



# Carbon Management: Changing Attitudes and an Opportunity for Action

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# Executive Summary

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The US energy industry is in the early stages of an energy transition with a focus on decarbonization. Despite these efforts, the immense scale of decarbonization required, while providing society with more, affordable, and sustainable energy, necessitates all stakeholders to contribute to the energy transition. Governments, producers, and consumers must collaborate to advance technology, policy, and regulatory shifts, invest in low-carbon technologies, and incentivize carbon management. These efforts can gain firm anchorage from public support and consumer willingness to partially cover the costs of the energy transition. At a time when climate, social, and economic concerns need urgent prioritization, public opinion will be a powerful driver of the US response on carbon management, climate change, and the future of sustainable energy.

In October 2020, the Hobby School of Public Affairs and UH Energy conducted an online survey to assess public opinion and attitudes toward climate change and carbon management, support for carbon mitigation policies, support for research and development of technologies for decarbonization, and the willingness to pay for low-carbon energy products. This survey included responses of 1,000 individuals aged 18 and above, residing in all 50 US states and the District of Columbia. The survey also included an oversample of 500 residents of the state of Texas for a total sample of 1,500 respondents.

These key themes emerged from survey responses:

- Four out of five respondents believe that climate change is happening and more than three out of five believe that it is anthropogenic in origin.

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- About four out of five respondents held the oil and gas industry and governments of developed countries responsible for climate change, but few blamed individual consumption preferences.
  - Climate change is still viewed as a distant threat, with respondents more concerned about future generations experiencing harm from climate change as compared to themselves.
  - There is broad support for the adoption of carbon management and its incentivization through governmental action and policy changes. A majority of respondents support investing the money collected by a price on emissions on research and development related to energy and the environment.
  - Despite the support, knowledge about several globally employed climate and carbon mitigation policy instruments was found to be cursory.
  - In general, respondents are willing to pay higher prices for low-carbon energy but only to the extent that they feel they can afford to do so. A majority of respondents did not want to internalize the full cost of different energy transition alternatives.
  - Among the alternatives presented, respondents were more willing to pay more for low-carbon energy sourced from renewable energy than from traditional low-carbon sources, such as natural gas, even though the cost of doing so is higher.
  - In a remarkable shift from the past, public opinion in Texas resembles that in other US states on climate change concerns, carbon management, and willingness to pay.
  - Carbon management was ranked highly on attitudes toward sectoral growth and job prospects. The relative ranking of oil and gas, manufacturing, wind, and solar industries suggested a preference for an all-of-the-above energy strategy. Respondents were optimistic about the future of carbon management and willing to embrace the new markets and products it will create.

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The knowledge gaps toward the policy instruments and the technology and economic implications of different mitigation alternatives suggest an urgent need for comprehensive public education with clear and consistent messaging.

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# Individual Concerns about Climate Change and Attitudes Toward Carbon Management

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## 1.1 Introduction

The energy sector is in the midst of a fundamental transformation. Drivers of this transformation are largely attributed to concerns about the anthropogenic generation of greenhouse gases stemming from the extraction, production, and use of fossil energy - some of these are internal to the industry and others come from external opportunities and constraints. Some of these constraints and opportunities are grounded in politics, particularly in individuals' attitudes and support for policies aimed at securing access to sustainable energy, reducing greenhouse gas emissions, and achieving a lower carbon future. In theory, there is a simple and widely agreed upon way to address this problem: implementing decarbonization technologies and increasing the price of carbon so that it is closer to the true social costs of those emissions. Reducing greenhouse gas emissions that are linked to climate change could be done through the implementation of decarbonization technologies, taxation, subsidies, quotas, or regulation of the activities that have the greatest impact. Yet, it has become apparent that despite expressing concerns about climate change, economic agents and individuals are often reluctant to internalize the true costs when making their consumption and production choices. The problem is compounded by the fact that while beneficial to the society as a whole, the cost of policy interventions are not evenly distributed. Such policy changes also have direct and severe impacts on the workforce, the most vulnerable populations, and the economy, with global spillover. Moreover, while the costs of climate related economic interventions are immediate and ongoing, the benefits

of the policy interventions are probably derived much later.

An additional roadblock to promoting the adoption of carbon management and mitigation policies is associated with the lack of information and uncertainty about what works and what does not. Individuals face a steep learning curve to acquire information and learn about the underlying problems, the proposed solutions, and the costs and trade-offs associated with the implementation of policies.

Lastly, changing the price of carbon affects consumers and incentivizes energy producers to invest in cost-effective technologies that would result in lower carbon emissions and cleaner environment. Yet, governments often prefer targeted subsidies and regulations that are not as effective at mitigating emissions, but are politically expedient and enduring.<sup>1</sup>

Large emitters could mobilize to oppose any form of policy intervention that increases their costs of doing business. But, push-back from the public, investors, and non-governmental organizations (NGOs) can encourage firms and sectors to reconsider their stance by increasing their costs of doing business. The movement to divest is gaining momentum, and there is also compelling evidence that young workers who are considering careers in the oil and gas industry take environmental stewardship practices by potential employers into account when assessing their job choices.<sup>2</sup> The tide is changing even in a state like Texas: younger voters and those who moved to Texas from other states seem less wedded to the “no taxes” credo; the result is that on average Texans, along with residents in the rest of the country, are willing to pay for policies that result in outcomes they value, including policies and regulations that promote low-carbon energy.

The Texas Legislature is now ready to consider initiatives aimed at curbing methane flaring/venting and other forms of carbon emissions in its next session, set to begin on January 12. Greater public awareness of the effects of reducing carbon emissions, restricting flaring/venting of methane into the atmosphere, and promoting carbon management practices could play an important role in the cost-effectiveness of the proposals developed. To contribute to this debate the Hobby School of Public Affairs at the University of Houston and UH Energy

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<sup>1</sup>Mankiw, G.N. (2009); Bueno de Mesquita (2016)

<sup>2</sup>Kennedy, R., and P.M. Pinto (2019)

conducted a survey of Americans' attitudes toward climate change and climate change mitigation policies, such as a carbon tax. The survey was fielded online between October 15 and 22, 2020 and includes an over-sample of 500 respondents from Texas.

## 1.2 Summary of Findings

Our survey and this report provide insights into individuals' attitudes toward emissions reduction and carbon mitigation policies, the adoption of carbon management, and the future of low-carbon energy in the US. We find that reducing the human carbon footprint is a salient concern among respondents, with an anticipation that climate change is likely to significantly impact future generations. Surprisingly, we found that respondents from Texas, the center of energy production in the country, were almost in lockstep with the national trends regarding climate change, the anthropogenic nature of climate change, and its substantial impacts on future generations. These concerns translate to expectations of policy changes and environmental stewardship practices by government, the energy industry, and consumers. Yet, respondents were not particularly familiar with the proposed policy instruments. Respondents expressed the willingness to pay higher prices for fuel, electricity, and gas, as well as for the adoption of carbon management practices to mitigate greenhouse gas emissions, as long as the price increases are not too steep.

### Texas and the rest of the country

Texas is the largest energy producer and consumer in the country. Given its reliance on the oil and gas industry, public opinion on climate change and emissions reduction in Texas has largely favored the status quo. Historically, this has resulted in a pronounced divide between Texans and the rest of the US on most issues of energy and the environment.<sup>3</sup>

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<sup>3</sup>New York Times (2019)

## 1.2. Summary of Findings

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Our survey suggests that there has been a significant shift in public opinion in Texas, with respondents expressing views similar to those in the rest of the country. In addition to the political and demographic changes from a growing young population and increased domestic and foreign migration, changes in the oil and gas industry, and the energy industry at large, are being observed in Texas.

First, the sharp growth of wind energy, the impending growth of solar energy, and the switch from coal to cleaner-burning natural gas have helped Texas diversify its energy mix. Over time, the diversification has proven to be cost-competitive and strategic, providing Texans with cheaper, reliable, and sustainable electricity and supporting state and national economic growth.<sup>4</sup>

Second, with the growth of natural gas and shale oil production in Texas, energy exports have fueled the state's economy and helped the US become a net energy exporter for the first time since the 1950s.<sup>5</sup> The natural gas boom has transformed global markets and the Gulf Coast economy through the growth of sectors like petrochemicals, plastics, and consumer goods, while also adding new jobs in construction and manufacturing.<sup>6</sup>

Lastly, many energy companies headquartered in Houston are striving to maintain their social license to operate. With increasing global pressure to decarbonize, the flight of capital away from the oil and gas industry, the enforcement of greenhouse gas mitigation and environmental, social, and governance (ESG) principles by venture capital groups, many of the companies have committed to leading the energy transition.<sup>7</sup> As reflected in the responses, these changes have also induced an unprecedented convergence of public opinion in Texas with the rest of the country on carbon management and the willingness to pay for low-carbon energy.

The convergence points to a pivotal moment for policy and regulatory shifts. As a first-mover in the energy industry, the consensus in Texas can accelerate the energy transition at the national and global levels. This presents a unique opportunity for state and federal legislators to lock in long term climate and carbon mitigation

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<sup>4</sup>PUCT (2020)

<sup>5</sup>US EIA (2020c)

<sup>6</sup>Hegar, G. (2016); Krishnamoorti, R. (2017); Radhakrishnan, S., Krishnamoorti, R., and A. Datta (2019)

<sup>7</sup>OGCI (2019); API (2020); Fink, L. (2020)

policies.

### **Knowledge about carbon mitigation policies**

While there is broad-based support for reducing emissions and concern about climate change, our survey found that respondents had a cursory knowledge of climate policies and mitigation efforts, such as cap and trade. By far the most recognized policy was the carbon tax, with 61% of respondents reporting to have heard or read about a carbon tax. Less than two-fifths of respondents, by contrast, had ever heard of globally deployed practices such as cap and trade or emissions trading systems.

When it comes to attributing responsibility for climate change, respondents overwhelmingly blamed governments and industry - with the exception of the meat and dairy industry - as opposed to their own individual behavior. Seventy-three percent of respondents reported governments of developed countries, as well as the oil and gas industry were somewhat or very responsible for climate change (see Figure 3.15). Seventy-one percent, 69%, and 68% of respondents believed the transportation industry, governments of developing countries, and the coal industry, respectively, were somewhat or very responsible for climate change.

Despite the fact that individual consumption behavior is one of the biggest contributors to climate change, only 58% of respondents laid blame with their own individual consumption and behavior. However, among those respondents with more knowledge about environmental impacts, 78% believed individual consumption and behavior to be somewhat or very responsible for climate change. Overall, attribution of responsibility was much higher among respondents with more issue knowledge (see Figure 3.16). While respondents' level of knowledge conditioned how they viewed responsibility for climate change, it was not associated with recognition of key climate policies and mitigation efforts (see Figure 3.17). Evidently there is a need for comprehensive public education with clear and consistent messaging on the mitigation strategies available to address climate change.

### **Willingness to pay for low-carbon energy**

To gauge respondents' willingness to pay for low-carbon energy, we asked a battery of questions with different scenarios about changing prices of gasoline and electricity that would be required to attain carbon neutrality. Research suggests that a carbon-neutral fuel, which does not add any new emissions to the atmosphere upon combustion, can be produced and sold in US markets, based on current energy prices, at approximately \$4 per gallon, or an increase of \$1.70 per gallon from the current national average. A majority of respondents are not willing (32%) or cannot afford (27%) to pay \$1.70 more per gallon of fuel. Yet, three in four respondents are willing to accept extra costs ranging between \$1 and \$5 for pumping carbon-neutral fuel. This suggests that despite their penchant for blaming industry and governments for climate change, consumers recognize the importance of curbing greenhouse emissions and are willing to internalize the cost of their carbon footprint to the extent that they can afford it. However, when the full cost for carbon neutrality is passed on to the consumer, respondents clearly demonstrated that they were unwilling or unable to afford the increase.

We also assess respondents' willingness to pay higher prices for electricity under the scenarios of having 100% renewable electricity, natural gas-based electricity which is produced without venting and flaring, and electricity that is produced with a price of \$40 per ton of carbon dioxide on emissions for their homes. One in four respondents are willing to pay up to \$10 more per month, 37% would pay between \$11 and \$50 more, and about 25% would pay more than \$50. In Texas, a similar share of respondents are willing to pay up to \$10 and between \$11 and \$50 as the national sample, but a greater share, 35%, are willing to pay more than \$50.

Ninety-two percent of respondents in other US states and 88% of those in Texas are willing to pay more for natural gas-based electricity that can be produced without flaring or venting. An overwhelming majority of respondents are willing to pay for electricity that is produced by paying a carbon price, indicating greater acceptance for the policy than previously observed. Similar shares of Texans (23%) and respondents from other states (20%) are willing to pay \$50 or more.

We found that 21% of respondents are willing to pay between \$1 and \$10 more for electricity produced with a \$40 price on emissions. Thirty-seven percent were will-

ing to pay between \$11 and \$50 more, and 16% more than \$50. Texans expressed similar willingness to pay for electricity produced with a price on the emissions.

Willingness to pay higher prices for low-carbon energy suggests two significant findings. First, the public is willing to pay higher amounts for a 100% renewable energy system. However, this would be a slow transition to a low-carbon future, given the cost and scale of the challenge. On the other hand, controlling venting and flaring of methane from natural gas can significantly reduce emissions, lead to immediate climate benefits, and a quick transition to a low-carbon future. Yet, a smaller share of respondents were willing to pay the same amount for that as for renewable energy. Again, this indicates a lack of public education about the merits of different mitigation alternatives. Second, there is overwhelming similarity between Texans and respondents from other states on how much they are willing to pay for low-carbon energy.

While we have not fully explored the theme of partisanship in this report, we did find some partisan differences in concerns about the negative impact of climate change. Nevertheless, there was broad bipartisan consensus on the need to adopt carbon management in the energy industry, and for the government to support, incentivize, and promote carbon management.

### **The future of carbon management**

Carbon management was ranked highly on sectoral growth and job prospects. Nearly a third of the respondents believe that the carbon management industry will witness the most job growth over the next decade. The relative ranking of oil and gas, manufacturing, wind, and solar industries suggested a preference for an all-of-the-above energy strategy. Additionally, it suggests that the oil and gas industry can continue to grow, with public support, if the goal of emissions reductions and climate change mitigation are prioritized instead of picking winners and losers amongst energy and technology alternatives.

The next section introduces our survey and sample. In the ensuing chapters we discuss the results of the survey in depth.

## Overview of Survey and Respondents

This report includes responses from a recent survey conducted by the Hobby School of Public Affairs and UH Energy. The aim of the survey was to assess public attitudes toward climate change and support for policies aimed at curbing carbon emissions, such as a carbon tax, as well as respondents' willingness to pay for low-carbon electricity and fuel. The survey was fielded online October 15-22, 2020. It surveyed 1,000 individuals aged 18 and above, residing in all 50 US states and the District of Columbia. The survey also included an over-sample of 500 residents of the state of Texas for a total sample of 1,500 respondents.

**Table 1.1:** Distribution of respondents by race

<b>Race</b>	<b>No.</b>	<b>%</b>
White	947	63.1
Black	181	12.1
Hispanic	242	16.2
Asian	55	3.6
Native American	14	0.9
Two or more races	25	1.7
Other	30	2.0
Middle Eastern	6	0.4
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

Of the 1,500 respondents, 51% were female and 49% male. Table 1.1 shows the distribution of respondents by race and ethnicity. Sixty-three percent of respondents identified as white, 12.1% as Black, 16.2% as Hispanic, and 3.7% as Asian. About 5% of respondents identified as other races, including Middle Eastern, or as two or more races.

One-third of respondents were between 45 and 64 years old (see Table 1.2). Around one-fifth of respondents were 18 to 29 years old and older than 65; a quarter of respondents were 30 to 44 years old. Appendix B contains distributions for the remaining demographic variables.

**Table 1.2:** Distribution of respondents by age groups

<b>Age Group</b>	<b>%</b>
18-29	21.2
30-44	25.1
45-64	33.0
65+	20.6
<b>Total</b>	<b>100.0</b>

The ensuing sections present the results from our analysis of survey responses. The full set of questions and responses is presented in the appendix.

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# General Perceptions on Climate Change

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## Attitudes toward Climate Change in the United States

The US formally quit the Paris Climate Agreement in November 2020. Having once spearheaded efforts to formalize global agreement to coordinate emissions reductions, the US is now the only country among the original signatories to have exited. Polls conducted after President Donald Trump first announced the decision to withdraw from the agreement indicated that a majority of Americans did not support the decision - 7 out of 10 people, across party lines, were in favor of the US remaining in the agreement. On the other hand, President-elect Joe Biden has committed to rejoining the agreement when his administration takes charge in 2021.<sup>1</sup>

Public opinion has historically played a critical role in shaping the US response on many policy fronts. The public's knowledge, risk perception, attitudes, and behavior can help advance understanding of the policy appetite and preferences of Americans at a time when climate change mitigation, carbon management, and the energy transition are gaining global attention. Many studies have found that public opinion on climate change has shifted considerably in the US over the last few years.<sup>2</sup> Climate concern is currently the highest and it has been in the last decade. As more Americans witness frequent and intense extreme weather events, including wildfires and hurricanes, many are demanding greater climate action from the government. This has also resulted in a shift in Environmental, Social, and

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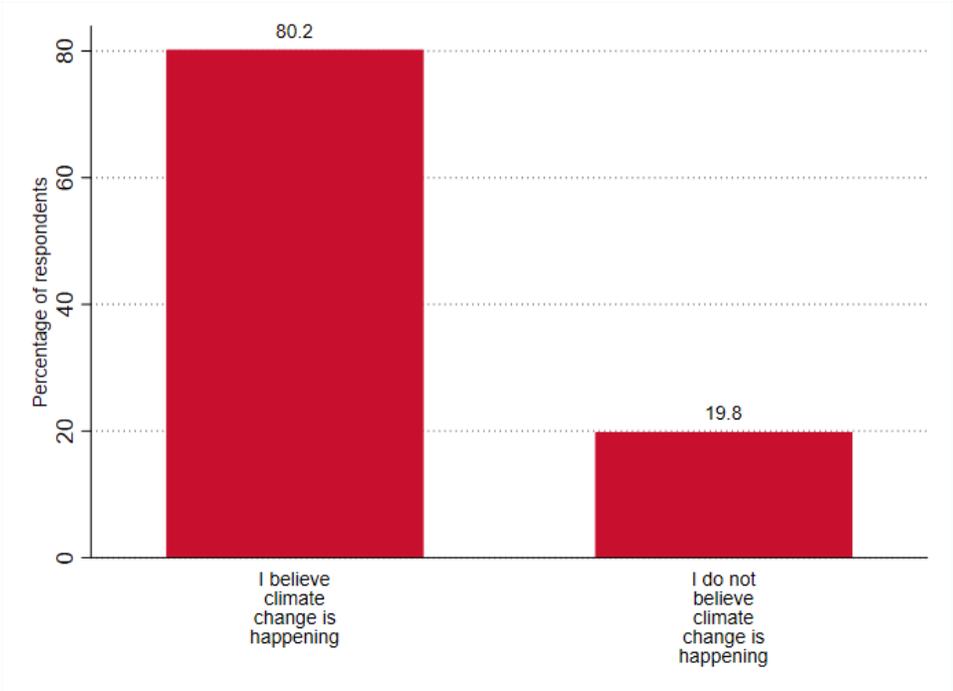
<sup>1</sup>Yale Program on Climate Change Communication (2017).

<sup>2</sup>Yale Program on Climate Change Communication (2020); Funk,C., and B. Kennedy (2020)

Governance (ESG) priorities for the energy industry, predominantly the oil and gas sector, where public support and acceptance provides companies with the social license to operate. Major energy companies and a broad group of stakeholders have acknowledged that the industry must be held accountable for its impact on the climate. Many have committed to meeting public demands for climate action and emissions reduction while also meeting society’s growing energy needs.<sup>3</sup>

To assess current attitudes, concerns, and how the public views this transition, we asked respondents their opinions on climate change and its causes. As shown in Figure 2.1, 80% of respondents believe climate change is happening, and only one out of every five respondents does not believe that climate change is happening.

**Figure 2.1:** You may have heard that the world’s temperature has been changing over the past 100 years, a phenomenon referred to as climate change. What is your personal opinion regarding whether or not this phenomenon is happening?



Respondents’ beliefs about whether climate change is happening by age groups are presented in Table 2.1. Eighty-seven percent of those aged 30 to 44 and 84% of those 18 to 29 years old believe in climate change, compared to 76% and 75% of respondents aged 45 to 64 and 65 years and older, respectively. While the majority

<sup>3</sup>OGCI (2019); API (2020); Buchele, M. (2020)

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of respondents believe in climate change across all age groups, a greater share of younger respondents were found to believe in climate change.

**Table 2.1:** Beliefs in climate change by age groups

<b>Belief in climate change?</b>	18-29	30-44	45-64	65+	Total
Yes	83.8%	87.1%	75.8%	75.0%	80.2%
No	16.2	12.9	24.2	25.0	19.8

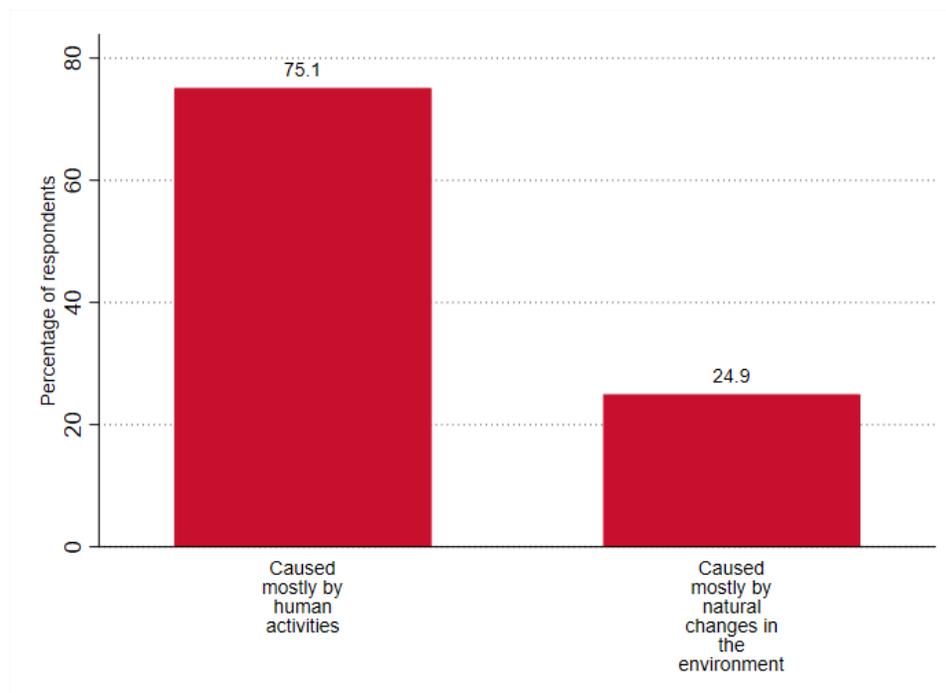
For those who responded that climate change is happening,<sup>4</sup> the survey asked whether they believed climate change is mostly caused by human activities or natural changes in the environment (see Figure 2.2). The vast majority of respondents (75%) believe that climate change is mostly caused by human activities, while about 25% believe it is caused mostly by natural changes in the environment. Previous studies between 2013 and 2018 have found the share of those who believe that climate change is mostly caused by human activities, or is anthropogenic in nature, has gradually increased from 47% to 62% in the US. The survey found that a much greater share of people believe that climate change is anthropogenic than previously recorded.<sup>5</sup>

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<sup>4</sup>1,222 respondents believe that climate change is happening

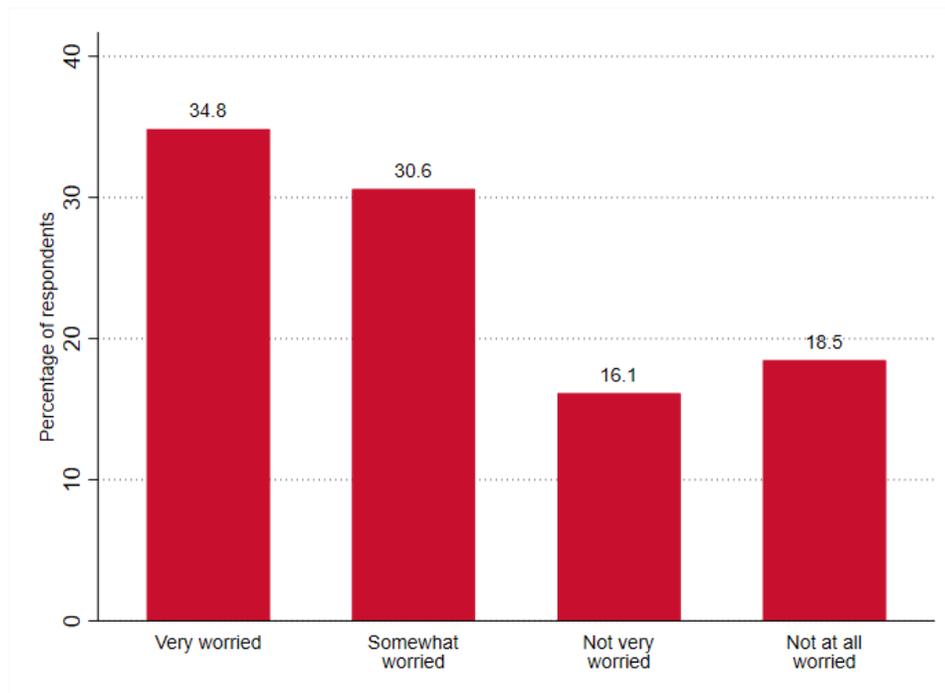
<sup>5</sup>[Yale Program on Climate Change Communication \(2019\)](#)

**Figure 2.2:** Assuming that climate change is happening, please indicate which of the following statements you most agree with. Climate change is ...



The survey also asked respondents about their level of concerns with climate change. About two thirds of respondents expressed feeling “very worried” (35%) or “somewhat worried” (31%) about climate change. In contrast, 16% of respondents said they were “not very worried” and 18% reported being “not at all worried” about climate change (see Figure 2.3).

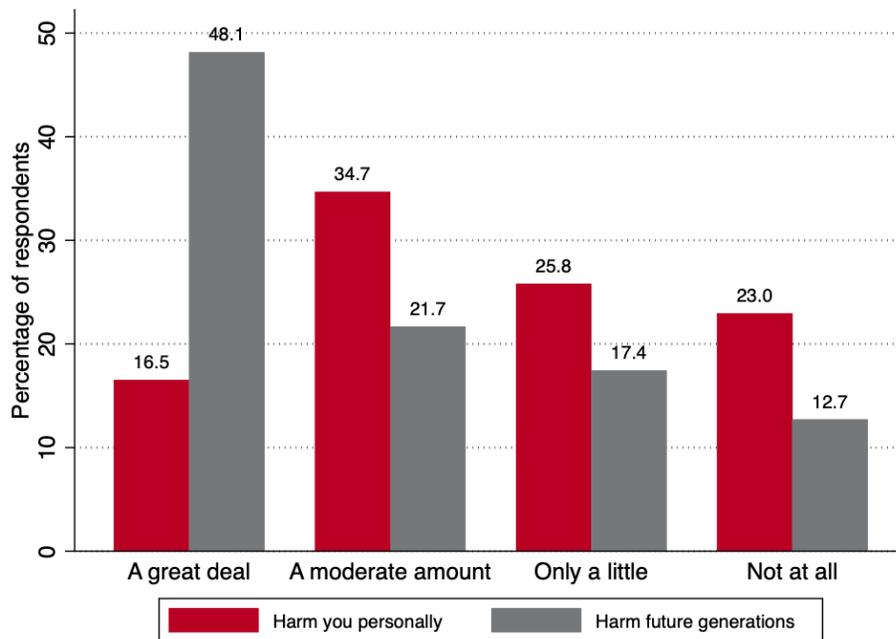
**Figure 2.3:** How worried are you about climate change?



Finally, the survey asked about respondents' perceptions of the amount of harm climate change can cause them personally and for future generations (see Figure 2.4). Seventeen percent of respondents believe that climate change will hurt them "a great deal," and 48% responded it will cause "a great deal" of harm to future generations. About half of respondents believe climate change will not hurt them at all (23%) or will hurt them only a little (26%). In contrast, the share of respondents who believe that climate change will have no or little harm to future generations are 13% and 17%, respectively.

## 2.1. Perceptions of Climate Change Among Texans

**Figure 2.4:** Belief in climate change harm to self and future generations



Among those who are concerned that climate change will harm them and future generations, there is a remarkable contrast between the perspectives of harm to self and harm to future generations. Approximately half of respondents expressed that they were greatly or moderately worried that climate change will harm them personally, while 70% were worried that climate change will harm future generations.

## 2.1 Perceptions of Climate Change Among Texans

With its abundant natural resources, Texas is the largest energy-producing and energy-consuming state in the US. Texas oil production accounts for 41% and natural gas production accounts for 25% of total US production.<sup>6</sup> The state is also the largest producer of lignite coal in the country. Texas accounts for 31% of the nation's refining capacity and annually contributes \$172 billion to US GDP through its petrochemicals sector. Texas has been considered a stronghold of the

<sup>6</sup>US EIA (2020a)

## 2.1. Perceptions of Climate Change Among Texans

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traditional energy industry, with public opinion aligned against climate action. However, a shift in public opinion has occurred with the switch from coal to natural gas, the growth of renewable energy, prioritization of Environmental, Social, and Governance (ESG) issues, and the increased frequency and intensity of hurricanes along the Gulf Coast and heat waves across Texas. With these shifts, Texas has also supported much of the diversification of the US energy mix. Along with its share of natural gas production, Texas accounts for 28% of US wind-powered electricity. As a result, coal's share in the Texas electricity mix dropped from 32% in 2017 to 15% in 2020. Growing public support for renewable energy in Texas has led to a flight of capital from the Permian Basin, even though natural gas burns more cleanly than coal and is expected to be the bridge fuel in the energy transition. The Permian accounts for 15% of the natural gas production in the US, but growth has been constrained by globally suppressed demand and the unwillingness of financial institutions to lend capital in fear of public retaliation.

To gauge if public opinion in Texas has indeed helped shape this transition, we analyzed the responses of Texans for each of the question discussed above. In a remarkable shift from past trends, respondents in Texas mirrored those in the rest of the country.<sup>7</sup> Figure 2.5 shows that 81% of Texans believe in climate change compared to 80% for Americans generally.

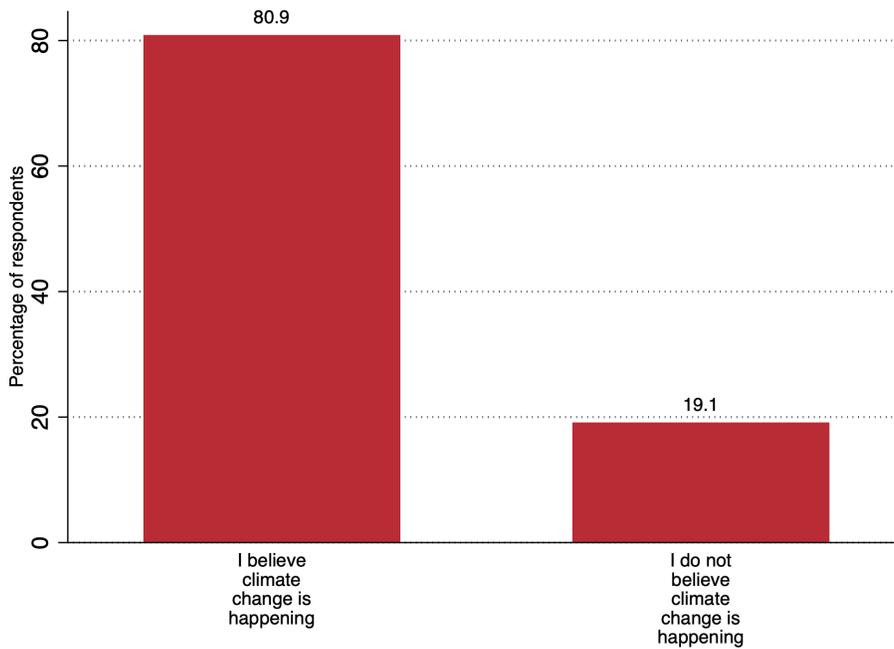
Again, Texans beliefs about the causes of climate change are in line with those in the rest of the country (Figure 2.6). A slightly lower proportion of Texans (71%) believes that climate change is caused mostly by human activities compared to Americans as a whole (75%).

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<sup>7</sup>The Texas Politics Project (2020)

## 2.1. Perceptions of Climate Change Among Texans

**Figure 2.5:** Belief in climate change among Texans



**Figure 2.6:** Causes of climate change among Texans

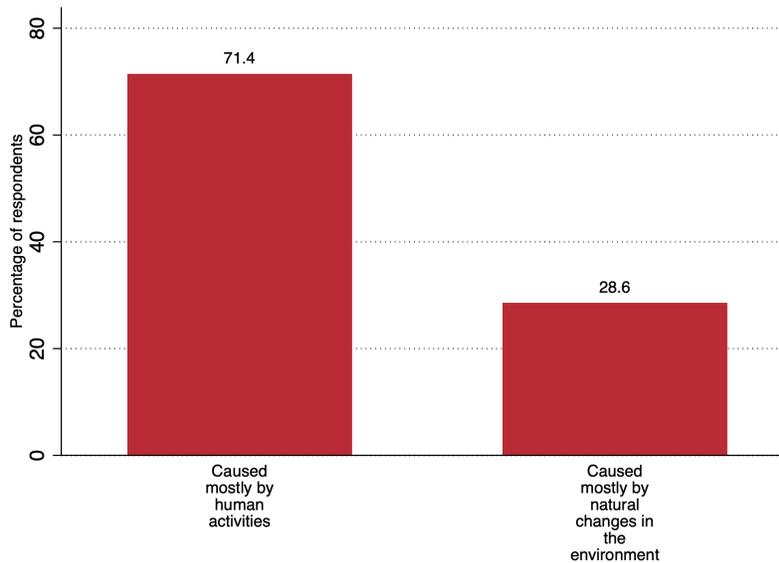
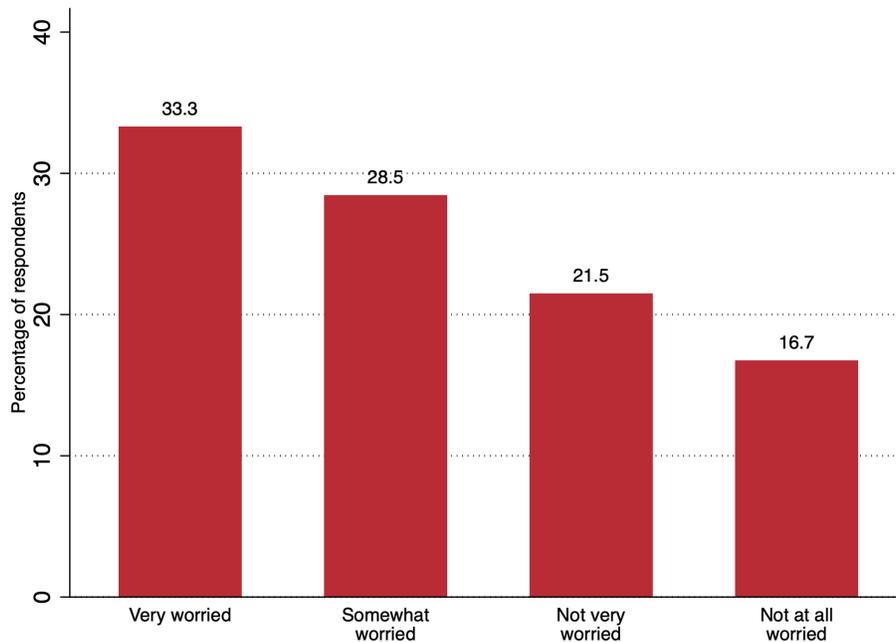


Figure 2.7 reveals that the level of worry among Texans about climate change largely mirrors concerns in the rest of the country. One-third of respondents in

## 2.1. Perceptions of Climate Change Among Texans

Texas said they were very worried about climate change compared to 35% in the rest of the country. A slightly higher percentage of Texans (22%) reported being not very worried compared to the percentage in the rest of the country (16%).

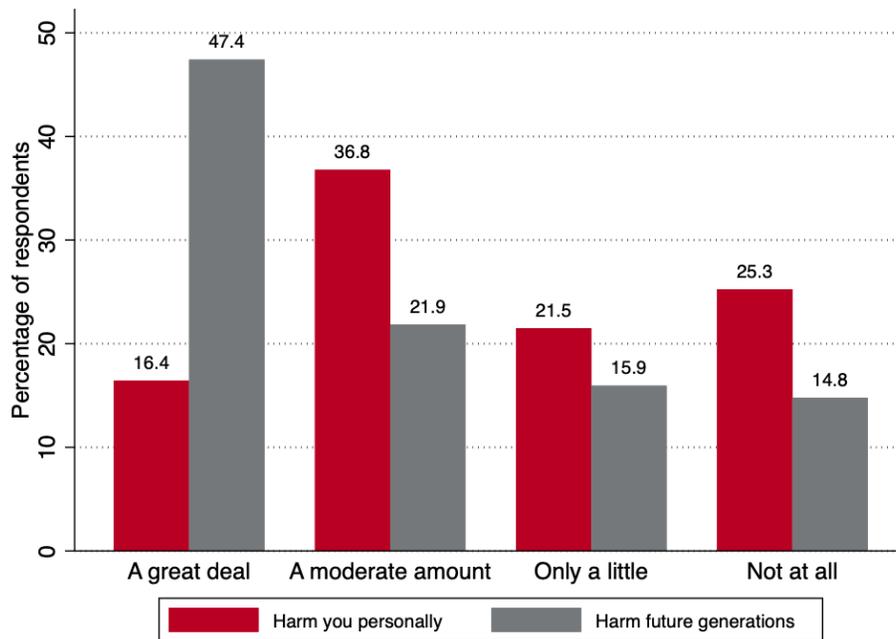
**Figure 2.7:** How worried are Texans about climate change?



Among respondents in Texas, perceptions about the amount of harm climate change will cause them and future generations are very similar to those observed in the rest of the country. Figure 2.8 reveals the same stark contrast between respondents' perspectives regarding harm to self from climate change compared to harm to future generations. While only 16% of respondents believe climate change will harm them personally, 47% reported believing it would harm future generations. One-quarter of Texas respondents said climate change will not harm them personally, whereas only 15% replied "not at all" when asked about climate change's harm to future generations. Similar to the national trend, there is a 20 percentage point difference between the perceived threat of harm to self from climate change and that to future generations.

## 2.1. Perceptions of Climate Change Among Texans

**Figure 2.8:** Belief in climate change harm to self and future generations (Texas respondents only)



Overall, despite the year’s many momentous events - the COVID-19 pandemic, tensions over racial injustice, law enforcement, and public safety concerns, the economic downturn, and US presidential elections- concern for climate change has not diminished. It is comparable to concerns among people living in top emitters such as India (76%), Japan(80%), and South Korea (81%); and higher than that recorded in China, the United Kingdom and Germany (all at 71%), Canada (67%), and Australia (60%).<sup>8</sup>

With a striking shift in public opinion, Texans have begun to resemble the rest of the country more than previously observed. This, along with strong economic drivers, has helped diversify the Texas and the US energy mix. Simultaneously, it has also constrained the capital available for the traditional energy sectors.

The contrast in how respondents, including Texans, perceive the threat of climate change to be greater for future generations than for themselves indicates that most view climate change as a distant problem. This gap in knowledge is consequential

<sup>8</sup>Fagan, M., and C., Huang (2020a, 2020b)

## 2.1. Perceptions of Climate Change Among Texans

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and likely a result of inadequate public education. While much of the climate change conversation today is around the Paris Climate Agreement goals to limit global warming to below 2°C, the average global temperature across land and ocean surfaces in 2019 was 0.95°C above the 20<sup>th</sup> Century average. The five warmest years between 1880 and 2019 have all occurred since 2015, and the temperature increase recorded in 2019 made it the second warmest year on record.<sup>9</sup> This awareness appears to be lacking when respondents weighed the present threat to self, even though climate change and its impact are currently being felt.

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<sup>9</sup>Lindsey, R, and L. Dahlman (2020)

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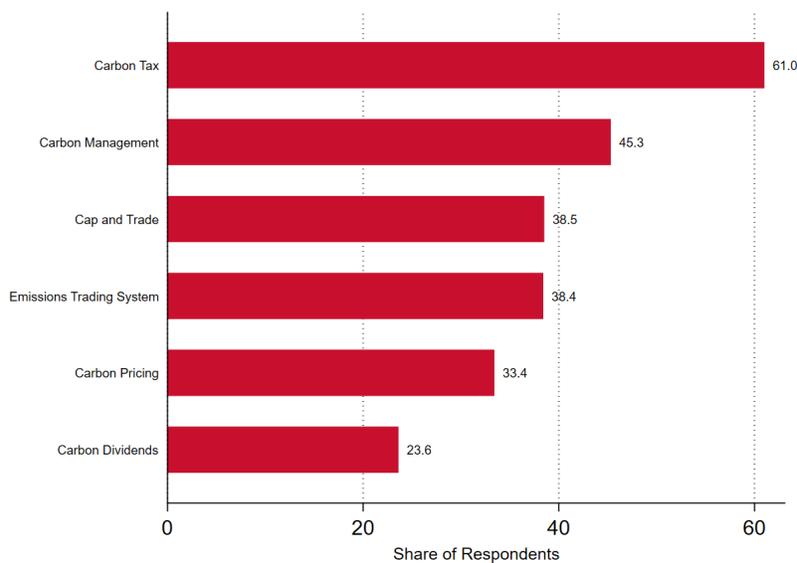
# Perception toward Carbon Management and Climate Policies

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## Perceptions and Policy Attitudes

This chapter presents results on respondents' knowledge about policies aimed at mitigating climate change and attitudes toward those policies. Respondents were asked to identify the climate policies and mitigation efforts they have previously heard or read about among Cap and Trade, Carbon Management, Carbon Pricing, Carbon Tax, Emissions Trading System, and Carbon Dividend (see Figure 3.1).

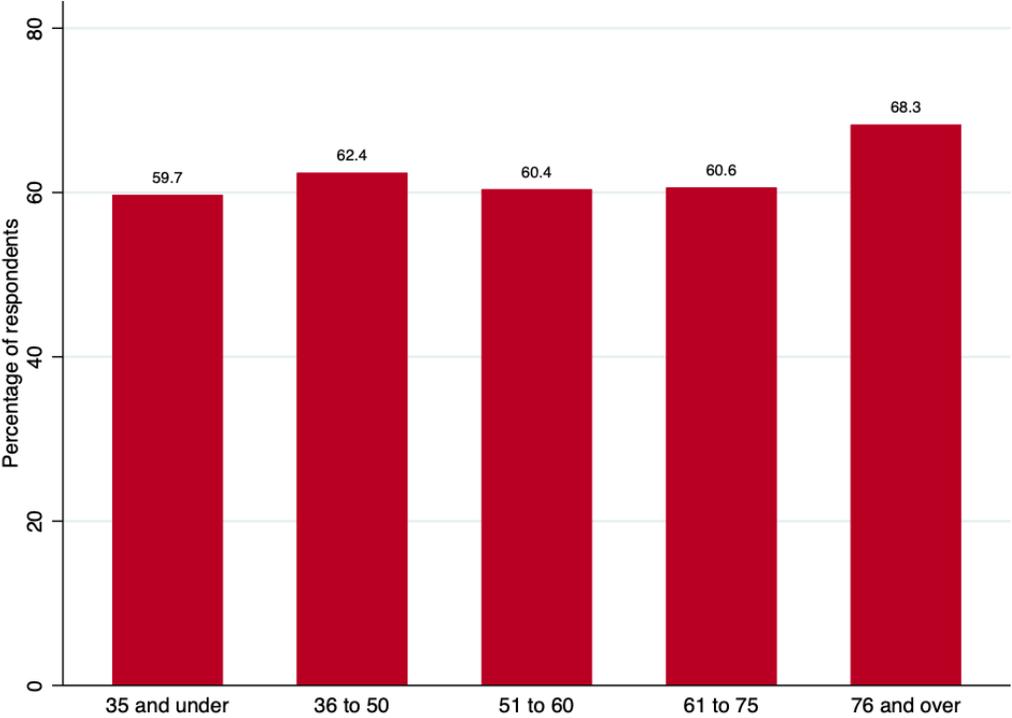
**Figure 3.1:** Which of the following terms have you heard or read about?



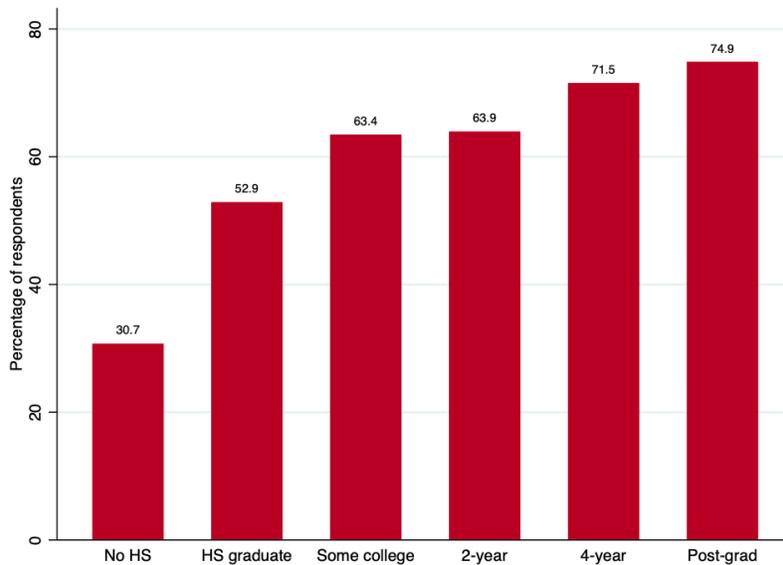
Carbon Tax was the most familiar term, selected by 61% of respondents. Forty-five percent of respondents selected Carbon Management, 39% Cap and Trade, 38% Emissions Trading System, 33% Carbon Pricing, and lastly, 24% selected Carbon Dividends.

Overall, Figure 3.1 reveals very low awareness among the public about various climate policies and mitigation efforts. Among those who selected Carbon Tax - the most recognized policy - the greatest share was among those 76 and over (see Figure 3.2) and familiarity increased with level of education (see Figure 3.3).

**Figure 3.2:** Familiarity with *Carbon Tax* by age



**Figure 3.3:** Familiarity with *Carbon Tax* by education



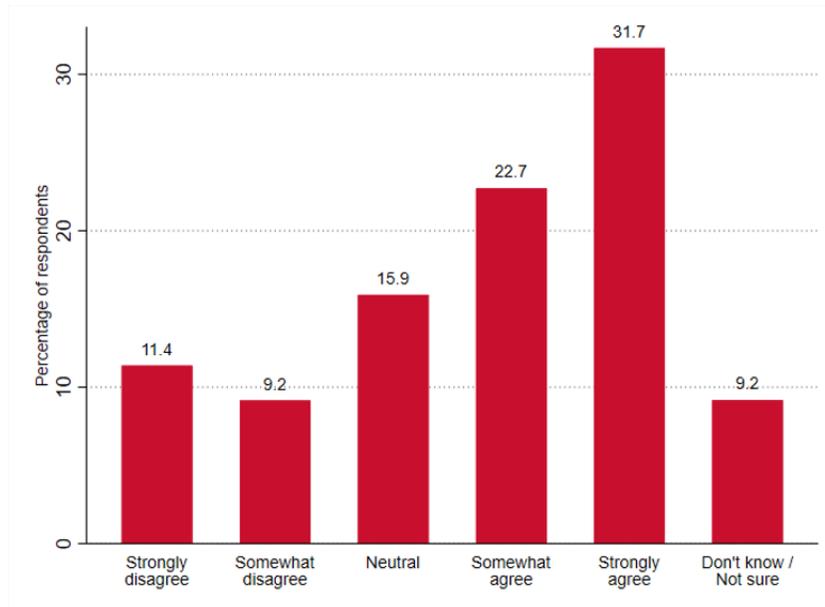
### 3.1 Carbon Management Technologies and Policies

Respondents were also asked to express their level of agreement with the following statements:

- The oil and gas industries have deliberately misled people on climate change (see Figure 3.4)
- Oil and gas companies should adopt carbon management technologies (see Figure 3.5)
- Oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management technologies (see Figure 3.6)
- Government should promote, incentivize, and subsidize carbon management technologies (see Figure 3.7)

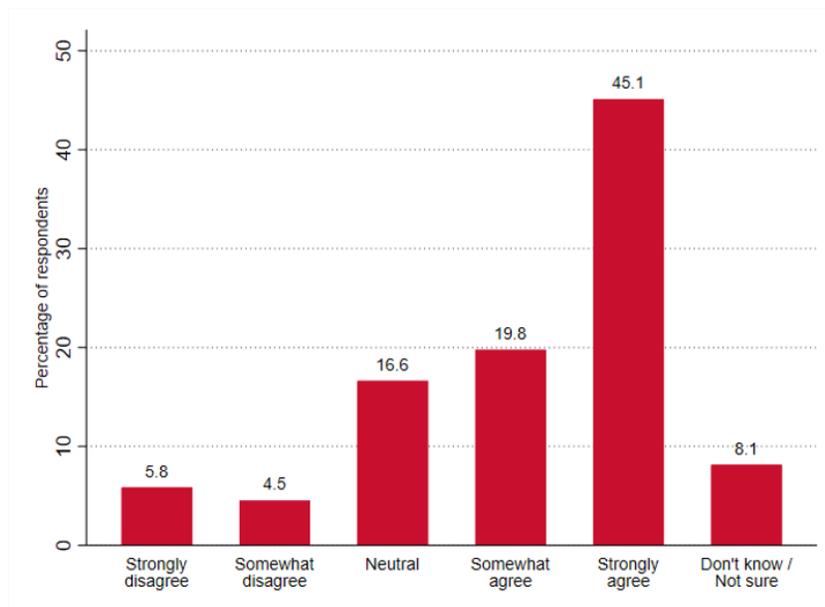
### 3.1. Carbon Management Technologies and Policies

**Figure 3.4:** The oil and gas industries have deliberately misled people on climate change



In line with the responses observed in Figure 3.15 (discussed below), a majority (55%) of respondents either strongly agreed (32%) or somewhat agreed (23%) that the oil and gas industry has deliberately misled people on climate change.

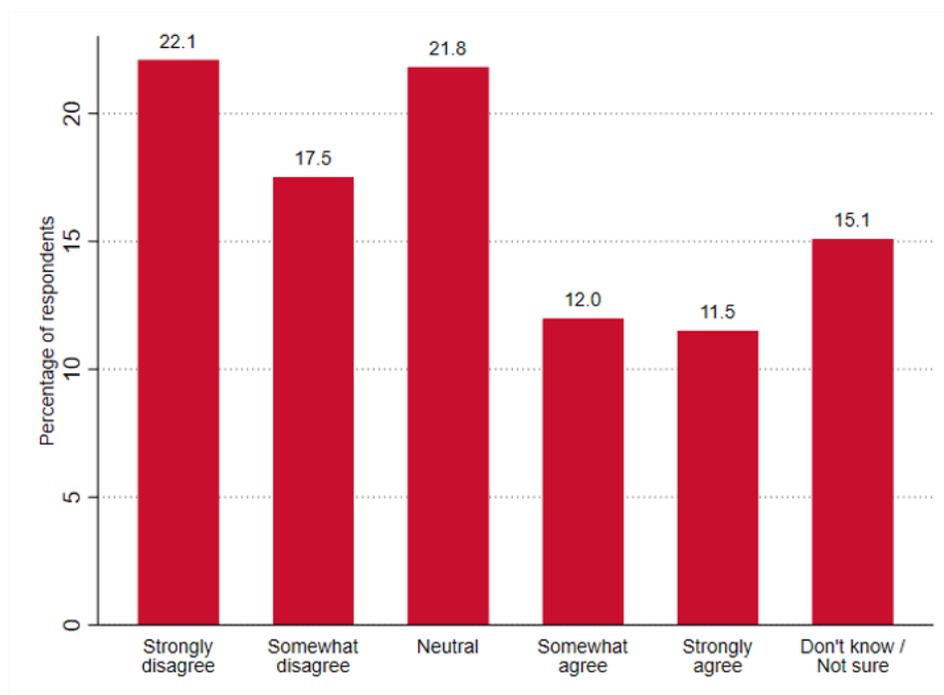
**Figure 3.5:** Oil and gas companies should adopt carbon management technologies



### 3.1. Carbon Management Technologies and Policies

Nearly two-thirds of respondents strongly (45%) or somewhat (20%) agreed that oil and gas companies should adopt carbon management technologies (Figure 3.5).

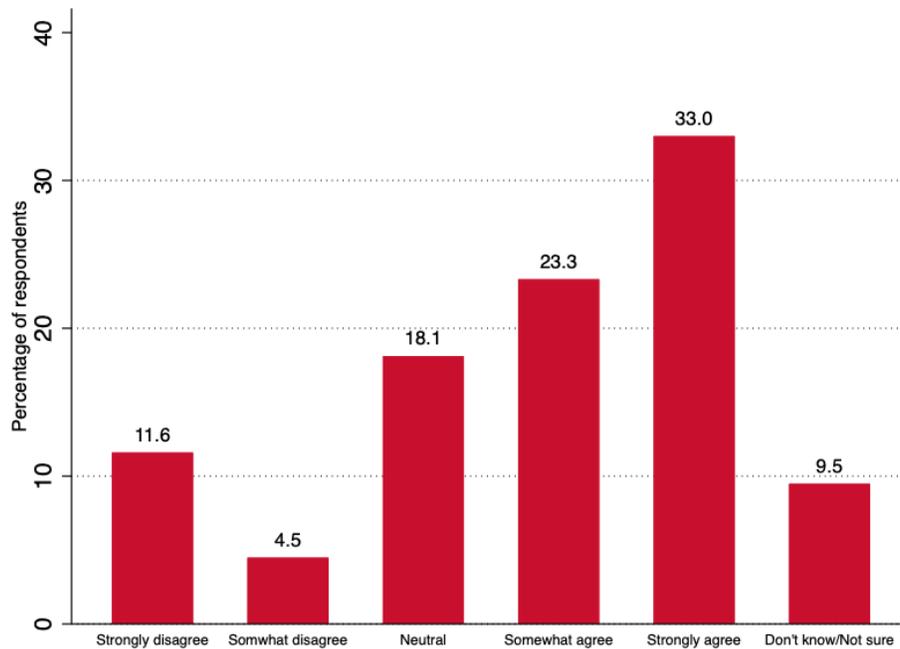
**Figure 3.6:** Oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management technologies



A majority of respondents had a positive or neutral outlook of the impact of adopting carbon management technologies on the future of the oil and gas industry (see Figure 3.6). Forty percent of respondents either strongly or somewhat disagreed that oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management technologies, while 22% were neutral. However, a notable degree of uncertainty was observed with 15% of those surveyed choosing “Don’t know/Not sure”.

### 3.1. Carbon Management Technologies and Policies

**Figure 3.7:** Government should promote, incentivize, and subsidize carbon management technologies

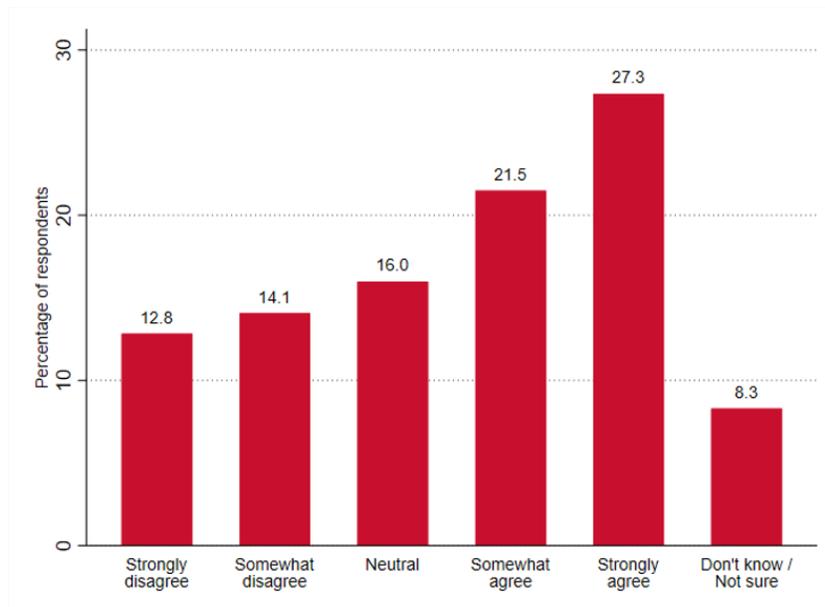


Additionally, a majority of respondents (56%) strongly or somewhat agreed that the government should promote, incentivize, and subsidize carbon management technologies (Figure 3.7).

In Texas, despite the state's economic dependence on hydrocarbons production and processing, the perception that the oil and gas industries deliberately misled people on climate change was consistent with the national opinion (see Figure 3.8).

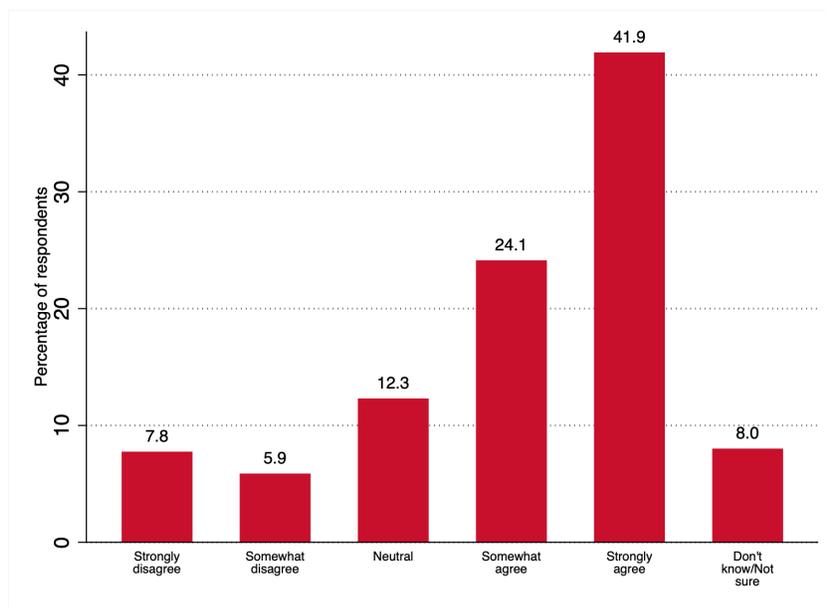
### 3.1. Carbon Management Technologies and Policies

**Figure 3.8:** The oil and gas industries have deliberately misled people on climate change (Texas respondents only)



Again, in line with the national response, an overwhelming majority of respondents from Texas (66%) agreed that oil and gas companies should adopt carbon management technologies.

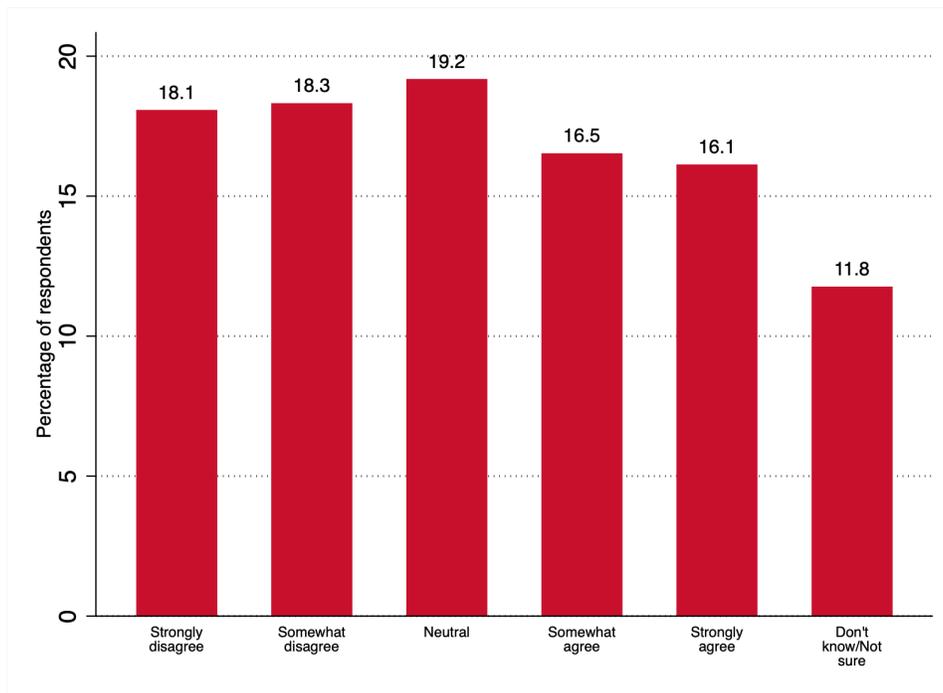
**Figure 3.9:** Oil and gas companies should adopt carbon management technologies (Texas respondents only)



### 3.1. Carbon Management Technologies and Policies

Texans were relatively more split on the future prospects of the oil and gas industries than Americans in general. The highest share of respondents (19%) expressed a neutral stance on whether oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management technologies. At the same time, Texans expressed almost a three-percentage point lower degree of uncertainty than the national sample.

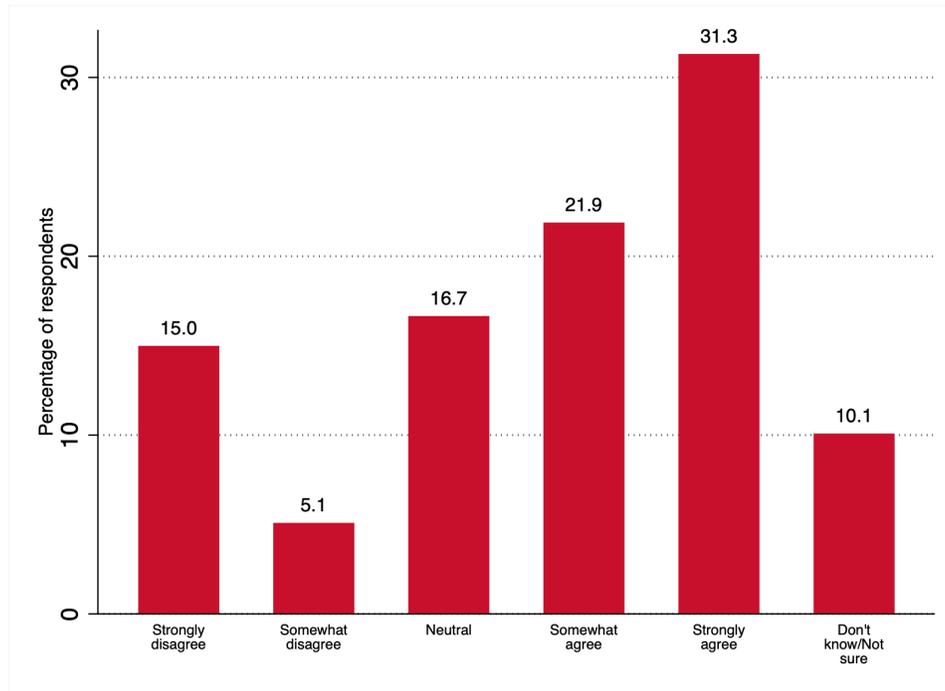
**Figure 3.10:** Oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management technologies (Texas respondents only)



Texans also expressed similar opinions as the national sample on whether the government should promote, incentivize, and subsidize carbon management technologies (Figure 3.11).

## 3.2. Carbon Tax and Revenue Expenditure

**Figure 3.11:** Government should promote, incentivize, and subsidize carbon management technologies (Texas respondents only)

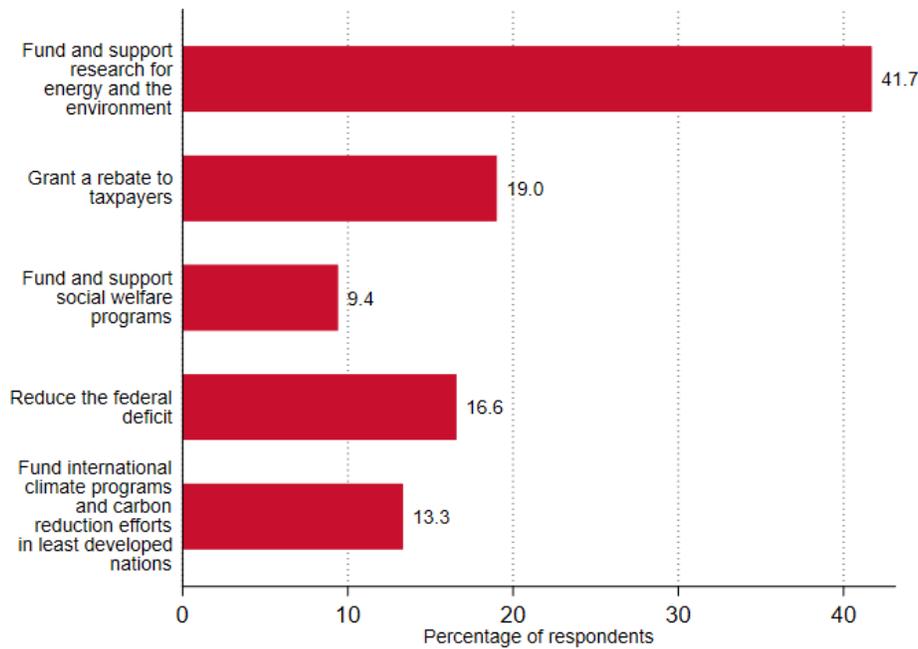


## 3.2 Carbon Tax and Revenue Expenditure

Next, respondents were asked about their opinion on the best way to spend the revenue if the government implements a tax on carbon emissions (see Figure 3.12). Two-fifths (42%) expressed that the revenue should fund and support research for energy and the environment. This was followed by a taxpayer rebate (19%), reducing the federal deficit (17%), funding international climate programs and carbon reduction efforts in least developed nations (13%), and lastly, funding and supporting social welfare programs (9%).

### 3.3. Issue Knowledge about Hydraulic Fracturing, and Flaring

**Figure 3.12:** If the government implements a tax on carbon emissions, what would you think is the best way to spend that revenue



Notably, the support for revenue spending on energy and environment research and development is more than double of that for the next most favored choice, a taxpayer rebate, indicating a shift from the belief that the public will support a carbon tax only when it is revenue-neutral.

## 3.3 Issue Knowledge about Hydraulic Fracturing, and Flaring

Respondents were then asked to express whether they believe the following statements are true or false:

- Fracking has a negative impact on the environment
- Flaring during natural gas production is good for the environment

Sixty-four percent believed that fracking, also known as hydraulic fracturing, has a negative impact on the environment, while 36% of respondents consider the

### 3.3. Issue Knowledge about Hydraulic Fracturing, and Flaring

statement to be false. Among Texans, despite the economic dependence on the large volumes of oil and gas produced from fracking in the Permian Basin, the response was consistent with the national sample: 61% of respondents believe that fracking has a negative impact on the environment.

**Table 3. 1:** Perception about the environmental impact of fracking: US & Texas

<b>Fracking has a negative impact on the environment</b>	U.S.		Texas	
	No.	%	No.	%
True	955	63.8	339	61.0
False	541	36.2	216	38.9
<b>Total</b>	<b>1,496</b>	<b>100.0</b>	<b>555</b>	<b>100.0</b>

Among all respondents, 72% said they did not believe flaring during natural gas production is good for the environment, while the rest responded that the statement is true. Even though Texas currently accounts for over half of national emissions from flaring and has no state-level regulations toward flaring, the responses of Texans were consistent with national opinion. Sixty-nine percent of respondents said they believe flaring has a negative impact on the environment.

**Table 3. 2:** Perception about the environmental impact of flaring: US & Texas

<b>Flaring is good for the environment</b>	U.S.		Texas	
	No.	%	No.	%
True	415	27.7	171	30.7
False	1,080	72.3	384	69.1
<b>Total</b>	<b>1,495</b>	<b>100.0</b>	<b>555</b>	<b>100.0</b>

### 3.4 Pipeline Infrastructure

Earlier in 2020, legal and financial barriers halted many national oil and gas pipeline projects. The Atlantic Coast pipeline across West Virginia, Virginia, and North Carolina was canceled by the utilities developing the project. Environmental lawsuits and delays from public opposition increased costs to about \$8 billion from the anticipated \$4.5 billion to \$5 billion.<sup>1</sup> The already operational Dakota Access Pipeline from North Dakota to Illinois was ordered by court to shut down and be emptied of oil - pending an environmental review.<sup>2</sup> The US Supreme Court also suspended construction on parts of the Keystone XL pipeline, which is a network of pipelines that would carry Canadian and US oil to different parts of the United States.<sup>3</sup>

To gauge the attitude of respondents toward the issue, the survey asked respondents whether they support or oppose an expansion of the pipeline network for the development of new natural gas projects. In contrast to the resistance most projects have faced from the public, nearly two-fifths of respondents agreed (strongly or somewhat), while 34% expressed a neutral opinion toward such pipeline expansions (see Figure 3.13).

Even in Texas, protesters have been opposing the Permian Highway Pipeline, which would connect the West Texas oil and gas fields to refineries along the Gulf Coast.<sup>4</sup> However, 46% of Texans agreed strongly or somewhat to the expansion of pipelines, followed by 29% who were neutral (see Figure 3.14). The proportion of support observed amongst Texans was slightly higher than the national response.

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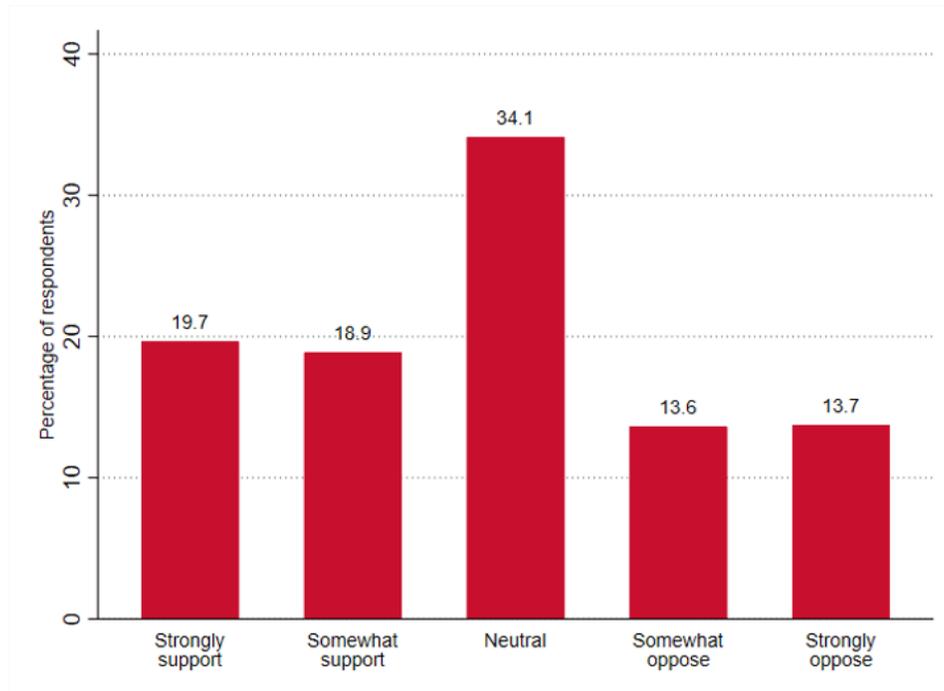
<sup>1</sup>Penn, I. (2020)

<sup>2</sup>Fortin, J., and L. Friedman (2020)

<sup>3</sup>Wilson, P. (2020)

<sup>4</sup>Bernd, C. (2019)

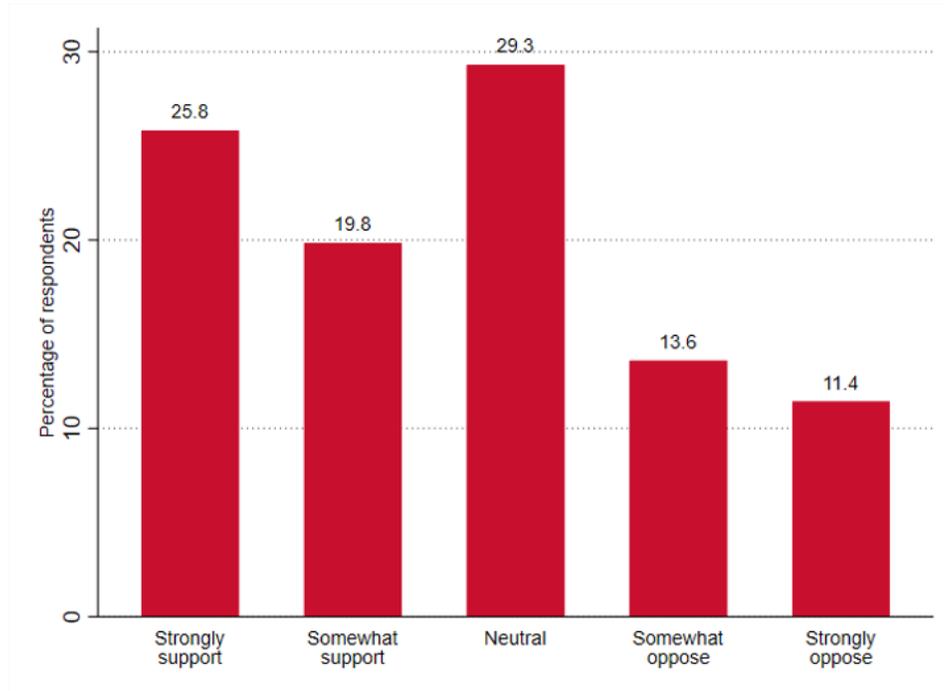
**Figure 3.13:** The development of new natural gas projects requires the expansion of pipelines. Do you support or oppose an expansion of the pipeline network?



The support expressed nationally and amongst Texans is particularly unexpected given the aforementioned projects which have been cancelled or delayed due to public opposition. Also, even though most respondents expressed neutrality toward pipeline expansions, a majority thinks current industry practices for natural gas production such as fracking and flaring of methane are harmful for the environment, as discussed in the previous section. If policies for sustainable extraction and zero flaring and venting during natural gas production are enforced, public acceptance for new projects may increase and also drive greater support for related infrastructure such as pipelines.

### 3.5. Responsibility for Climate Change and Issue Knowledge

**Figure 3.14:** The development of new natural gas projects requires the expansion of pipelines. Do you support or oppose an expansion of the pipeline network? (Texas respondents only)

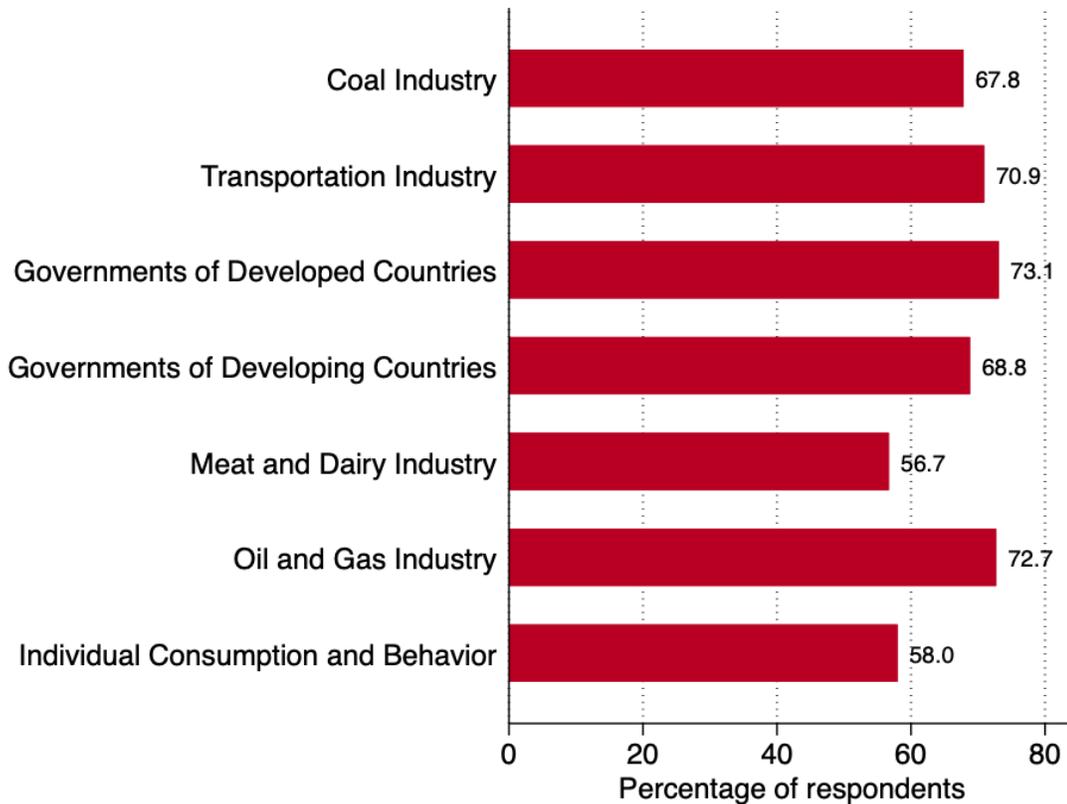


## 3.5 Responsibility for Climate Change and Issue Knowledge

Respondents were asked how responsible for climate change they think various industries and governments are. Seventy-three percent of respondents reported governments of developed countries and the oil and gas industry (Figure 3.15) were very or somewhat responsible. Seventy-one percent believed the transportation industry to also be responsible for climate change. Fewer respondents thought that the meat and dairy industry (57%) and individual behavior (58%) were responsible compared to other industries and governments.

### 3.5. Responsibility for Climate Change and Issue Knowledge

**Figure 3.15:** How responsible or not responsible for climate change do you think each of the following entities are?

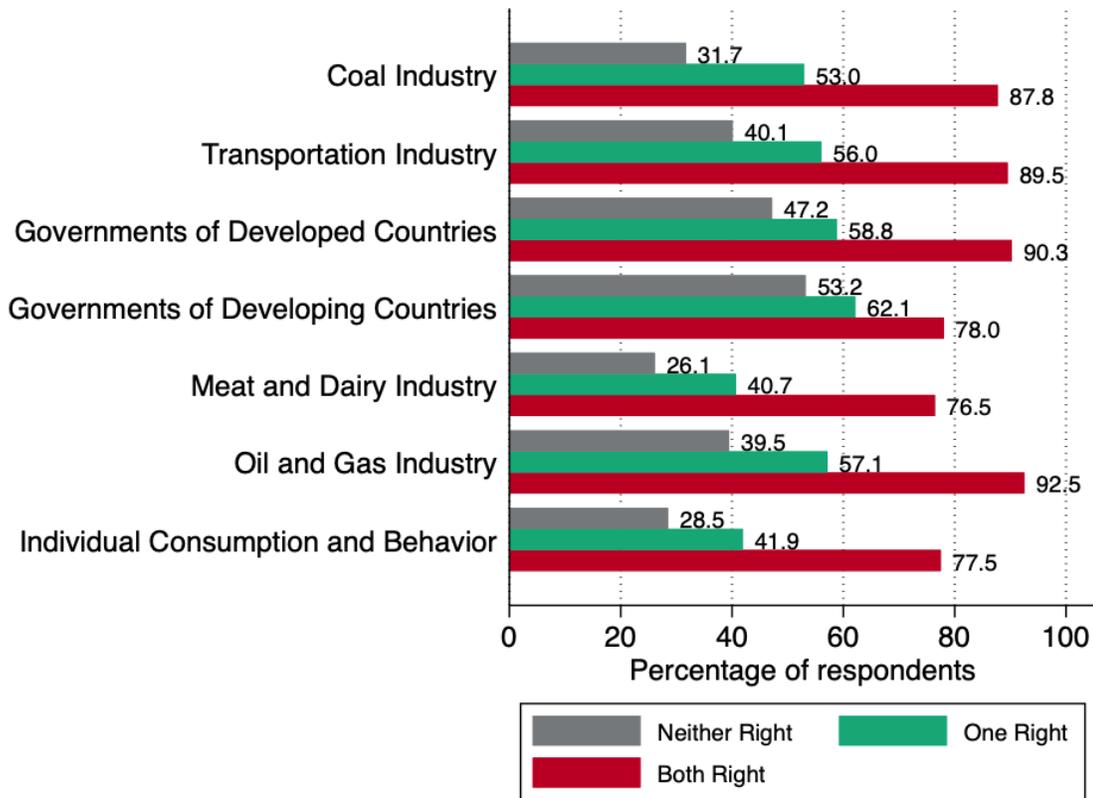


Attributing responsibility did tend to be associated with respondents' level of awareness about the impact of certain behaviors on the environment. To evaluate this, responses to the questions on hydraulic fracturing/fracking and flaring were used as measures of respondents' issue knowledge. Issue knowledge was measured as those who got neither, one, or both questions on hydraulic fracturing and flaring right. Answering true to whether hydraulic fracturing has a negative impact on the environment and false to whether flaring during natural gas production is good for the environment were treated as the correct responses. Based on this, responsibility attribution for climate change by issue knowledge suggests 93% of those who got both questions right attribute climate change responsibility to the oil and gas industry, followed by the governments of developed countries (90%) and the transportation industry (90%) (Figure 3.16). In addition, those who answered both questions correctly were much more likely to attribute responsibility to

### 3.5. Responsibility for Climate Change and Issue Knowledge

individual consumption and behavior (77.5%) and the meat and dairy industry (76.5%) compared those who answered one or neither question correctly.

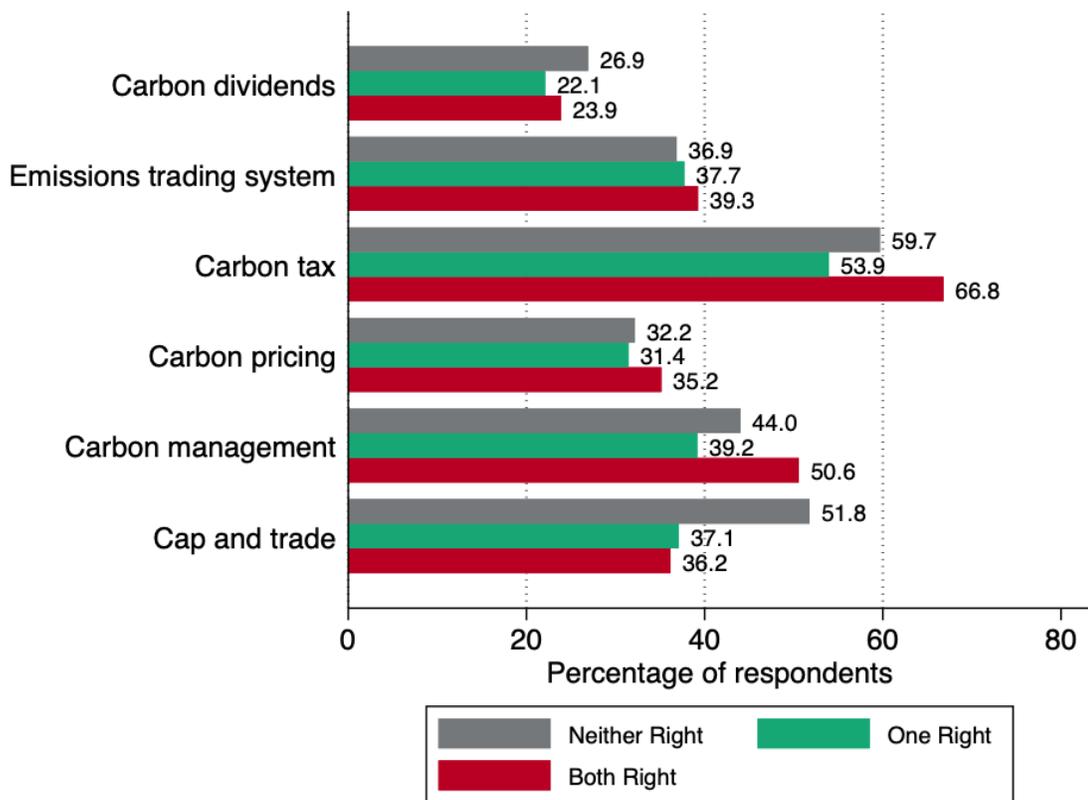
**Figure 3.16: Responsibility Attribution and Knowledge**



Next, the familiarity with technology and policy terms discussed in Figure 3.1 was also measured against issue knowledge. The responses suggest that familiarity with technology and policy terms or term awareness is not related to issue knowledge. Many of those who answered none of the issue knowledge questions correctly were familiar with the technology and policy terms; in all cases those less knowledgeable accounted for a higher proportion of those who chose a given term than those who got one question right, or as in the case of carbon dividends and cap and trade even more than those who got both questions right. Figure 3.17 again reveals overall low familiarity with key policies and mitigation efforts, regardless of one's issue knowledge.

### 3.5. Responsibility for Climate Change and Issue Knowledge

**Figure 3.17:** Familiarity with Terminology and Knowledge



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# The Costs of Carbon Management

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## Willingness to Pay for Low-Carbon Energy

Respondents' willingness to pay higher prices for carbon management and the new products it will create is crucial for a low-carbon future. In the previous chapters, we document individual concerns about carbon management and support for low-carbon policies. These policies require changing incentives and costs that force economic agents, including producers and consumers, to internalize the costs of their behavior in the marketplace. To further gauge willingness to pay for sustainable energy, we asked a battery of questions about changing prices of gas and electricity required to attain carbon neutrality. Once respondents volunteered the increase in prices they were willing to support for different types of energy they consume, we probed them further by providing four scenarios:

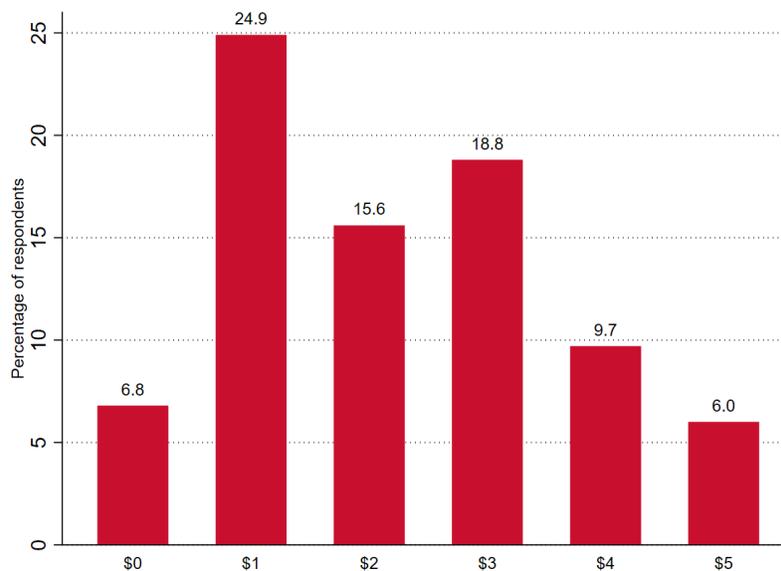
- A \$1.70 per gallon increase at the pump for carbon-neutral fuel.
- A \$250 increase in the electricity bill for switching to renewable residential energy.
- A \$5 increase in the electricity bill to switch to natural-gas based electricity without the venting or flaring of methane.
- A \$20 increase in the electricity bill resulting from a \$40 economy-wide carbon tax.

## 4.1 Willingness to pay for a carbon-neutral fuel

Carbon-neutral fuels have no net greenhouse gas emissions. As an alternative to traditional transportation fuels such as gasoline, they can reduce the carbon intensity of the transportation sector; however, they are currently more expensive than regular gasoline.<sup>1</sup>

To understand if the public is inclined to support the higher cost of production, we asked respondents how much of a per-gallon increase they are willing to pay for a carbon-neutral fuel. Over 93% of respondents report that they are willing to pay a non-zero amount for carbon neutral fuel: 75% state they would be willing to pay between \$1 and \$5 more per gallon, while 18% of respondents are willing to pay other values.

**Figure 4.1:** How much of a per gallon increase would you be willing to pay for a carbon-neutral fuel?



**Note:** The proportion of respondents who reported willingness to pay other values is 18%

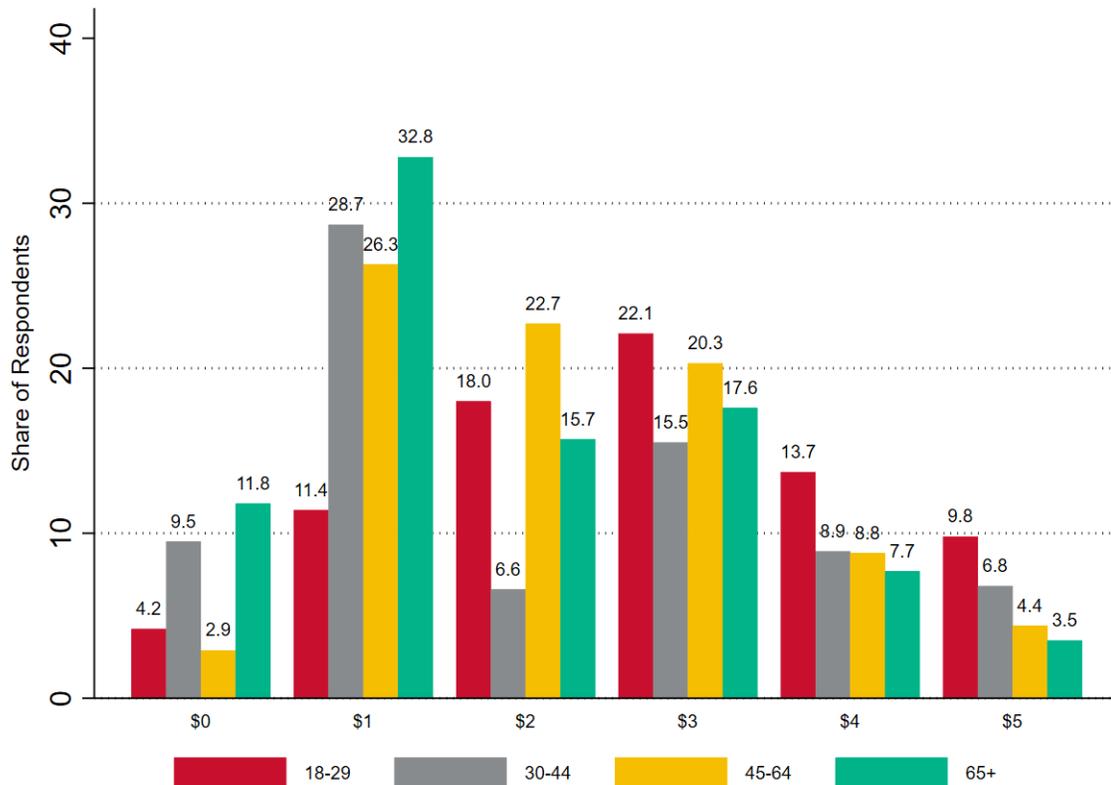
As shown in Figure 4.1, of the total respondents willing to give up between \$0 and \$5, 25% respondents are willing to pay a \$1 increase, 16% are willing to give up \$2,

<sup>1</sup>Lewis, J. (2018)

## 4.1. Willingness to pay for a carbon-neutral fuel

and about 33% are willing to pay between \$3 and \$5. However, 7% are unwilling to pay any extra cost on carbon-neutral fuel.<sup>2</sup>

**Figure 4.2:** Willingness to pay for a carbon-neutral fuel by age



**Note:** The proportion of respondents who reported willingness to pay more than \$5 is 21% for 18-29, 24% for 30-44, 14% for 45-64 and 11% for respondent with 65+ age category.

Figure 4.2 shows respondents' willingness to pay across age groups. Most of the youngest respondents (40%) are willing to pay a \$2-\$3 increase per gallon while 24% were even willing to pay a \$4-\$5 increase. One-third of those between 30-44 years are willing to pay a \$1 increase, whereas 31% are willing to pay an additional \$3 and \$5. For those between 45-64, 26% are willing to pay a \$1 increase while 43% are willing to pay an additional \$2-\$3. Most respondents (33%) who are 65 or

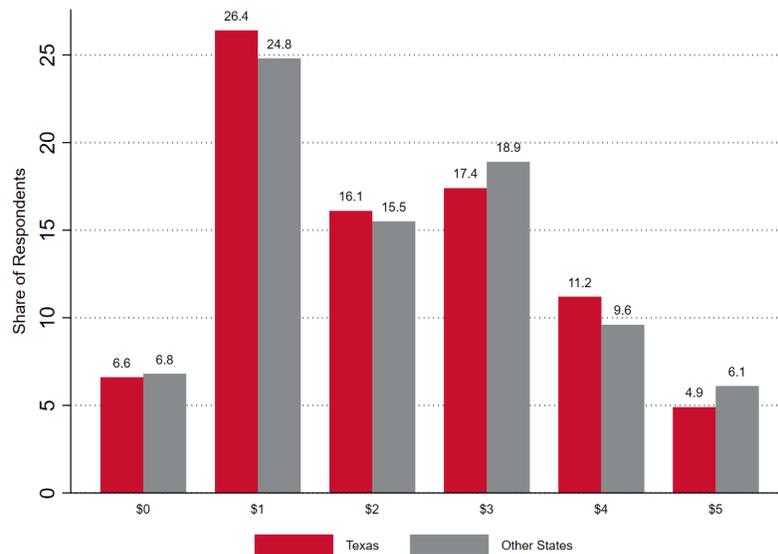
<sup>2</sup>Figures 4.1, 4.3, and 4.2: 18% of respondents reported willingness to pay other values.

## 4.1. Willingness to pay for a carbon-neutral fuel

older are willing to pay an additional \$1 for a carbon-neutral fuel.

For those between 30-44 years and those 65 and older, 10% and 12%, respectively, said they are unwilling to accept an increase on their gasoline bill for a carbon-neutral fuel. Overall, the youngest respondents are willing to pay more.

**Figure 4.3:** Willingness to pay for a carbon-neutral fuel: Texas and other states



**Note:** The proportion of respondents who reported willingness to pay other values is about 18% for Texas and other states.

In Figure 4.3, we plot the distribution for Texas and other states. The distribution of willingness to pay for carbon neutral fuel is not significantly different between Texas and other states. As reflected in the figure, the differences are negligible: 6.6 % of Texas respondents and 6.8% of respondents from other states said they are not willing to pay extra for carbon-neutral gas; 76% and 75% of respondents from Texas and other states, respectively, are willing to pay between \$1 and \$5 dollars more per gallon. Distributions for higher amounts are also similar.

### **Willingness to pay for 100% Renewable Electricity**

Power production relies heavily on hydrocarbons and is a major source of greenhouse gas emissions. Even though the cost of electricity production from renewable sources such as solar and wind has decreased substantially, a 100% renewable energy-based electricity grid would be a multi-trillion dollar transition.<sup>3</sup> The US would need enormous capacity additions of wind, solar, biomass, geothermal, and hydroelectric power, extensive redesigning and addition of electricity transmission lines, and advances in battery storage technology for 100% renewable energy-based electricity. The consumption of electricity is an important expense for most households. According to our survey data, Texas residents pay \$307 monthly on electricity while residents in other states pay \$196 on average.

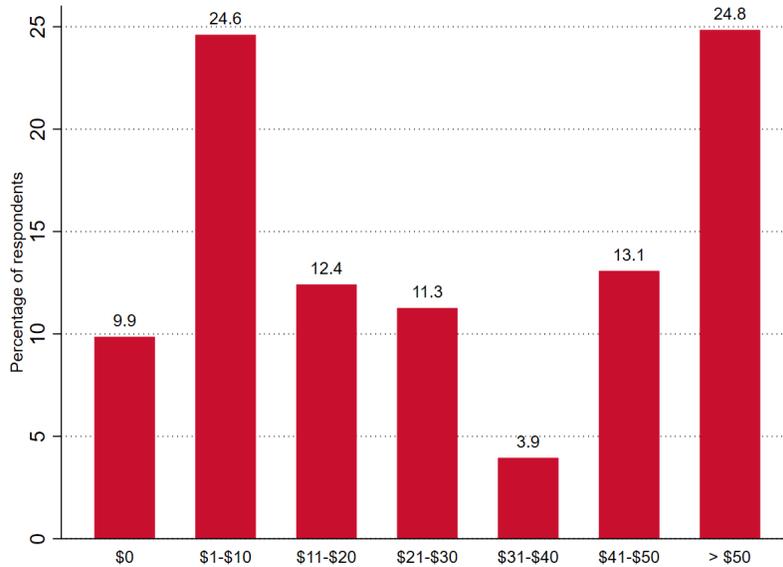
We asked respondents how much more they would be willing to pay per month for electricity generated from renewable sources. Results presented in Figure 4.4 show that 90% of respondent are willing to pay more: about one-fourth would be willing to pay between \$1-\$10 more per month, and another third are willing to pay more than \$10 additional per month for electricity produced from renewable sources. Almost 25% are willing to pay more than \$50 a month more.

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<sup>3</sup>Jacobson, M., et al., (2017)

## 4.1. Willingness to pay for a carbon-neutral fuel

**Figure 4.4:** How much of an increase on your monthly electricity bill would you be willing to pay if you were to only use renewable energy to power your home?



**Figure 4.5:** Willingness to pay for 100% renewable electricity: Texas and other states

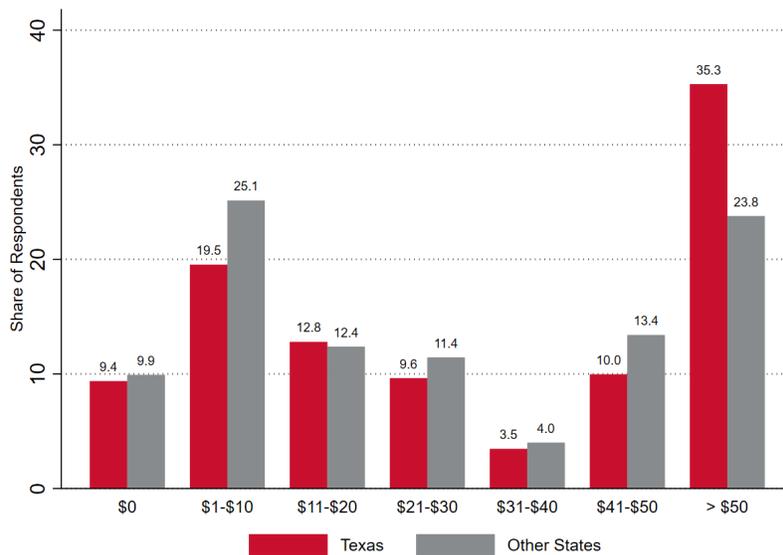


Figure 4.5 shows that there is significant heterogeneity in respondents' willingness to pay for 100% renewable energy by location: respondents from Texas are willing

## 4.1. Willingness to pay for a carbon-neutral fuel

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to give up a higher amount for renewable energy compared to respondents from other states, indicating strong support for the ongoing growth of renewable energy in Texas.

### **Willingness to pay for electricity from natural gas produced without methane flaring and venting**

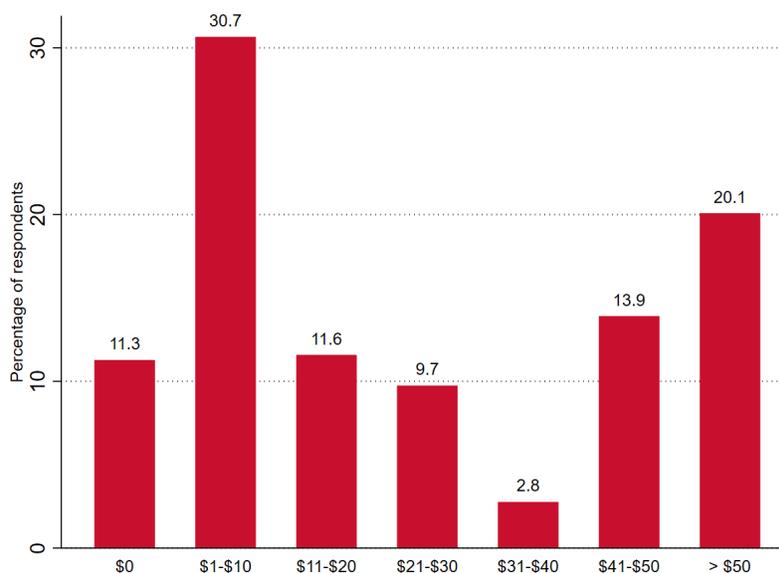
The coal-to-natural gas switch in the US has resulted in a 30% drop in emissions from the electricity sector between 2005 and 2019.<sup>4</sup> While natural gas burns more cleanly than coal, flaring and venting methane during production increases greenhouse gases in the atmosphere. Natural gas-based electricity can be produced without any flaring or venting, but it would increase the cost of production and consequently the cost to the consumer. We asked how much respondents would be willing to pay monthly on natural gas-based electricity produced without flaring or venting methane. Eleven percent of respondents are not interested in paying any additional amount for natural gas-based electricity. Over 30% of respondents reported they are willing to pay an amount between \$1 and \$10 and 38% are willing to pay between \$11 and \$50 more to avoid energy produced using flaring and/or venting. About 20% are willing to pay more than \$50 per month on natural gas-based electricity for their homes (see Figure 4.6).

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<sup>4</sup>US EIA (2018)

## 4.1. Willingness to pay for a carbon-neutral fuel

**Figure 4.6:** Willingness to pay for natural gas, non-flaring/non-venting electricity



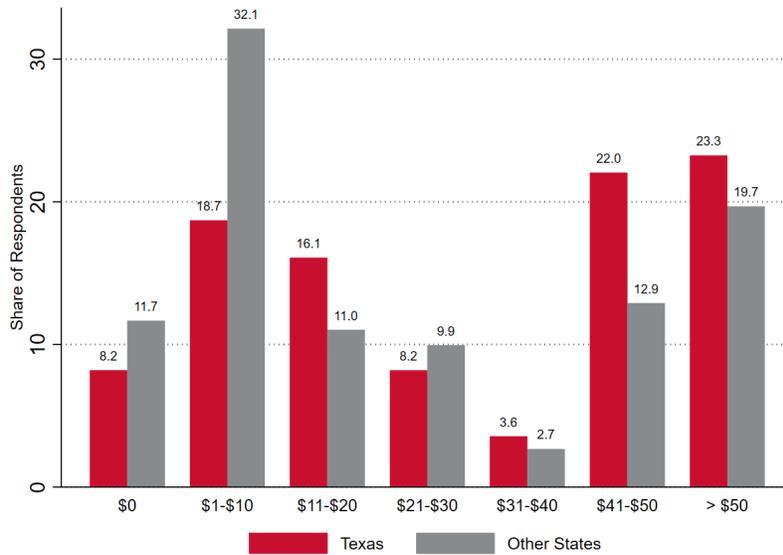
We further decompose the responses by looking at Texas and other states in Figure 4.7. While Texans are willing to pay a higher amount, respondents from other states are willing to bear a smaller additional cost. More than 11% of non-Texas respondents are not interested in natural gas-based electricity, while 8.2% of Texans are not interested in electricity produced without flaring and venting. About 19% of Texans are willing to cover an extra cost ranging between \$1 and \$10 a month, while more than 32% of non-Texans are willing to pay same amount. About 49% Texans are willing to pay between \$11 and \$50, while 35% of non-Texans are willing to pay the same amount.

Texas produces 25% and consumes 15% of US natural gas but has no state-level regulations for methane venting and flaring.<sup>5</sup> The willingness of Texans to pay more to mitigate methane emissions indicates an opportunity for state legislators to regulate emissions from the Permian Basin, which emits more methane than any other US oilfield.

<sup>5</sup>US EIA (2020b); Watkins, K. (2020)

## 4.1. Willingness to pay for a carbon-neutral fuel

**Figure 4.7:** Willingness to pay for natural gas, non-flaring/non-venting electricity: Texas and other states

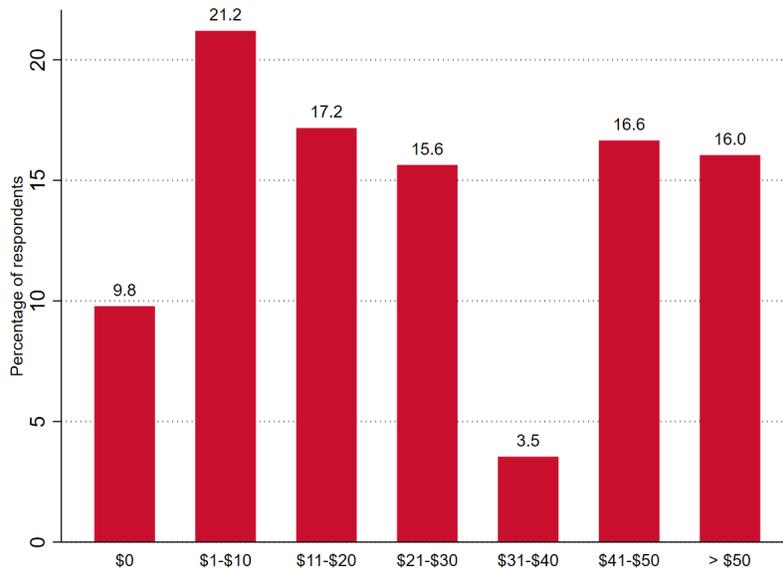


### Willingness to pay for electricity with a \$40 carbon tax

Setting a price of \$40 per ton of carbon dioxide would incentivize practices and technologies that reduce emissions and encourage greater energy efficiency. Since a price on carbon will increase the production cost of hydrocarbon-based energy, it is expected to also increase the cost of energy for consumers. Respondents were asked how much of an increase on their monthly electricity bill they would be willing to pay for electricity produced by paying a carbon price. About 10% are not willing to pay an additional cost for electricity produced with a carbon tax, while 21% are willing to pay an additional \$1 to \$10. Fifty percent are willing to pay between \$11 and \$50, and 16% of respondents are willing to pay more than \$50, as presented in Figure 4.8.

## 4.1. Willingness to pay for a carbon-neutral fuel

**Figure 4.8:** Willingness to pay more for electricity with a carbon price



**Figure 4.9:** Willingness to pay monthly for electricity produced by paying a carbon price



Texans are willing to pay more on average (see Figure 4.9). Even when a few more Texans are not interested in buying carbon price-based electricity for their homes, over 70% are willing to pay between \$1 and \$50 more per month; 74% of

non-Texans who are willing to pay that amount for carbon price-based electricity. Moreover, 18% of Texans are willing to pay upwards of \$50 more per month for carbon priced electricity, whereas 16% of non-Texans are willing to pay that amount. The willingness to pay more for a price on carbon strengthens recent findings that Texans increasingly support prioritizing emissions reduction.<sup>6</sup>

## 4.2 Willingness to Pay: Scenario Analyses

To further probe respondents' willingness to pay, we presented respondents with four scenarios with specific costs for different energy sources with a lower carbon impact. The four scenarios are:

1. A \$1.70 per gallon increase in the price they pay for gasoline to switch to a carbon-neutral fuel.
2. A \$250 increase in their monthly electricity bill to switch to 100% renewable energy for their homes.
3. A \$5 increase in their monthly electricity bill to switch to natural gas-based electricity produced without venting or flaring methane, which was presented to half the sample.
4. A \$20 increase in their monthly electricity bill due to a \$40 economy-wide carbon tax, presented to the other half of the sample.

### Scenario 1: \$1.70 increase for a carbon-neutral fuel

We presented respondents with an estimate for switching to a carbon-neutral fuel that would increase the price for gas by \$1.70 per gallon. The estimate is based on an analysis from Carbon Engineering, an energy company commercializing Direct Air Capture technology. Their Air-To-Fuels technology can deliver carbon-neutral fuels for about \$4 per gallon or a \$1.70 increase from the national average gas price.<sup>7</sup>

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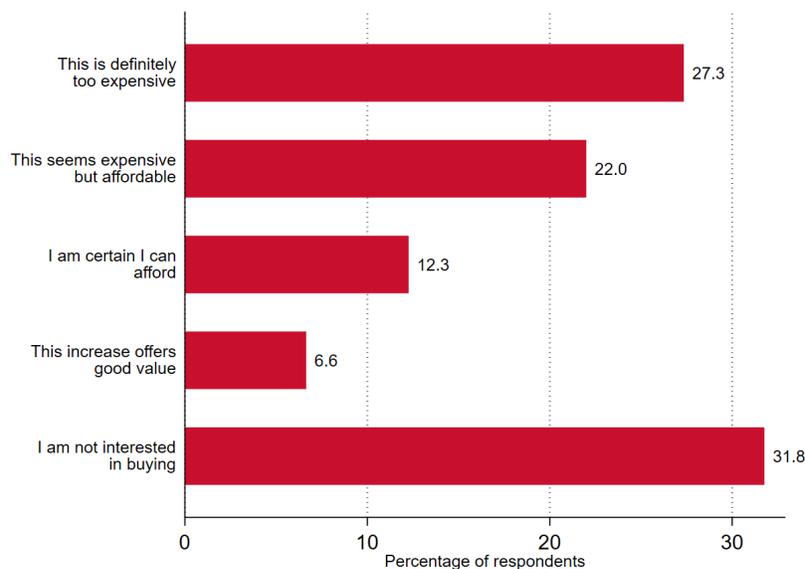
<sup>6</sup>Yale Program on Climate Change Communication (2019);University of Texas and Texas Tribune Polls(2020); Yale Program on Climate Change Communication (2020)

<sup>7</sup>Keith, D. W., Holmes, G., St. Angelo, D., and Heidel, K. (2018).

## 4.2. Willingness to Pay: Scenario Analyses

We asked respondents what they think about this estimate. Figure 4.10 reports their responses: 27% believe this amount is too expensive and 32% of respondents are not interested in buying a carbon-neutral fuel for their car. Even though a majority of respondents indicated that they are willing to pay \$2 or more in the open-ended question asked above, 12% indicated that they can certainly afford it, 22% think the amount is too expensive but still can afford it, and only about 7% can easily afford the increase and believe it offers good value.

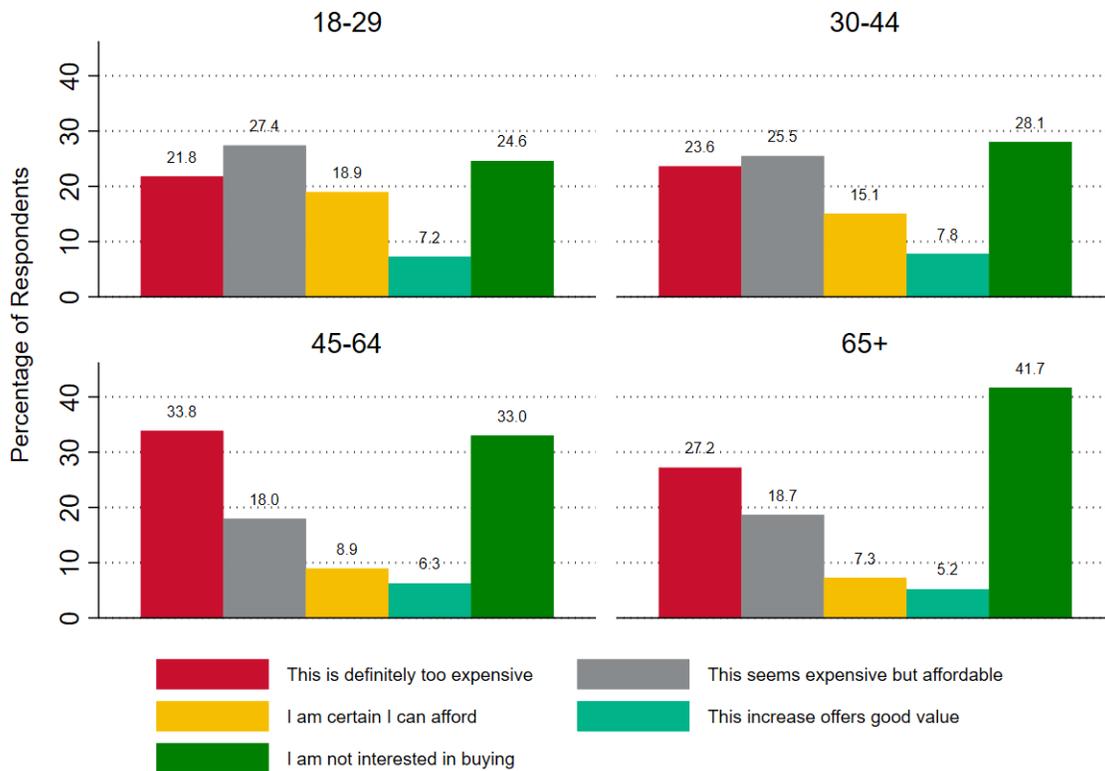
**Figure 4.10:** Feelings about \$1.70 per gallon increase for a carbon-neutral fuel



To see the effect of age on respondents' likely choice, we plot the willingness to pay a \$1.70 increase in gas price by age. Thirty-four percent of those in the 45-64 age group, 27% of those 65 years and older, 24% and 22% of those between 30-44 and 18-29, respectively, believe that the increase is too expensive.

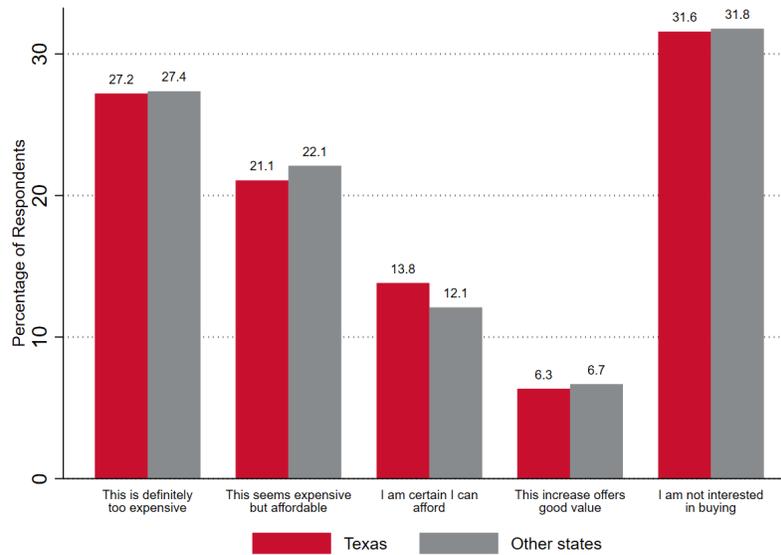
## 4.2. Willingness to Pay: Scenario Analyses

**Figure 4.11:** Feelings about \$1.70 per gallon increase in carbon-neutral fuel by age



Twenty-seven percent of those between 18-29 and 26% of those between 30-44 years of age are certain they can afford the increase. About 18% of respondents in both the 45-64 and 65 and older age groups believe they could afford such an increase. Among the older age groups, 42% of those 65 and older and 33% of those 45-64 said they were not interested in buying a carbon-neutral fuel. In agreement with the open-ended responses, the willingness to pay higher amounts is lowest for those who are between 45-64 and 65 and above.

**Figure 4.12:** Feelings about \$1.70 per gallon increase in carbon-neutral fuel: Texas and other states



In Figure 4.12, we present the responses by comparing Texas with other states. There are no significant differences between Texans and non-Texans. Overall, the scenario analysis suggests that the most Americans are willing to pay for switching to a carbon-neutral fuel is a 50% increase when compared to the national average price of \$2.10 per gallon. Compared to the open-ended response discussed above, any increase over \$1 per gallon is not considered affordable.

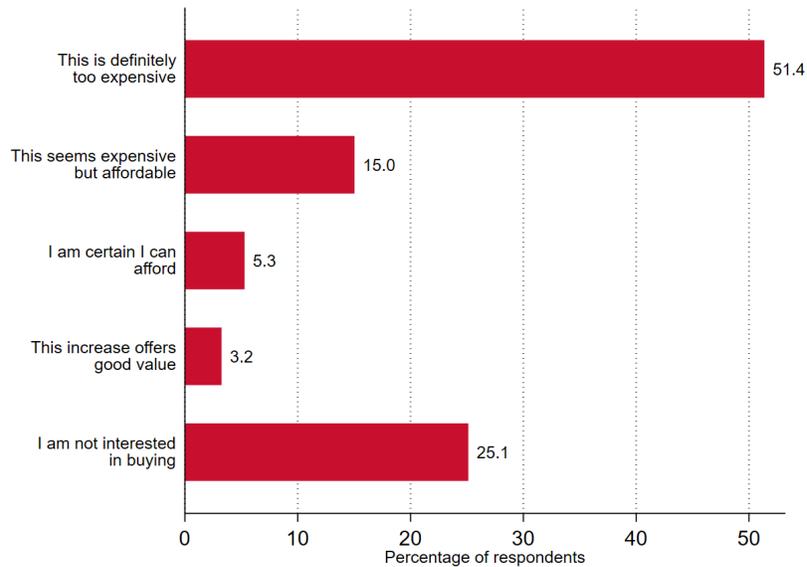
### Scenario 2: \$250 increase for 100% renewable electricity

The average US household pays 12 cents per kilowatt-hour, which translates to an electricity bill of about \$110 per month. A 2018 analysis suggests that to have 100% renewable electricity delivered to their homes will increase monthly electricity bills between 40% and 280%.<sup>8</sup>

<sup>8</sup>Sepulveda, N.A., et al. (2018); Rossetti, P., and S. Batkins (2019)

## 4.2. Willingness to Pay: Scenario Analyses

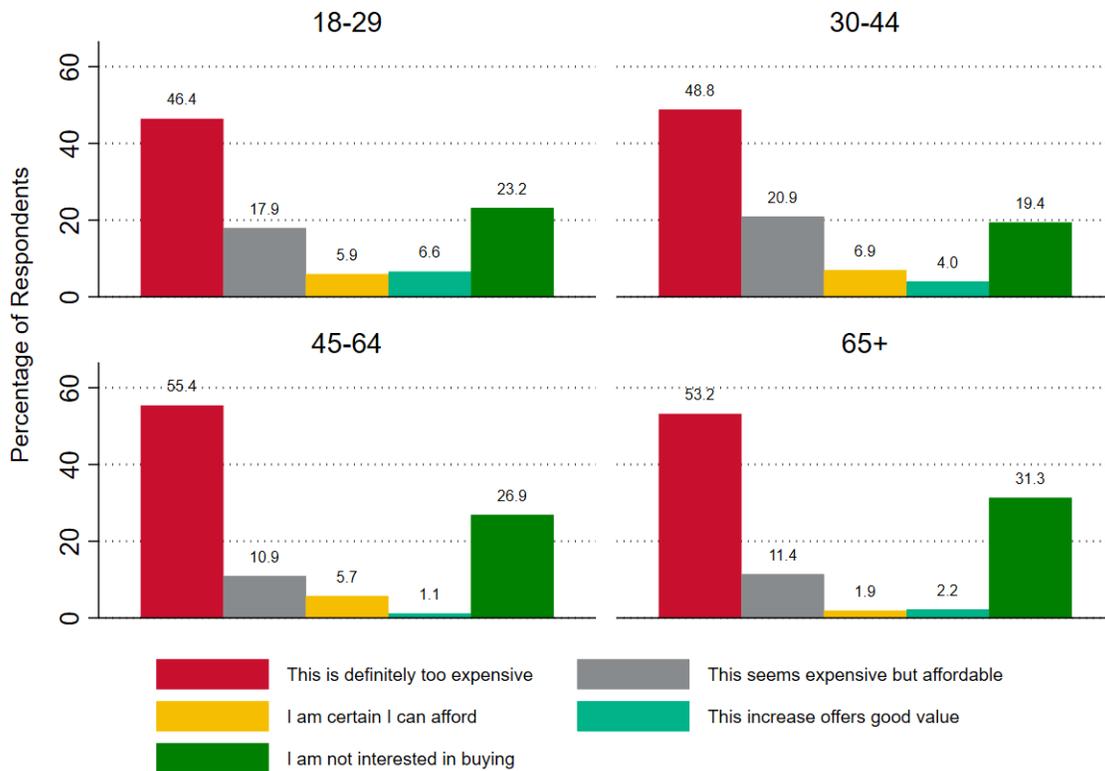
**Figure 4.13:** Feelings about \$250 increase in monthly electricity bill from 100% renewable energy scenario



Averaging over this range, in the second scenario, we told respondents that having only renewable energy in US homes would increase the monthly electricity bill by \$250. We then asked respondents whether they thought they could afford a \$250 increase to their monthly electricity bill. Figure 4.13 reports their responses. Just over 50% believe this amount is too expensive, 5% said they could certainly afford it, and 15% think the amount is too expensive but still can afford it. Only about 3% said this increase represented good value, while 25% are not interested in buying renewable energy for their home.

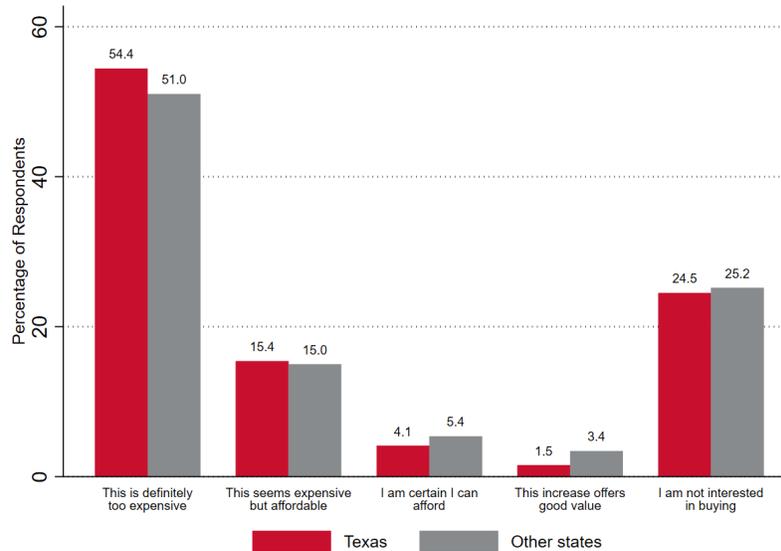
## 4.2. Willingness to Pay: Scenario Analyses

**Figure 4.14:** Feelings about \$250 increase in monthly electricity bill from 100% renewable energy scenario by age



There is large disparity in responses to the \$250 renewable energy electricity tariff by age. Nearly 50% of respondents aged 30 to 44 and more than 50% of those 45 years and older think a \$250 increase is too expensive. Almost a third of respondents older than 65 and 27% of those ages 45-64 are not interested in renewable energy for their home. While 7% of respondents aged 30-44 say they can certainly afford increase, only 2% of those 65 and older reported the same.

**Figure 4.15:** Feelings about \$250 increase in monthly electricity bill from 100% renewable energy scenario by age: Texas and other states



We further look at responses by state: 54% of Texans and 51% of non-Texans think a \$250 monthly tariff is definitely too expensive. This indicates that although a majority of respondents in Texas and other states are willing to pay more, the current cost of 100% renewable electricity is not affordable for most respondents. A quarter of respondents also expressed disinterest in renewable electricity when provided with the expected increase in cost.

### Scenario 3: \$5 increase from natural gas electricity without flaring and venting

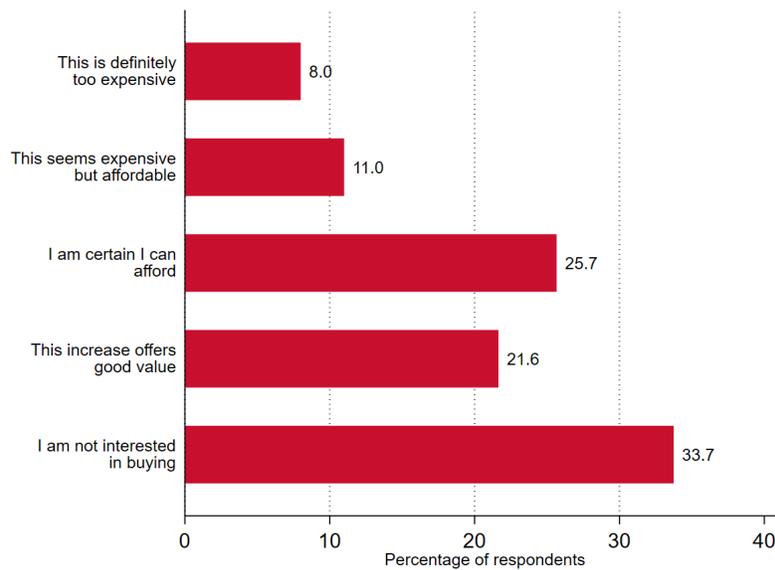
In the third scenario, we estimate that having natural gas-based electricity produced without venting or flaring methane would increase the monthly electricity bill by \$5 for the average household. This was based on a 2017 analysis, System-wide and Super-emitter Policy Options for the Abatement of Methane Emissions from the U.S. Natural Gas System, which found the break-even cost of zero flaring/venting natural gas to be \$3 per million British Thermal Units (MMBTU).<sup>9</sup> Setting a Henry Hub price of \$1.60 from July 2020, the projections would result

<sup>9</sup>Mayfield, E.N., Robinson, A.L., and J. L. Cohon (2017); IEA (2020)

## 4.2. Willingness to Pay: Scenario Analyses

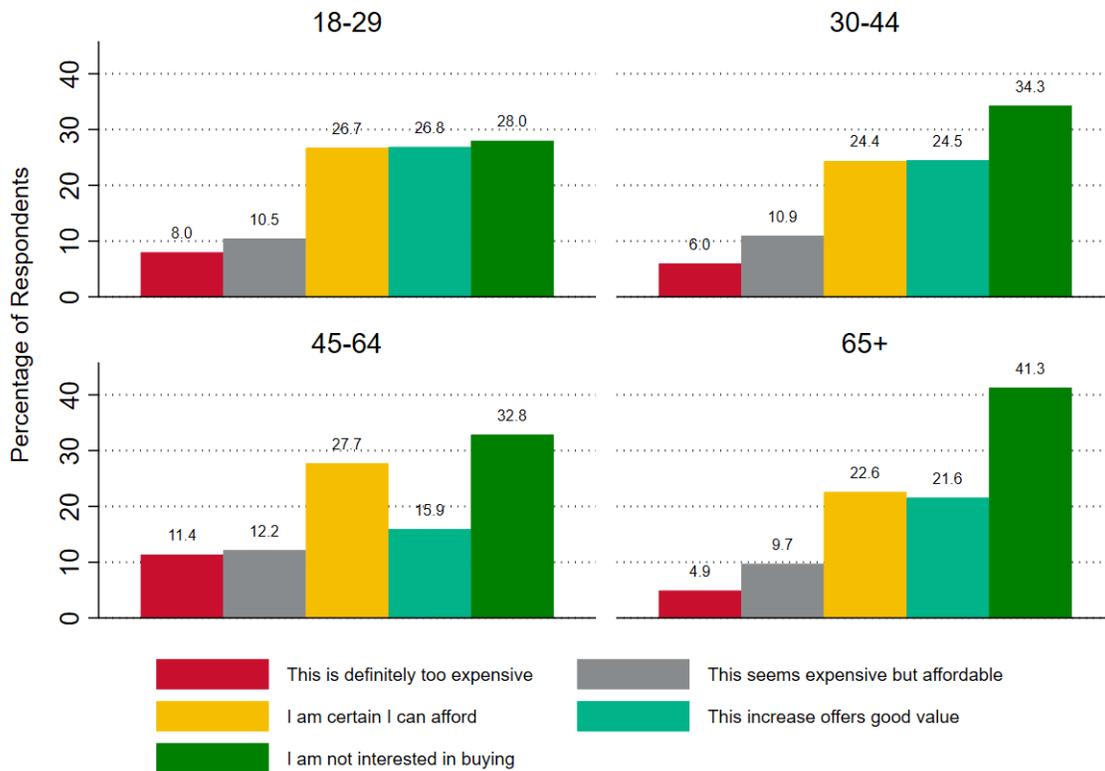
in a \$5 monthly increase for the average US home which uses 900 kWh every month. We asked only half of the sample what they think about a \$5 monthly increase to their electricity bill. Figure 4.16 reports their responses. Eight percent of respondents believe this amount is too expensive, 11% could certainly afford it, and 26% think the amount is too pricey but still can afford it. About 22% believe they can easily afford the increase and that it offers good value, while 34% were not interested in buying natural gas-based electricity produced without methane emissions.

**Figure 4.16:** Feelings about \$5 increase in monthly electricity bill from natural gas, non-flaring/non-venting electricity



## 4.2. Willingness to Pay: Scenario Analyses

**Figure 4.17:** Feelings about \$5 increase in monthly electricity bill from natural gas, non-flaring/non-venting electricity by age



In Figure 4.17, we present responses to the \$5 monthly increase by respondents' age. With a reduced sample, the distribution looks similar across all age groups. For older age groups, the plurality of respondents said they were not interested in buying natural gas-based electricity produced without flaring or venting. Those 65 years and older had the highest percentage of respondents (41%) who were uninterested. Fifty percent of respondents in the 30-44 age group said they could certainly afford the increase or that the increase offers good value; and over 50% of respondents in the youngest age group reported similarly.

## 4.2. Willingness to Pay: Scenario Analyses

**Figure 4.18:** A \$5 Increase in Electricity Scenario: Texas and other states (Reduced Sample)

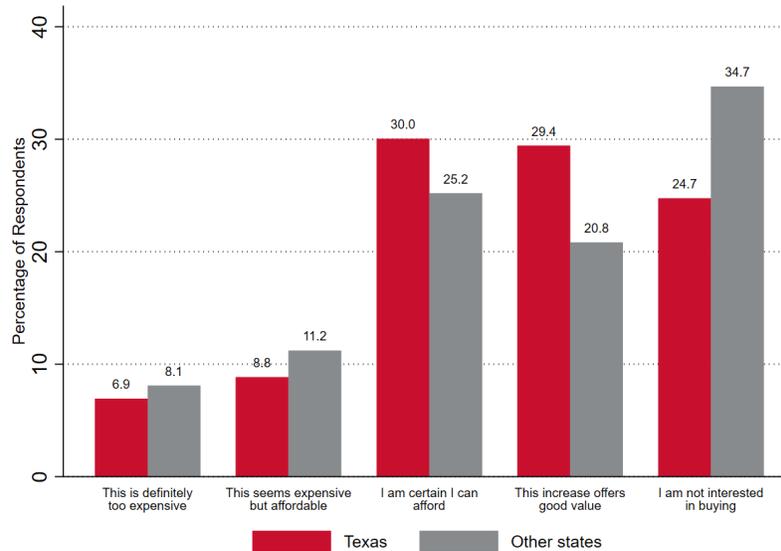


Figure 4.18 presents responses to the \$5 tariff hike by location - Texas and other states, for a reduced sample. Thirty percent of Texans said they could certainly afford this increase and another 30% said the increase offers good value. In other states, by contrast, 35% said they were not interested in buying natural gas-based electricity produced without methane flaring or venting (compared to 25% in Texas). Less than 10% of respondents in Texas and other states said the \$5 increase is definitely too expensive. Given the overall support for the modest \$5 increase, national and state-wide policy efforts to mitigate methane emissions will likely enjoy considerable public support.

In Table 4.1 we compare responses to the \$250 and \$5 monthly increase for the full sample and the reduced sample. There is a 43 percentage point difference between respondents who think \$250 monthly increase is too expensive for 100% renewable energy, compared to \$5 increase for electricity from natural gas produced without venting or flaring of methane. For the \$250 increase scenario, 3.2% think that increase offers good value compared to 22% of respondents presented with the \$5 increase scenario. Even though the scenarios have a significant price differential, 25% respondents expressed they were not interested in buying renewable energy for their home in the \$250 monthly increase scenario, while 36% respondents

## 4.2. Willingness to Pay: Scenario Analyses

**Table 4.1:** \$250 and \$5 increase in monthly electricity bill

Energy products	\$250 increase electricity (Full sample)		\$5 increase electricity (Reduced sample)	
	No.	%	No.	%
This is definitely too expensive	770	51.4	60	8.0
This seems expensive but affordable	225	15.0	82	11.0
I am certain I can afford	79	5.3	191	25.7
This increase offers good value	49	3.2	161	21.6
I am not interested in buying	376	25.1	252	33.7
<b>Total</b>	1,499	100.0	746	100.0

expressed the same for a \$5 increase from natural gas-based electricity produced without venting or flaring methane. The public opinion on oil and gas companies, hydraulic fracturing, and venting/flaring discussed in Chapter 3 likely have an impact on shaping attitudes toward specific sources of energy. We find that a lower share of respondents are willing to support a measure to reduce emissions from a traditional source of energy, even when it's produced with a fifty-times lower increase to their electricity bill, as compared to 100% renewable energy, which would add much more to their electricity bill.

### Scenario 4: \$20 Increase in electricity from a set carbon price of \$40 (Reduced Sample)

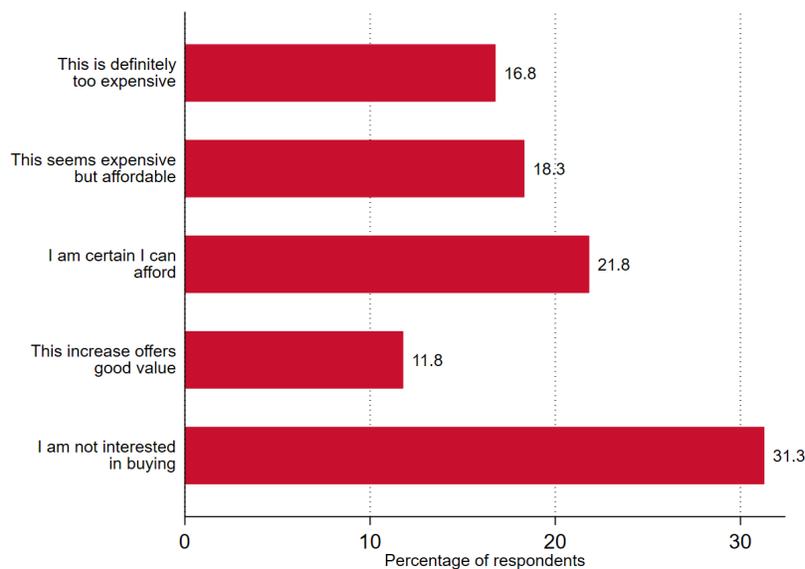
In the fourth scenario, we estimate that a \$40 per ton carbon price would increase the average monthly electricity bill by \$20. This estimate was based on the Tax Policy Center's analysis that a tax (or set price) of \$40 per ton of carbon dioxide would increase the price of electricity by 2 cents per kWh. Since the average US household consumes 900 kWh of electricity per month, this would mean about a \$20 increase to monthly electricity bills.<sup>10</sup>

<sup>10</sup>Tax Policy Center (2020); US EIA (2020b)

## 4.2. Willingness to Pay: Scenario Analyses

In this scenario, we asked all respondents what they thought about this estimated increase. Figure 4.19 reports their responses. About 17% think this amount is too expensive, and 18% think it is expensive but affordable, while 22% said they can certainly pay an additional \$20 per month for a carbon tax. More than 31% of respondents were not interested in a \$20 increase in their electricity bill that would result from a set carbon price. Compared to Scenario 2, there is a six percentage point difference in those expressing disinterest even though the increase to the electricity bill from the carbon tax is much lower than from using 100% renewable electricity.

**Figure 4.19:** Feelings about \$20 increase in electricity from a carbon tax scenario (Reduced Sample)



In Figure 4.20 we present the distribution of responses by respondent age. More than two-fifth of respondents ages 65 and older, 33% respondents within the 45 to 64 age group, and 31% between the ages of 18 and 29 are not interested in buying carbon pricing-based electricity for their homes. While more than one-quarter of respondents ages 18-44 say they can certainly afford the increase, only 18% ages 45 and older said they could certainly afford the increase.

## 4.2. Willingness to Pay: Scenario Analyses

**Figure 4.20:** Feelings about \$20 increase electricity from a carbon tax scenario by age (Reduced Sample)

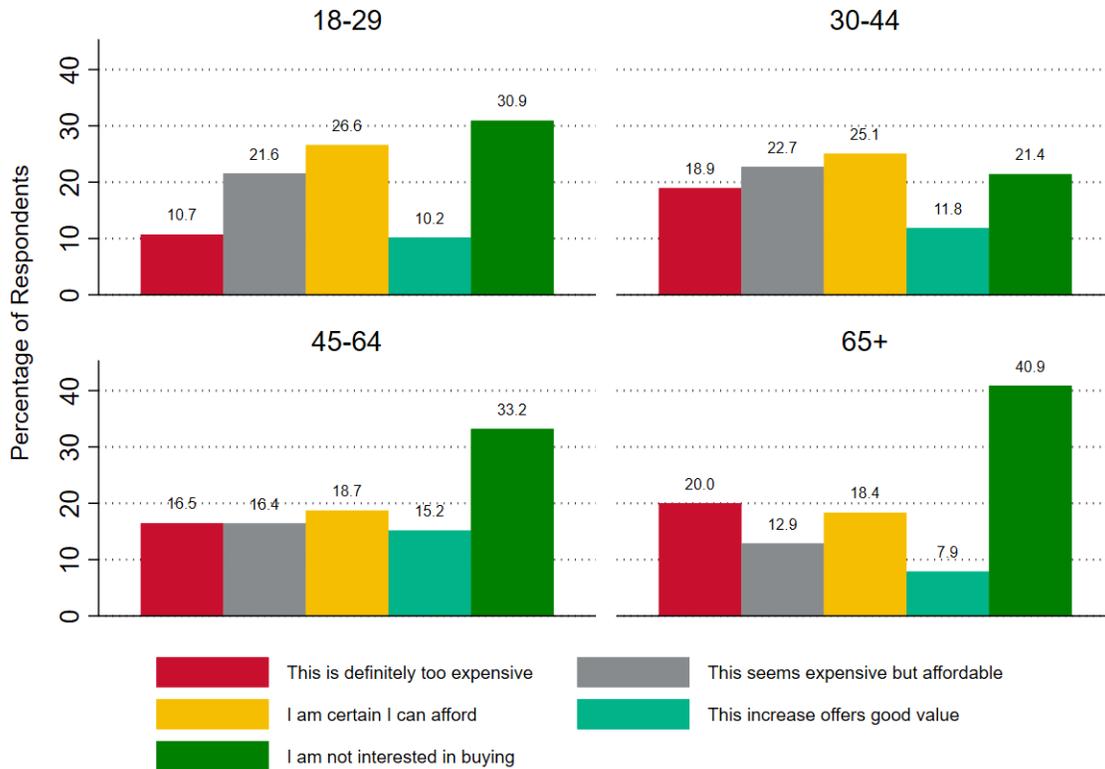
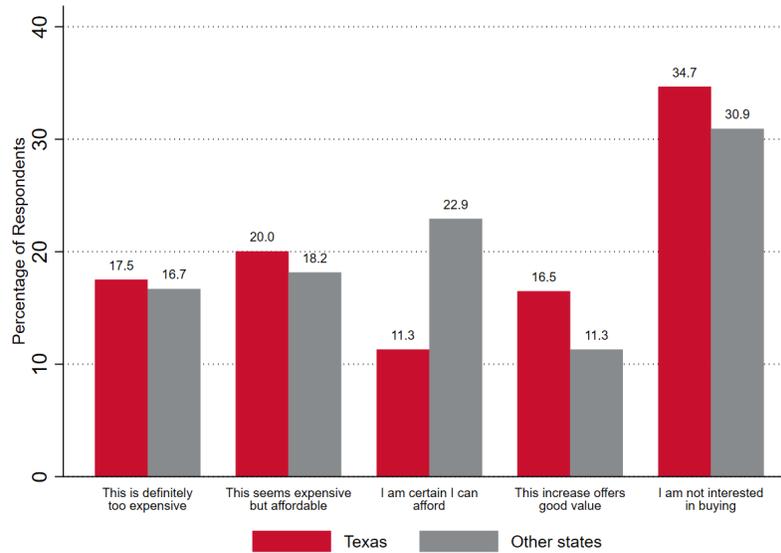


Figure 4.21 presents responses to a \$40 carbon tax for Texas and other states. Fewer Texans are interested in a carbon tax compared to respondents from other states. Although 16.5% of Texans think the proposal offers good value, 17.5% of Texans state that is definitely too expensive, while 20% think it is expensive but affordable. Whereas 11% of non-Texas think the proposal offers good value, 19% of Texans believe it does. In general, 48% of Texans and 52% of non-Texans may be willing to support a carbon tax if the resulting increase to their monthly electricity bill is \$20.

## 4.2. Willingness to Pay: Scenario Analyses

**Figure 4.21:** Feelings about \$20 increase in electricity from a carbon tax scenario: Texas and other states (Reduced Sample)



**Table 4.2:** Willingness to Pay Analysis by Energy Products

Energy products	\$1.70 increase Gas		\$250 increase Electricity		\$5 increase Electricity (reduced sample)		\$20 increase Electricity (reduced sample)	
	No.	%	No.	%	No.	%	No.	%
This is definitely too expensive	410	27.3	770	51.4	60	8.0	126	16.8
This seems expensive but affordable	330	22.0	225	15.0	82	11.0	138	18.3
I am certain I can afford	184	12.3	79	5.3	191	25.7	164	21.8
This increase offers good value	100	6.6	49	3.2	161	21.6	89	11.8
I am not interested in buying	476	31.8	376	25.1	252	33.7	236	31.3
<b>Total</b>	<b>1,500</b>	<b>100.0</b>	<b>1,499</b>	<b>100.0</b>	<b>746</b>	<b>100.0</b>	<b>753</b>	<b>100.0</b>

Finally, in Table 4.2, we present a summary of all four scenarios. Despite the varying amounts of an increase, at least a quarter of respondents are not interested in paying for any of the low-carbon products when presented with information on how much it would add to their gas or electricity bill. We also observe relatively more support for and willingness to accept 100% renewable electricity, even though respondents find the current cost to transition to such a system unaffordable.

## 4.2. Willingness to Pay: Scenario Analyses

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While smaller increases to electricity bills in Scenarios 3 and 4 have a greater share of respondents who would be willing to pay the differential, we also observe a higher share of respondents expressing disinterest in the policy proposition altogether. Despite this, we found that a significant share of the public is willing to embrace and pay for low-carbon policies in general, revealing greater support for emissions reduction, climate change mitigation, and the energy transition than previously recorded. However, given the differences in how traditional and renewable energy sources are perceived, we found that a greater share of respondents are more willing to accept expensive policies that support renewable energy, even though they may not be able to afford the increase, as compared to less expensive emissions reduction policies for traditional sources or an economy-wide tax on carbon. This indicates that biases about energy sources, the growing opposition toward the oil and gas sector, and a general aversion toward taxes are prevalent and influence the decisions of Americans. Once again, we note that transparent, consistent, and comprehensive public education is required to advance the knowledge on the mitigation alternatives, timelines, and costs associated with the energy transition.

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# Conclusion

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## 5.1 Energy Future

Low-carbon technologies and practices are changing how energy is produced, distributed, and used. These changes have also led to workforce development opportunities in the energy sector, both for reskilling and upskilling current employees, and new job roles adapted to the energy transition. The energy industry and the energy workforce are expected to look substantially different during and after the energy transition.

To gauge opinions on the future of the industry, respondents were asked to rank the job creation prospects for oil and gas, carbon management, wind, solar, and the manufacturing industries in their states on a scale from 1 to a 5. Table 5.1 reports the distribution for the five industries. Nearly a third of respondents ranked the carbon management industry as most likely to witness the greatest job creation in the next 10 years, followed by the oil and gas sector (28%), wind (18.8%), manufacturing (13.5%), and finally solar (8%). While 26% believe the oil and gas industry would witness the greatest job growth, an almost equal share ranked prospects for oil and gas job growth as the lowest. The prospect of job growth in the solar industry was ranked the lowest by most respondents (27%). This suggests that while respondents may indicate support for renewable electricity, as presented in Chapter 4, they do not believe the solar energy sector will witness any notable growth in jobs.

Figure 5.1 provides the mean rank on a scale of 1-5 by industry for Texas and other states. Carbon management received an average rank of 3.7 from Texans and 3.6 among respondents in other states. Texans equally ranked prospects for job growth in the wind and manufacturing industries, with slightly lower ranked

**Table 5.1:** Which of the following industries do you think would witness the greatest job growth in your state in the next 10 years?

<b>Rank</b>	<b>Oil &amp; Gas(%)</b>	<b>Carbon Management(%)</b>	<b>Wind(%)</b>	<b>Solar(%)</b>	<b>Manufacturing(%)</b>
1.Lowest	26.0	7.4	16.3	27.8	22.7
2	17.1	11.5	25.3	21.9	24.0
3	13.0	23.8	20.47	23.0	19.7
4	15.4	25.9	19.2	19.1	20.1
5.Highest	28.3	31.2	18.8	8.0	13.5
<b>Total</b>	1,497	1,498	1,499	1,497	1,499

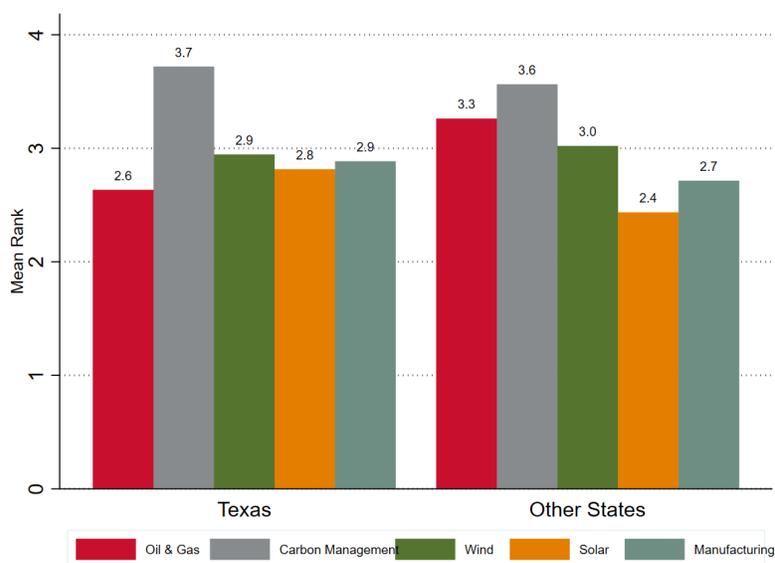
prospects for job growth in the solar energy and oil and gas sectors. In fact, Texans ranked the oil and gas as the lowest (2.6) among all five industries. For other states, job prospects in the oil and gas industry is ranked higher (3.3) compared to other energy industries, and solar is ranked lowest.

This likely reflects the growing perception among Texans, many of whom are directly or indirectly employed in the traditional energy sector, that oil and gas job growth may be inhibited by public pressure and the growing sentiment amongst Texans that emissions reduction must be a policy priority and business-as-usual is not sustainable.<sup>1</sup> For the US, the anticipated growth in carbon management and the oil and gas industry appears to suggest that:

1. Americans support an all-of-the-above strategy for the energy transition and socioeconomic development.
2. The oil and gas industry can thrive, with public support, if a robust adoption of carbon management is initiated and advanced across the oil and gas value chain. The carbon management industry, and the new jobs Americans are anticipating it will offer, must focus on the end goal of emissions reductions and climate change mitigation, instead of picking winners and losers amongst energy and technology alternatives.
3. Americans likely anticipate that raw materials and equipment for solar and wind industries will continue to be manufactured outside of the US.

<sup>1</sup>Yale Program on Climate Change Communication (2019); Elliott, R. (2020)

**Figure 5.1:** Which of the following industries do you think would witness the greatest job growth in your state in the next 10 years? (Texas and other states)



## 5.2 Concluding Remarks

There is still a lot we do not know about climate change. However, we do know that, given the current trajectory, the US and the world will emit more carbon dioxide and other greenhouse gases in the coming decades. We also know we will witness an increase in the frequency and intensity of extreme weather, such as hurricanes and flooding, which will have the harshest social and economic impacts on the most vulnerable groups, even as uncertainties remain around where and when the worst impacts will be felt. At the same time, the world will require more energy, and currently this energy cannot be provided solely by renewable sources. Hydrocarbons will continue to supply the bulk of our energy needs in the near future.

Understanding the magnitude of the threats to our climate and gauging individuals' perception and willingness to pay for low-carbon energy are key to the future of the Texas and US economy, carbon management, and climate change mitigation. Through our survey, we found that a non-partisan sustainable energy and low-carbon policy is embraced by people in all states. While younger generations

are willing to pay more for low-carbon gas and electricity, a greater share of older respondents are more inclined to support 100% renewable energy than a carbon tax or carbon-neutral fuel. In a shift from past reports of public opinion, respondents expressed strong support for directing revenues from a carbon tax to fund research and development on energy and the environment, rather than returning revenues to taxpayers as rebates. Also, the survey found an extraordinary and unprecedented shift in public opinion in Texas, wherein Texans revealed preferences increasingly aligned with the rest of the US.

With new technology, processes, tax policy, and changes in household preferences for energy products, the opportunities and threats to the future and profitability of the energy industry remain up for debate, which can only be resolved through policy support and regulatory certainty. Job creation has been the foundation of President-elect Joe Biden's campaign; and the survey has revealed public support for investment in the energy transition. Americans are also optimistic about the job prospects of the carbon management industry and are willing to embrace the new markets and products it will create.

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## Appendix A: Technical Note

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The Hobby School of Public Affairs and UH Energy entrusted the fielding of the survey to [YouGov](#). The survey was fielded online between Oct. 15 and Oct. 22, 2020. YouGov matched the 1,657 respondents to a sampling frame based on gender, age, race/ethnicity, and years of education that was constructed from the full 2018 American Community Survey (ACS). The resulting sample is 1,500 respondents. YouGov used propensity scores to weight the matched cases to the sampling frame. Weights for the national sample were then post-stratified on 2016 Presidential vote choice, state of residence, and a four-way stratification of gender, race/ethnicity, age, and education.

We included a Texas oversample of 556 matched cases, using the same procedure as described above. The weights for the state sample were post-stratified according to 2016 Presidential vote choice, political ideology, party ID, whether respondent identified as “born-again” or evangelical Christian, political interest, and a three-way stratification of gender, race/ethnicity, and education.

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## Appendix B: Summary Tables for Survey Questions

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This appendix provides summary statistics for all questions used in the report and for demographic characteristics of the 1,500 respondents.

**Table B1:** You may have heard that the world’s temperature has been changing over the past 100 years, a phenomenon referred to as climate change. What is your personal opinion regarding whether or not this phenomenon is happening?

<b>Is climate change happening</b>	No.	%
I believe climate change is happening	1,202	80.2
I do not believe climate change is happening	297	19.8
<b>Total</b>	1,499	100.0

**Table B2:** Assuming that climate change is happening, please indicate which of the following statements you most agree with. Climate change is ...

<b>Climate change cause</b>	No.	%
Caused mostly by human activities	917	75.1
Caused mostly by natural changes in the environment	305	24.9
<b>Total</b>	1,222	100.0

**Table B3:** How worried are you about climate change?

<b>How worried are you about climate change</b>	<b>No.</b>	<b>%</b>
Very worried	523	34.8
Somewhat worried	459	30.6
Not very worried	242	16.1
Not at all worried	277	18.5
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

Tables B4 to B10 show responses to the following question: **Why do you think climate change is harmful?**

**Table B4:** Frequent extreme weather events, such as droughts, hurricanes, increased rainfall, forest fires, etc.

	<b>No.</b>	<b>%</b>
Selected	998	66.5
Not selected	502	33.5
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

**Table B5:** Threat to endangered species and species diversity

	<b>No.</b>	<b>%</b>
Selected	873	58.2
Not selected	627	41.8
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

---

**Table B6:** Rising sea levels

	No.	%
Selected	819	54.6
Not selected	681	45.4
<b>Total</b>	1,500	100.0

**Table B7:** Food and potable water shortages

	No.	%
Selected	751	50.1
Not selected	749	49.9
<b>Total</b>	1,500	100.0

**Table B8:** Increased migration and displacement of people

	No.	%
Selected	661	44.0
Not selected	839	56.0
<b>Total</b>	1,500	100.0

**Table B9:** Threat to human health and security

	No.	%
Selected	784	52.3
Not selected	716	47.7
<b>Total</b>	1,500	100.0

---

**Table B10:** Declining glaciers and melting ice caps

	No.	%
Selected	866	57.8
Not selected	634	42.2
<b>Total</b>	1,500	100.0

**Table B11:** How much do you think climate change will harm you personally?

	No.	%
Not at all	344	23.0
Only a little	387	25.8
A moderate amount	520	34.7
A great deal	248	16.5
<b>Total</b>	1,499	100.0

**Table B12:** How much do you think climate change will harm future generations?

	No.	%
Not at all	191	12.7
Only a little	262	17.4
A moderate amount	325	21.7
A great deal	722	48.2
<b>Total</b>	1,500	100.0

**Table B13:** Assuming that climate change has harmful effects, please indicate which of the following statements you most agree with:

<b>Climate change statements</b>	No.	%
Humans will be able to adapt to these harmful effects without altering their behavior and lifestyle	300	20.0
Humans should adapt to these harmful effects by altering their behavior and lifestyle, but they should not try to reverse these effects	298	19.9
Humans should adapt to these harmful effects by altering the altering their behavior and lifestyle, and they should try to reverse these effects	899	60.1
<b>Total</b>	1,497	100.0

**Tables B14 to B20 show responses for the following question: How responsible or not responsible for climate change do you think each of the following entities are?**

**Table B14:** Individual consumption and behavior

<b>Responsible for climate change</b>	No.	%
Not responsible at all	154	10.8
Little responsible	225	15.8
Neutral	220	15.4
Somewhat responsible	447	31.3
Very responsible	382	26.7
<b>Total</b>	1,428	100.0

---

**Table B15: Oil and gas industry**

<b>Responsible for climate change</b>	No.	%
Not responsible at all	112	7.8
Little responsible	130	9.1
Neutral	149	10.4
Somewhat responsible	255	17.8
Very responsible	787	54.9
<b>Total</b>	<b>1,433</b>	<b>100.0</b>

**Table B16: Meat and dairy industry**

<b>Responsible for climate change</b>	No.	%
Not responsible at all	214	15.3
Little responsible	137	9.8
Neutral	255	18.2
Somewhat responsible	398	28.4
Very responsible	396	28.3
<b>Total</b>	<b>1,400</b>	<b>100.0</b>

**Table B17: Governments of developing countries**

<b>Responsible for climate change</b>	No.	%
Not responsible at all	89	6.4
Little responsible	109	7.9
Neutral	235	16.9
Somewhat responsible	434	31.3
Very responsible	521	37.5
<b>Total</b>	<b>1,387</b>	<b>100.0</b>

---

**Table B18:** Governments of developed countries

<b>Responsible for climate change</b>	No.	%
Not responsible at all	93	6.6
Little responsible	81	5.8
Neutral	204	14.5
Somewhat responsible	336	23.9
Very responsible	692	49.2
<b>Total</b>	<b>1,406</b>	<b>100.0</b>

**Table B19:** Transportation industry

<b>Responsible for climate change</b>	No.	%
Not responsible at all	106	7.5
Little responsible	116	8.2
Neutral	191	13.5
Somewhat responsible	380	26.7
Very responsible	629	44.2
<b>Total</b>	<b>1,423</b>	<b>100.0</b>

**Table B20:** Coal industry

<b>Responsible for climate change</b>	No.	%
Not responsible at all	123	8.7
Little responsible	128	9.1
Neutral	204	14.4
Somewhat responsible	268	18.9
Very responsible	693	48.9
<b>Total</b>	<b>1,416</b>	<b>100.0</b>

**Table B21:** How likely or unlikely do you think it is that scientists will find solutions to mitigate and reverse climate change in the next 10 years?

<b>Will scientists will find solutions</b>	No.	%
Very likely	153	10.2
Somewhat likely	572	38.1
Somewhat unlikely	457	30.4
Very unlikely	319	21.2
<b>Total</b>	1,500	100.0

**Table B22:** Which of the following terms have you heard or read about: Cap and trade

<b>Terms you have read about - Cap and Trade</b>	No.	%
Selected	578	38.5
Not selected	922	61.5
<b>Total</b>	1,500	100.0

**Table B23:** Which of the following terms have you heard or read about: Carbon management

<b>Terms you have read about - Carbon Management</b>	No.	%
Selected	680	45.3
Not selected	820	54.7
<b>Total</b>	1,500	100.0

**Table B24:** Which of the following terms have you heard or read about: Carbon pricing

<b>Terms you have read about - Carbon Pricing</b>	No.	%
Selected	501	33.4
Not selected	999	66.6
<b>Total</b>	1,500	100.0

**Table B25:** Which of the following terms have you heard or read about: Carbon tax

<b>Terms you have read about - Carbon Tax</b>	No.	%
Selected	915	61.0
Not selected	585	39.0
<b>Total</b>	1,500	100.0

**Table B26:** Which of the following terms have you heard or read about: Emissions trading system

<b>Terms you have read about - Emissions Trading System</b>	No.	%
Selected	576	38.4
Not selected	924	61.6
<b>Total</b>	1,500	100.0

**Table B27:** Which of the following terms have you heard or read about: Carbon dividends

<b>Terms you have read about - Carbon Dividends</b>	No.	%
Selected	354	23.6
Not selected	1,146	76.4
<b>Total</b>	1,500	100.0

---

**In Tables B28 to B31, respondents were asked “Please indicate how much you agree or disagree with each of the following statements.”**

**Table B28:** The oil and gas industries have deliberately misled people on climate change

	No.	%
Strongly disagree	170	12.5
Somewhat disagree	137	10.1
Neutral	238	17.5
Somewhat agree	339	25.0
Strongly agree	473	34.9
<b>Total</b>	<b>1,357</b>	<b>100.0</b>

**Table B29:** Oil and gas companies should adopt carbon management technologies

	No.	%
Strongly disagree	87	6.4
Somewhat disagree	67	4.9
Neutral	248	18.1
Somewhat agree	295	21.5
Strongly agree	674	49.1
<b>Total</b>	<b>1,372</b>	<b>100.0</b>

**Table B30:** Oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management technologies

	No.	%
Strongly disagree	334	26.0
Somewhat disagree	265	20.6
Neutral	330	25.7
Somewhat agree	181	14.1
Strongly agree	174	13.6
<b>Total</b>	<b>1,283</b>	<b>100.0</b>

**Table B31:** Government should promote, incentivize, and subsidize carbon management technologies

	No.	%
Yes, I will vote	173	12.8
No, I will not vote	67	5.0
No, I did not vote	271	20.0
Somewhat agree	348	25.8
Strongly agree	493	36.5
<b>Total</b>	<b>1,353</b>	<b>100.0</b>

**Table B32:** If the government implements a tax on carbon emissions, what would you think is the best way to spend that revenue?

	No.	%
Fund and support research for energy and the environment	623	41.7
Grant a rebate to taxpayers	284	19.0
Fund and support social welfare programs	140	9.4
Reduce the federal deficit	248	16.6
Fund international climate programs and carbon reduction efforts in least developed nations	199	13.3
<b>Total</b>	<b>1,495</b>	<b>100.0</b>

---

**Table B33:** True or False: Fracking has a negative impact on the environment

	No.	%
True	955	63.8
False	541	36.2
<b>Total</b>	1,496	100.0

**Table B34:** True or False: Flaring during natural gas production is good for the environment

	No.	%
True	415	27.7
False	1,080	72.3
<b>Total</b>	1,495	100.0

**Table B35:** The development of new natural gas projects requires the expansion of pipelines. Do you support or oppose an expansion of the pipeline network?

<b>Support or oppose an expansion of the pipeline network</b>	No.	%
Strongly support	295	19.7
Somewhat support	283	18.9
Neutral	512	34.1
Somewhat oppose	204	13.6
Strongly oppose	206	13.7
<b>Total</b>	1,500	100.0

**Table B36:** What would be the most important reason for you to own an electric vehicle?

<b>Most important reason for you to own an electric vehicle</b>	No.	%
It would help the environment	449	29.9
It would help the alternative vehicle industry	55	3.7
It would help you earn a tax credit	51	3.4
It would lower your gasoline expenses	242	16.2
It would be a new and fun experience	44	2.9
It would show others that you care for the environment	38	2.5
I am not considering owning an electric vehicle	554	36.9
Other	68	4.5
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

**Table B37:** Over the next 10 years which of the following industries do you think would witness the greatest job growth in your state? Please rank them from 1-5.

<b>The oil and gas industry</b>	No.	%
1	390	26.1
2	257	17.2
3	195	13.0
4	231	15.4
5	424	28.3
<b>Total</b>	<b>1,497</b>	<b>100.0</b>

**Table B38:** Over the next 10 years which of the following industries do you think would witness the greatest job growth in your state? Please rank them from 1-5.

<b>The carbon management industry</b>	No.	%
1	111	7.4
2	173	11.5
3	357	23.8
4	389	26.0
5	468	31.2
<b>Total</b>	1,498	100.0

**Table B39:** Over the next 10 years which of the following industries do you think would witness the greatest job growth in your state? Please rank them from 1-5.

<b>The wind industry</b>	No.	%
1	242	16.1
2	380	25.4
3	307	20.5
4	288	19.2
5	282	18.8
<b>Total</b>	1,499	100.0

**Table B40:** Over the next 10 years which of the following industries do you think would witness the greatest job growth in your state? Please rank them from 1-5.

<b>The solar industry</b>	No.	%
1	417	27.9
2	328	21.9
3	345	23.0
4	287	19.2
5	120	8.0
<b>Total</b>	1,497	100.0

---

**Table B41:** Over the next 10 years which of the following industries do you think would witness the greatest job growth in your state? Please rank them from 1-5.

<b>The manufacturing industry</b>	No.	%
1	340	22.7
2	360	24.0
3	295	19.7
4	302	20.1
5	202	13.5
<b>Total</b>	1,499	100.0

---

## Respondent Demographics

**Table B42:** Distribution of respondents by age groups

<b>Age Group</b>	<b>%</b>
18-29	21.2
30-44	25.1
45-64	33.0
65+	20.6
<b>Total</b>	<b>100.0</b>

**Table B43:** Are you male or female?

<b>Gender</b>	<b>No.</b>	<b>%</b>
Male	729	48.6
Female	771	51.4
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

**Table B44:** What racial or ethnic group best describes you?

<b>Race</b>	<b>No.</b>	<b>%</b>
Race White	949	63.4
Race Black	181	12.1
Race Hispanic	243	16.2
Race Asian	55	3.7
Race Other, two or more, Middle Eastern	69	4.6
<b>Total</b>	<b>1,497</b>	<b>100.0</b>

---

**Table B45:** What is the highest level of education you have completed?

<b>Education</b>	No.	%
No HS	80	5.4
High school graduate	495	33.0
Some college	331	22.1
2-year	152	10.2
4-year	273	18.2
Post-grad	169	11.2
<b>Total</b>	1,500	100.0

**Table B46:** Which of the following applies best to you?

<b>State identity</b>	No.	%
Lifelong Texan	310	55.9
Moved from another state in the US	202	36.4
Moved from another country	43	7.7
<b>Total</b>	555	100.0

**Table B47:** Are you currently working as paid employee?

<b>Are you currently working as a paid employee</b>	No.	%
Yes	678	45.2
No	822	54.8
<b>Total</b>	1,500	100.0

**Table B48: What is your occupation?**

<b>Current occupation</b>	No.	%
Management Occupations	44	6.4
Business and Financial Operations Occupations	53	7.7
Computer and Mathematical Occupations	28	4.1
Architecture and Engineering Occupations	9	1.3
Life, Physical, and Social Science Occupations	14	2.1
Community and Social Services Occupations	7	1.0
Legal Occupations	17	2.5
Education, Training, and Library Occupations	57	8.3
Arts, Design, Entertainment, Sports and Media Occupations	12	1.8
Healthcare Practitioners and Technical Occupations	21	3.1
Healthcare Support Occupations	30	4.4
Protective Service Occupations	1	0.2
Food Preparation and Serving Related Occupations	37	5.4
Building and Grounds Cleaning and Maintenance Occupations	7	1.0
Personal Care and Service Occupations	13	1.9
Sales and Related Occupations	55	8.0
Office and Administrative Support Occupations	51	7.5
Farming, Fishing, and Forestry Occupations	6	0.9
Construction and Extraction Occupations	21	3.1
Installation, Maintenance, and Repair Occupations	14	2.0
Transportation and Material Moving Occupations	24	3.5
Military Specific Occupations	1	0.2
Other	162	23.6
<b>Total</b>	<b>687</b>	<b>100.0</b>

**Table B49:** Which of the following better describes the sector of your current (or last) employment?

<b>Current employment sector</b>	<b>No.</b>	<b>%</b>
Agriculture, Forestry, and Fishing	6	0.9
Mining	7	1.0
Construction	27	3.9
Manufacturing	76	11.1
Transportation	34	5.0
Communications	24	3.5
Electric, Gas, and Sanitary Service	16	2.3
Wholesale Trade	12	1.8
Retail Trade	73	10.7
Finance, Insurance, and Real Estate	48	7.0
Other Services	158	23.0
Public Administration	29	4.2
Other	176	25.6
<b>Total</b>	<b>687</b>	<b>100.0</b>

**Table B50:** Thinking back over the last year, what was your family's annual income?

<b>Family Income</b>	<b>No.</b>	<b>%</b>
Family income: less than 10k	129	8.6
Family income: 10k-100k	953	63.5
Family income: 100k-250k	205	13.7
Family income: 250k-500k	21	1.4
Family income: above 500k	0	0.0
Family income: prefer not to say	192	12.8
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

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**Table B51:** What is your marital status?

<b>Marital Status</b>	No.	%
Married	663	44.2
Separated	25	1.6
Divorced	161	10.7
Widowed	84	5.6
Never married	491	32.7
Domestic / civil partnership	76	5.1
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

**Table B52:** What is your present religion, if any?

<b>Religion</b>	No.	%
Protestant	442	29.5
Roman Catholic	267	17.8
Mormon	20	1.3
Eastern or Greek Orthodox	12	0.8
Jewish	38	2.5
Muslim	20	1.4
Buddhist	16	1.0
Hindu	9	0.6
Atheist	116	7.7
Agnostic	85	5.7
Nothing in particular	340	22.7
Something else	135	9.0
<b>Total</b>	<b>1,500</b>	<b>100.0</b>

**Table B53:** Would you describe yourself as a “born-again,” or evangelical Christian, or not?

<b>Born Again (Pew version)</b>	No.	%
Yes	471	31.4
No	1,029	68.6
<b>Total</b>	1,500	100.0

**Table B54:** How important is religion in your life?

<b>Importance of religion (Pew version)</b>	No.	%
Very important	540	36.0
Somewhat important	381	25.4
Not too important	206	13.7
Not at all important	372	24.8
<b>Total</b>	1,499	100.0

**Table B55:** Aside from wedding and funerals, how often do you attend religious services?

<b>Church attendance (Pew version)</b>	No.	%
More than once a week	105	7.2
Once a week	225	15.5
Once or twice a month	100	6.9
A few times a year	213	14.6
Seldom	310	21.4
Never	499	34.3
<b>Total</b>	1,453	100.0

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**Table B56:** People practice their religion in different ways. Outside of attending religious services, how often do you pray?

<b>Frequency of Prayer (Pew version)</b>	<b>No.</b>	<b>%</b>
Several times a day	388	27.2
Once a day	194	13.5
A few times a week	159	11.1
Once a week	75	5.3
A few times a month	76	5.3
Seldom	200	14.0
Never	337	23.6
<b>Total</b>	<b>1,429</b>	<b>100.0</b>

## Political Ideology and Issue Priorities

**Table B57:** Distribution of respondents by political ideology

<b>7 point Party ID</b>	No.	%
Strong Democrat	344	23.0
Not very strong Democrat	163	10.9
Lean Democrat	134	8.9
Independent	266	17.7
Lean Republican	115	7.7
Not very strong Republican	131	8.7
Strong Republican	281	18.7
Not sure	66	4.4
<b>Total</b>	1,500	100.0

**Table B58:** In general, how would you describe your own political viewpoint?

<b>Ideology</b>	No.	%
Very liberal	175	11.6
Liberal	252	16.8
Moderate	456	30.4
Conservative	253	16.9
Very conservative	204	13.6
Not sure	160	10.7
<b>Total</b>	1,500	100.0

**Table B59:** Are you registered to vote or not currently registered?

<b>Voter Registration Status (1)</b>	No.	%
Yes	1,192	82.6
No	252	17.4
<b>Total</b>	1,444	100.0

**Table B60:** Did you vote in the 2018 Congressional election?

<b>Did you vote in the 2018 Congressional election</b>	No.	%
Yes	989	80.4
No, I didn't vote in the 2018 election and don't usually vote	114	9.3
No, I didn't vote in the 2018 election but I usually vote	128	10.4
<b>Total</b>	1,231	100.0

**Table B61:** Will you vote in the presidential election in November 2020?

<b>Will you vote in the presidential election in November 2020</b>	No.	%
Yes, I will vote in the presidential election	1,195	97.1
No, I will not vote in the presidential election	36	2.9
<b>Total</b>	1,231	100.0

**Table B62:** In the 2020 election for president, who will you vote for? If you are undecided, please indicate your best guess.

<b>In the 2020 election for president, who will you vote for</b>	No.	%
Donald Trump	505	42.6
Joe Biden	623	52.6
Someone else	50	4.2
Probably will not vote	6	0.5
<b>Total</b>	1,185	100.0

In November, there will be elections to choose the president of the US. How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? Tables B63 to B72 show the distribution for each of the 10 issues.

**Table B63:** The economy

<b>How important – The economy</b>	No.	%
Not at all important	16	1.1
Little important	35	2.4
Neutral	126	8.6
Somewhat important	257	17.6
Very important	1,023	70.2
<b>Total</b>	<b>1,457</b>	<b>100.0</b>

**Table B64:** The health care system

<b>How important – The health care system</b>	No.	%
Not at all important	26	1.8
Little important	37	2.5
Neutral	105	7.2
Somewhat important	283	19.4
Very important	1,010	69.1
<b>Total</b>	<b>1,462</b>	<b>100.0</b>

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**Table B65: Education**

<b>How important – Education</b>	No.	%
Not at all important	37	2.5
Little important	77	5.3
Neutral	187	12.9
Somewhat important	397	27.2
Very important	760	52.1
<b>Total</b>	1,458	100.0

**Table B66: Gun control/rights**

<b>How important – Gun control/rights</b>	No.	%
Not at all important	72	5.0
Little important	81	5.6
Neutral	209	14.3
Somewhat important	312	21.4
Very important	783	53.7
<b>Total</b>	1,458	100.0

**Table B67: Terrorism**

<b>How important – Terrorism</b>	No.	%
Not at all important	63	4.4
Little important	107	7.4
Neutral	206	14.2
Somewhat important	338	23.3
Very important	736	50.7
<b>Total</b>	1,450	100.0

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**Table B68: Immigration**

<b>How important – Immigration</b>	No.	%
Not at all important	46	3.2
Little important	93	6.4
Neutral	204	14.0
Somewhat important	393	27.0
Very important	717	49.4
<b>Total</b>	<b>1,453</b>	<b>100.0</b>

**Table B69: Protecting the environment**

<b>How important – Protecting the environment</b>	No.	%
Not at all important	80	5.5
Little important	108	7.4
Neutral	211	14.5
Somewhat important	321	22.0
Very important	737	50.6
<b>Total</b>	<b>1,456</b>	<b>100.0</b>

**Table B70: The income gap between rich and poor**

<b>How important – The income gap between rich and poor</b>	No.	%
Not at all important	120	8.3
Little important	102	7.0
Neutral	230	15.9
Somewhat important	345	23.8
Very important	654	45.1
<b>Total</b>	<b>1,450</b>	<b>100.0</b>

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**Table B71: The COVID-19 outbreak**

<b>How important – The COVID-19 outbreak</b>	<b>No.</b>	<b>%</b>
Not at all important	69	4.7
Little important	73	5.0
Neutral	154	10.6
Somewhat important	214	14.7
Very important	946	65.0
<b>Total</b>	<b>1,457</b>	<b>100.0</b>

**Table B72: The nomination of the Supreme Court**

<b>How important – The nomination of the Supreme Court</b>	<b>No.</b>	<b>%</b>
Not at all important	51	3.5
Little important	55	3.8
Neutral	198	13.7
Somewhat important	304	21.0
Very important	835	57.9
<b>Total</b>	<b>1,443</b>	<b>100.0</b>