 74
- ❑ 75 or older
- ❑ Prefer not to say

Q21. How would you describe your political orientation?

Very left wing					Neither left wing nor right wing					Very right wing
-5	-4	-3	-2	-1	0	1	2	3	4	5
❒	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒

❒ Prefer not to say

Q21a. What party best represents your political views, whether or not you vote?

- ❑ NDP
- ❑ Liberal
- ❑ Conservative
- ❑ Green
- ❑ Other
- ❑ Prefer not to say
- ❑ I don't know

Q22. Does anyone in your household or immediate family work for any of the following energy-related industries? Check all that apply.

- ❑ Electric Utility
- ❑ Energy Regulator
- ❑ Government department/ministry
- ❑ Oil and/or gas
- ❑ Coal
- ❑ None of the above
- ❑ Solar
- ❑ Hydroelectric
- ❑ Biofuel
- ❑ Geothermal
- ❑ Wind

Q23. What approximate share of your household's income comes from farming?

- ❑ 0%
- ❑ 1-25%
- ❑ 26-50%
- ❑ 51-75%
- ❑ 76-100%

Q24. Based on the percentage of your gross farm sales, how would you classify your farming operation?

❑ Primarily crops	❑ Primarily livestock	❑ Mixed operation
❑ Other (please specify): ___		

Q25. Do you have any comment or questions for us?

(Long answer option)

Thank you for your input. We would like to remind you that your data is completely confidential. After you hit the submission button below, you will not be able to withdraw from the study.

SUBMIT & COMPLETE SURVEY

If you have any questions about this study, please contact the research team:

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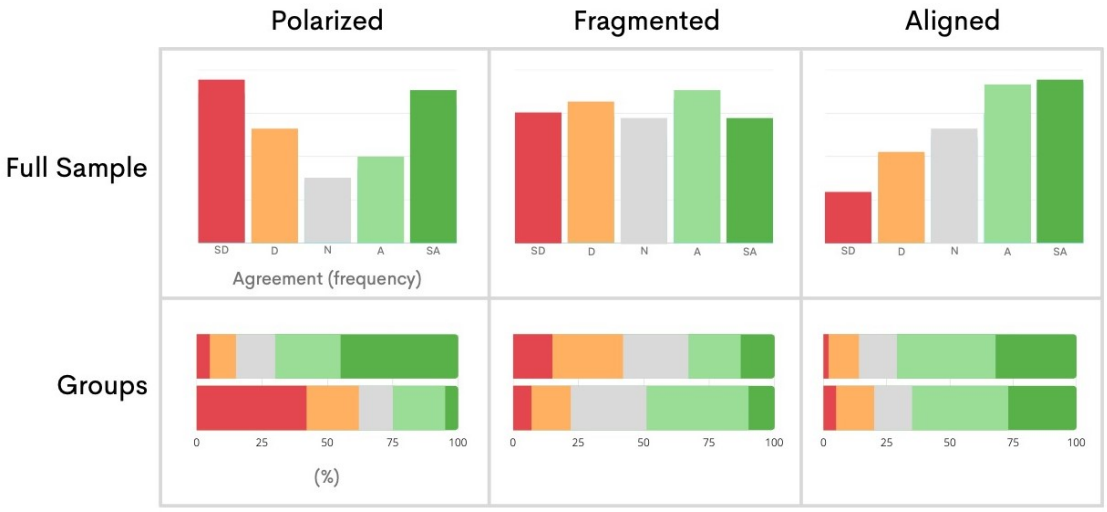
Appendix B – Opinion Patterns for Assessing Polarization

Figure 8. Three possible patterns in public opinion



Note. Scheme borrowed from Aguirre et al. (2021). This figure visualizes three patterns in public opinion, which can be assessed in two ways: for a full sample or between subgroups in the sample. First, if the full sample demonstrates a pattern where the scale ends are highly selected (e.g., *Strongly disagree and Strongly agree*), there is polarization in opinion within the sample. If the two groups show high frequencies for the opposing, "extreme" scale-end options, there would be polarization in the sample. Next, a population could express fragmented views on a whole or between subgroups. Fragmented patterns indicate diverse, moderate views. Last, a population could align in their views, showing a pattern where the sample leans toward agreement or disagreement. Two groups could also align in their views by having similar distributions.

Appendix C – Sample Characteristics

Table 7. Sample characteristics compared to the Albertan farmer population

	Survey Sample		Alberta Farmers[a]	
Variables	*f*	%	*f*	%
Gender				
Male	361	90	39,845	69
Female	39	9.8	17,760	31
Prefer not to say	1	0.2		
Age Category (years old)[b]				
18–34	13	3.2	4,910	8.5
35–54	125	31.2	20,155	35.0
55+	259	64.6	32,535	56.5
Prefer not to say	4	1		
A primary decision-maker on farm				
Yes	389	97		
No	12	3		
Farm size (acres)[c]				
<239	18	4.5	14,878	36.6
240–1599	169	42.1	17,699	43.6
>1600	214	53.4	8,061	19.8
Farm type				
Primarily crops	206	51.6		
Primarily livestock	47	11.78		
Mixed (crops & livestock)	146	36.6		
Household income from farming				
0–26%	18	4		
26–50%	45	11		
51–75%	70	17		
76–100%	268	67		
Has energy infrastructure on-farm				
Oil/gas	244	60.8		
Solar panel(s)	51	12.7		
Wind turbine(s)	10	2.4		
Biodigestor(s)	0	0		

Note. $N = 401$. All variables in survey sample are self-reported.

[a]Data from 2016 Census of Agriculture (GOA, 2018a; Statistics Canada, 2016). [b]Age data collected with seven ranges (18–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75+) and grouped to match census data ranges. [c]Farm size was collected as continuous data and displayed in three sizes for simplicity.

Appendix D – Descriptive Statistics

Table 8. Energy preferences, wind energy beliefs, trust and social norms

Variables	*M*	*SD*	*N*	*min*	*max*
Wind acceptance[a]	2.96	1.28	387	1	5
Beliefs about wind turbines[a]					
Unaesthetic	3.49	1.20	398	1	5
Noisy	3.31	.95	360	1	5
Unreliable	2.92	1.14	392	1	5
Not helpful for local economy	2.90	1.28	389	1	5
Not environmentally friendly	2.87	1.22	396	1	5
Trust for stakeholders[b]					
Local community	6.73	1.93	401	1	10
Fossil fuel industry	6.08	2.11	401	1	10
Renewable industry	5.14	2.07	401	1	10
Government	3.58	2.13	401	1	10
Academics/scientists	5.43	2.35	401	1	10
Perceived norms of local wind support	2.58	1.02	401	1	5
Support for fossil fuel development[c]	4.18	.65	401	2.33	5
Support for further renewable development[c]					
Hydroelectric	4.07	.90	396	1	5
Bioenergy	3.98	.79	372	1	5
Solar	3.94	.97	401	1	5
Geothermal	3.92	.86	383	1	5
Wind	3.44	1.21	397	1	5
Support for further non-renewable development[c]					
Natural gas	4.51	.60	401	2	5
Oil (from oil sands/tar sands)	4.43	.71	400	1	5
Oil (from non-oil sands)	4.27	.73	399	1	5
Coal	3.62	1.13	394	1	5
Nuclear	3.05	1.27	383	1	5

Note. $N = 401$. Total responses varied as respondents could opt out *(I don't know).*

[a]*Strongly disagree* (1) to *Strongly agree* (5). [b]*Fully distrust* (1) to *Fully trust* (10). [c]S*trongly oppose* (1) to *Strongly support* (5).

Appendix E – Predictor Variables by Wind Acceptance Level (Ch. 2)

Table 9. Average ratings for predictor variables sorted by wind acceptance level

	Level of wind acceptance		
	Oppose	Neutral	Support
Conservative Beliefs			
Anti-public spending	4.14	3.69	3.50
Anti-regulation	4.06	3.70	3.42
Pro-property rights	3.95	3.54	3.47
Anti-change	3.94	3.66	3.03
Individualism	4.48	5.61	6.14
Climate concern	2.34	2.92	3.37
Trust variables			
Oil/gas industry	6.57	5.92	5.76
Renewables industry	4.07	5.23	6.07
Government	2.67	3.78	4.27
Scientists/academics	4.48	5.61	6.14
Wind support norms	1.80	2.75	3.17
Support fossil fuel scale[a]	4.40	4.10	4.06

Note. N = 401. All variables run from 1 (*Strongly disagree*) to 5 (*Strongly agree*) except for trust variables, which span from 1 (*Fully distrust*) to 10 (*Fully trust*).

[a]Average score for support of oil (tar sands), natural gas, and coal development.

Appendix F – Correlation Matrix (Ch. 2)

Table 10. Spearman's correlation matrix for variables in ordered logistic models

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
Conservative beliefs[a]																
a. Anti-public spending																
b. Anti-regulation	.47***															
c. Pro-property rights	.08†	.00														
d. Anti-change	.22***	.16**	−.01													
e. Individualism	.02	.06	.09†	.17***												
f. **Climate concern**[a]	−.32***	−.34***	.02	−.39***	−.09†											
Trust[b]																
g. Oil/gas industry	.11*	.28***	−.01	.11*	−.03	−.23***										
h. Renewable industry	−.21***	−.16**	−.13*	−.37***	−.19***	.33***	.29***									
i. Government	−.25***	−.28***	−.13**	−.29***	−.23***	.31***	.04	.43***								
j. Scientists	−.16**	−.22***	−.07	−.21***	−.18***	.37***	.05	.45***	.52***							
k. **Wind support norms**	−.28***	−.21***	−.24***	−.33***	−.13**	.30***	−.04***	−.39***	.30***	.19***						
Wind energy beliefs[a]																
l. Noisy	−.25***	.18***	.28***	.13*	.12*	−.18***	.04	−.33***	−.28***	−.22***	−.41***					
m. Not environmental	−.27***	.22***	.17***	.29***	.06	−.34***	.17***	−.40***	−.23***	−.28***	−.51***	.42***				
n. Unreliable	−.26***	.32***	.18***	.24***	.13*	−.33***	.13*	−.34***	−.19***	−.24***	−.47***	.39***	.53***			
o. Unaesthetic	−.27***	.19***	.26***	.27***	.12*	−.22***	.11*	−.34***	−.23***	−.21***	−.49***	.51***	.47***	.43***		
p. Not help economy	.20***	.24***	.23***	.28***	.12*	−.29***	.10*	−.36***	−.29***	−.26***	−.58***	.43***	.63***	.52***	.44***	
q. **Wind acceptance**[a]	−.27***	−.27***	−.22***	−.36***	−.16**	.37***	−.17***	.43***	.32***	.30***	.61***	−.45***	−.69***	−.58***	−.53***	−.75***

Note. $N = 401$. Correlations use pairwise deletion to accommodate missing variables. [a]Recorded on 5-point Likert scales from *Strongly disagree* (1) to *Strongly agree* (5). [b]From *Not at all concerned* (1) to *Extremely concerned* (10). [c]Average of support for coal, Albertan oil, and natural gas rated from *Strongly oppose* (1) to *Strongly support* (5).

†$p<.10$. *$p<.05$. **$p<.01$. ***$p<.001$.

Appendix G – Correlation Matrix (Ch. 3)

Table 11. Spearman's correlations for variables in binomial logistic models

	a	b	c	d	e	f	g	h	i	j	k	l
Climate change beliefs												
a. Climate belief scale[ab]												
b. Skeptic *(vs Realist)*[b]	−.80***											
Dimensions of climate beliefs[b]												
c. *Concern*	.85***	−.63***										
d. *Certainty*	.64***	−.42***	.42***									
e. *Local impact*	.76***	−.49***	.64***	.40***								
f. *Efficacy-responsibility*	.88***	−.79***	.67***	.43***	.52***							
Trust[c]												
g. Oil/gas industry	−.27***	.21***	−.23***	−.14**	−.29***	−.23***						
h. Renewable industry	.41***	−.39***	.33***	.22***	.27***	.42***	.29***					
i. Government	.37***	−.33***	.31***	.21***	.25***	.37***	.04	.43***				
j. Scientists	.37***	−.26***	.37***	.22***	.33***	.30***	−.05	.45***	.52***			
k. Oil industry−science gap	−.48***	.34***	−.45***	−.29***	−.46***	−.39***	.61***	−.11*	−.35***	−.72***		
l. **Norms of wind support**[b]	.36***	−.32***	.30***	.20***	.18***	.38***	−.04	.39***	.30***	.19***	−.18***	
m**. Wind acceptance**[b]	.47***	−.43***	.37***	.27***	.31***	.50***	−.16***	.43***	.32***	.30***	−.35***	.61***

Note. N = 401.[a]Average of the five climate beliefs. [b]Recorded on 5-point Likert scales from *Strongly disagree* (1) to *Strongly agree* (5). [c]*Not at all concerned* (1) to *Extremely concerned* (10).

*p<.05. **p<.01. ***p<.001.