Climate Change and Carbon Management: Has the US Transcended Partisanship?

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Executive Summary: Partisanship Plays Key Role in Addressing Climate Change Policy, not Its Validity

As scientific evidence quantified the increased rate of climate change in the last 50 years, this poignant topic pushed to the forefront of political policy and subsequently emerged as a source of partisan dissent in the US. Original questions pertaining to the validity of climate change are no longer under scrutiny, but instead transitioned to what can be done to mitigate climate change.

At the onset of the 2020 presidential election the Hobby School of Public Affairs at the University of Houston and UH Energy conducted a survey to assess public attitudes toward climate change and support for policies aimed at emissions reduction, as well as respondents' willingness to pay for low-carbon electricity and fuel. One thousand individuals aged 18 or older in all 50 states and the District of Columbia participated in the survey, with an additional 500 Texas residents surveyed for a cumulative 1,500 respondents.

The study reveals where voters aligned and diverged across party lines, acting as a starting point toward understanding what constituents want, what they value, and how to find a navigable way forward. Both Biden and Trump voters are concerned with climate change and support the adoption of carbon management, which presents a timely opportunity for bipartisanship on climate change mitigation and emissions reduction. Our findings also reveal that public support can accelerate the pace of policy transition and assure energy producers that the cost of methane

abatement will be shared by consumers as well.

Findings show bipartisan support for capping methane emissions – a potent greenhouse gas – for example, as well as support across party lines for carbon management to mitigate climate change. The willingness to pay for methane abatement amongst most Trump voters and an overwhelming majority of Biden voters suggest an avenue for bipartisanship. The bipartisan support for the adoption of carbon management is a reflection of how much the US has moved on the issue of emissions reduction and addressing climate change.

But a palpable lack of understanding regarding deployed emissions reduction tools and policy mechanisms, such as emissions trading systems, cap and trade and carbon dividends, appears widespread across all voters. A common pain point for voters is the associated cost of the energy transition. Although Trump voters expressed greater levels of disinterest in low-carbon alternatives compared to Biden voters, the share of those not interested declines by nearly half when voters are informed about the cost of transition, irrespective of the magnitude of the increase.

These key themes emerged from survey responses:

- A majority of respondents believe that climate change is happening, including 58% of Trump voters. However, among these Trump voters who believe in climate change, a majority do not believe climate change is caused by human activity.

- More than two-thirds of Biden voters and a majority of Trump voters hold governments of developing and developed countries responsible for climate change. Biden voters were two to three times more likely to attribute responsibility to multiple stakeholders, including governments of developed and developing nations, the energy industry and individual behavior, than Trump voters.

- While 57% of Biden voters agreed that oil and gas companies could remain profitable and create new jobs if they invest in carbon management, only 26% of Trump voters agreed. However, the largest share of Trump voters (28%) neither agreed nor disagreed.

- More than three-fifths of Biden voters said that the government should fund and support research and development if a price on carbon were introduced in the US, whereas 25% of Trump voters agreed. A third of Trump voters said that the government should use the revenue from a carbon price to reduce the deficit or grant a rebate to taxpayers.

- Nearly three-quarters of Trump voters support expanding the country's pipeline network for natural gas projects. Support proved significantly lower among Biden voters (22%), though 33% were neither opposed nor supportive, suggesting room for partisan agreement.

- Nine in ten Biden voters agreed that oil and gas companies should adopt carbon management technologies, compared to about 45% of Trump voters. Again, a number of Trump voters neither agreed nor disagreed (26%).

- More Trump voters than Biden voters were not interested in carbon-neutral fuels (81% vs. 40%), and few voters thought an increase of $1.70 per gallon offered good value for carbon-neutral fuel. Most Trump voters expressed disinterest in owning an electric vehicle.

- More than twice as many Trump voters relative to Biden voters (74% vs. 32%) declined to pay any amount for solely renewable energy for their homes. An estimated $250 increase per month on electric bills for renewable energy was deemed too expensive by a majority of both Trump and Biden voters. A larger share of Biden voters thought the increase was expensive but affordable.

- Most voters expressed disinterest in paying for natural gas-based electricity produced without venting and flaring. However, 24% of Trump voters and 34% of Biden voters said that they could certainly afford a $5 increase in their monthly electricity bill for this low carbon alternative.

- Twice as many Trump voters as Biden voters declined to pay more for electricity produced with a $40 per ton tax on carbon emissions. While a third of Biden voters said they could afford a $20 increase in their monthly electricity to pay for the tax on carbon emissions, only 12% of Trump voters said they could afford it. Five times as many Biden voters said that a $20 increase offers good value for a carbon tax.

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Partisanship, Climate Change and Carbon Management: Challenges & Opportunities

Introduction

Climate change is a salient, complex and contentious issue that has matured into a central theme in the deep ideological divide that defines current US politics. Past research revealed that partisan differences in beliefs about the anthropogenic nature of climate change in the US are more pronounced than anywhere else in the world.[1] While ideological divisions have always defined American politics, these deep differences seem to be growing.[2] Moreover, this partisan divide is expressly manifested in the attitudes towards climate change, assessment of its origins and mitigation pathways.

During the Earth Summit held in April 2021, the Biden administration unveiled an ambitious program for carbon management that would sharply reduce carbon emissions by \$1.5bn–\$2.4bn by 2030 and net-zero emissions by 2050, while supporting global environmental justice, boosting clean energy jobs and building a future-ready workforce.[3] Both President Biden and the conservative British Prime Minister Boris Johnson stressed that fighting climate change through an energy

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[1] Mildenberger, M., Marlon, J.R., Howe, P.D. et al. (2017). The spatial distribution of Republican and Democratic climate opinions at state and local scales. Climatic Change 145, 539–548 (2017) and MacInnis, B., and Krosnick, J. A. (2020). Climate Insights 2020: Partisan Divide.

[2] Boxell, L., Gentzkow, M., and Shapiro, J. M. (2020). Cross-Country Trends in Affective Polarization. NBER.

[3] Hook, L., Hodgson, C., Sheperd, C. (2021, April 22). "US aims to lead by example as countries pledge climate action." Financial Times.

transition provides an opportunity to create jobs. The US also committed to help developing countries fight climate change, which a majority of both Democrat and Republican voters see as contributors to climate change. The program has been hailed by Democratic leaders, and strongly criticized by Republicans. Partisan patterns of support and opposition towards policies aimed at managing carbon emissions were also reflected among American voters at the time of the 2020 Presidential election.

The Hobby School of Public Affairs at the University of Houston and UH Energy conducted a survey to assess public attitudes toward climate change and support for policies aimed at emissions reduction, as well as respondents' willingness to pay for low-carbon electricity and fuel. The survey was fielded online two weeks before the 2020 Presidential Election, from October 15-22. 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 Texas residents for a total sample of 1,500 respondents.

Key themes examined in this study include:

- Partisan and ideological differences on the anthropogenic nature of and responsibility attribution for climate change;

- Convergent public opinion on carbon management, signaling partisan similarities and avenues for bipartisanship;

- Low levels of public awareness of climate and carbon policy instruments; and

- Willingness to pay for emissions reduction and the energy transition as long as costs are deemed affordable.

The Presidential vote choice expressed by survey respondents roughly mirrored the distribution of the electoral vote preferences for the 2020 election. Among those who were willing, eligible, and registered to vote, 45% expressed that they would vote for Donald Trump and 55% for Joe Biden (Figure 1, N=1124).[4]

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[4]Details in Appendix 5, Figure B1.

Figure 1.1: Expressed vote choice of respondents
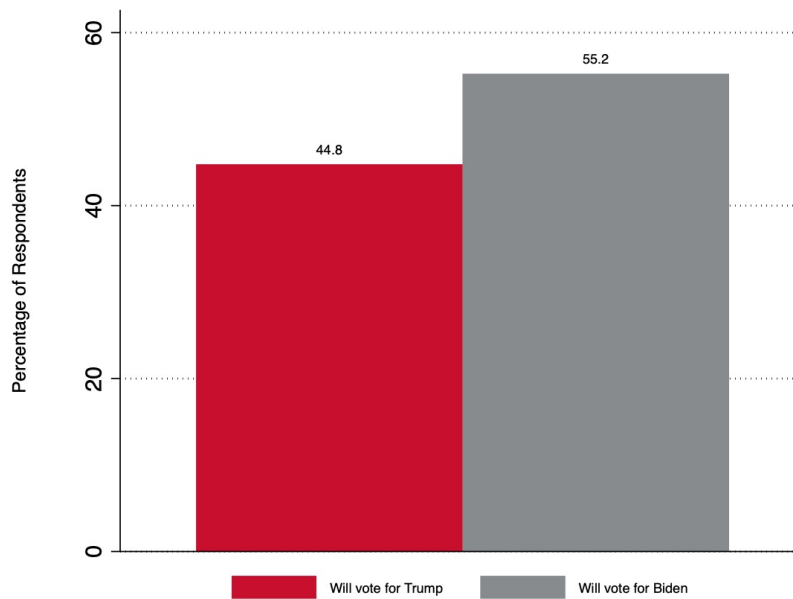
Question: *In the 2020 Presidential Election, who will you vote for?* Don't know/Not sure responses are included. N=1,124.

1.1 Climate change and its Anthropogenic Nature

Respondents' beliefs about climate change supported findings from recent polls which have found a shift in the environmental attitudes of conservative voters [5] A majority of Trump voters (58%) expressed that they believe climate change is happening (see Figure 1.2). Nonetheless, the partisan differences remain stark: Biden voters are a 38-percentage points more likely to believe climate change is happening than Trump voters.

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[5]MacInnis, B., and Krosnick, J. A. (2020). Climate Insights 2020: Partisan Divide. Yale Program on Climate Change Communication. (2020). Democratic and Republican Views of Climate Change (2018).

Figure 1.2: Beliefs about climate change
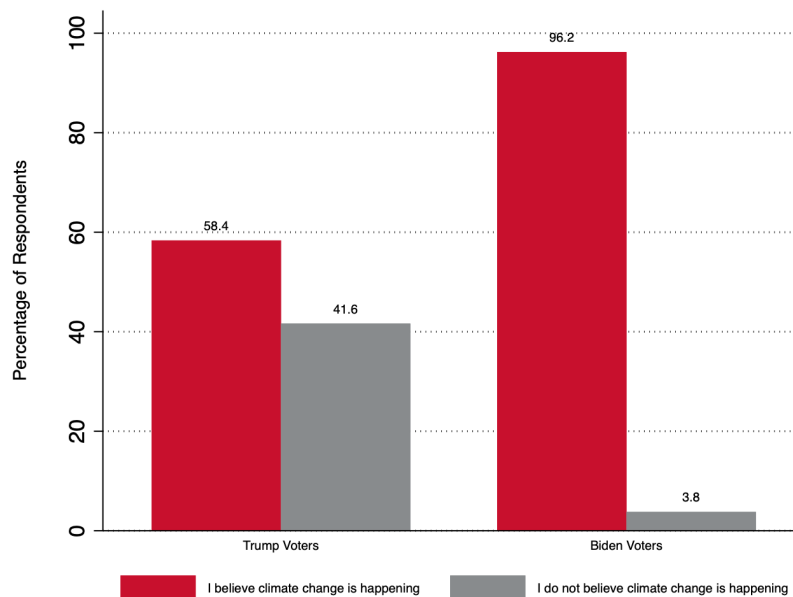
Note: All those who expressed they would vote for Joe Biden or Donald Trump answered this question. N=1,124.

Respondents who expressed they believe climate change is happening were asked about their opinion on whether climate change was caused by human behavior. A wider, 65-percentage point difference was found between Biden and Trump voters amongst those who believe that climate change is anthropogenic, i.e., caused by human activities (Table 1.1). Among Trump voters who believe climate change is happening, nearly two thirds believe climate change is caused by natural changes in the environment. Therefore, while a growing share of conservative voters agree that climate change is happening, they do not attribute responsibility to humans, despite scientific evidence and consensus [6] that human activities since the Industrial Revolution, have increased atmospheric concentrations of greenhouse gases, leading to more heat retention and increased surface temperatures than

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[6] Cook, J., et al (2016). "Consensus on consensus: a synthesis of consensus estimates on human-caused global warming," Environmental Research Letters, 11(4). Cook, J. et al. (2013). "Quantifying the consensus on anthropogenic global warming in the scientific literature," Environmental Research Letters, 8(2). Anderegg, W. R. L. (2010). "Expert Credibility in Climate Change," Proceedings of the National Academy of Sciences, 107(27), 12107-12109 DOI: 10.1126/science.1103618.

expected from natural factors only. [7]

Table 1.1: Beliefs about Climate change and its Anthropogenic Nature

Beliefs about climate change	Biden Voters (%)	Trump Voters (%)
Believe climate change is happening	96.2	58.4
For those that believe in climate change:		
Caused mostly by human activities	88.5	23.9
Caused mostly by natural changes	7.7	34.4
Do not believe climate change is happening	3.8	41.6

1.2 Responsibility Attribution for Climate Change

Respondents were asked to indicate the degree of responsibility for climate change they associate with the following stakeholders:

- Individual-level consumption and behavior

- Oil and gas industry

- Meat and dairy industry

- Governments of developing countries

- Governments of developed countries

- Transportation industry

- Coal industry

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[7]NASA (2020). Scientific Consensus: Earth's Climate is Warming.

Biden and Trump voters expressed disparate opinions about which industries and institutions are responsible for climate change (Table 2). We identify large variations and ideological contrasts in attribution of blame for climate change: Biden voters generally tend to believe that multiple stakeholders have shared responsibility, while Trump voters believe only a select few stakeholders are responsible for climate change.[8] As observed in Table 1.2, a majority of Trump voters attribute most responsibility to governments in developed and developing countries. By contrast, Trump voters attribute the least to individual consumption behavior and the coal, meat and dairy industries. By comparison, an overwhelming majority of Biden voters attributed comparable responsibility to both industries and governments, although they believe governments of developing countries contribute the least toward climate change. While all respondents attributed relatively lower responsibility to the meat and dairy industry and individual consumption behavior, Biden voters attributed two to three times more responsibility for climate change to all stakeholders than Trump voters.

Table 1.2: Responsibility Attribution for Climate Change

Stakeholder	Responsibility towards climate change % attribution of somewhat and very responsible (rank ordering in parentheses)	
	Biden Voters	Trump voters
Individual-level Consumption Behavior	77 (5)	34 (6)
Oil & Gas Industry	90 (1)	47 (3)
Meat & Dairy Industry	78 (4)	22 (7)
Governments of Developing Countries	72 (6)	54 (1)
Governments of Developed Countries	86 (3)	51 (2)
Transportation Industry	88 (2)	44 (4)
Coal Industry	88 (2)	39 (5)

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[8]Details in Appendix B, Figure B14 to B20.

1.3 Carbon Management for the Oil and Gas Industry and the Role of the Government

Respondents were asked if they agree or disagree that oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management. A majority of Biden voters (57%) disagreed strongly or somewhat that the industry would not continue to grow and remain profitable through the transition to a lower carbon future (see Figure 1.3). Trump voters appeared divided on the issue, with the largest share (34%) expressing that they somewhat or strongly agree that the oil and gas industry cannot remain profitable and create new jobs if they adopt carbon management; a comparable share (28%) of voters expressed neutrality and a quarter believe the industry could grow through the transition.

Figure 1.3: Oil and gas companies cannot remain profitable and create new jobs if they invest in carbon management
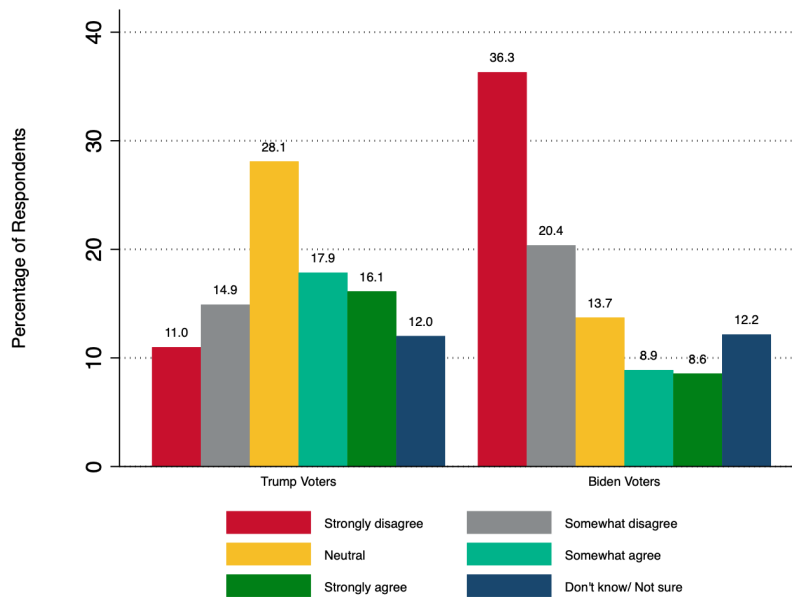
Note: Don't know/Not sure responses are included. N=1,124.

The government can play a role in incentivizing Carbon Capture, Utilization, and Storage (CCUS). Most recently, the Bipartisan Budget Act of 2018, specifically the 45Q tax credits for carbon sequestration, provided momentum for CCUS

and direct air capture projects. We discuss this further in the next section. When asked about the role of the government, 88% of Biden voters agree that the government should promote, incentivize, and subsidize carbon management (Figure 1.4). Trump voters appear divided. In keeping with conservative ideologies on the size and role of the government and allowing free and competitive markets, 37% disagree with government involvement. At the same time, 33% agree that the government should promote, incentivize and subsidize carbon management technologies. Support from a third of Trump voters is not unusual, as the expansion and reforms to 45Q credits were celebrated by the Republican-led federal government as a policy that would encourage technological innovation while also reducing emissions.

Figure 1.4: Government should Promote, Incentivize and Subsidize Carbon Management
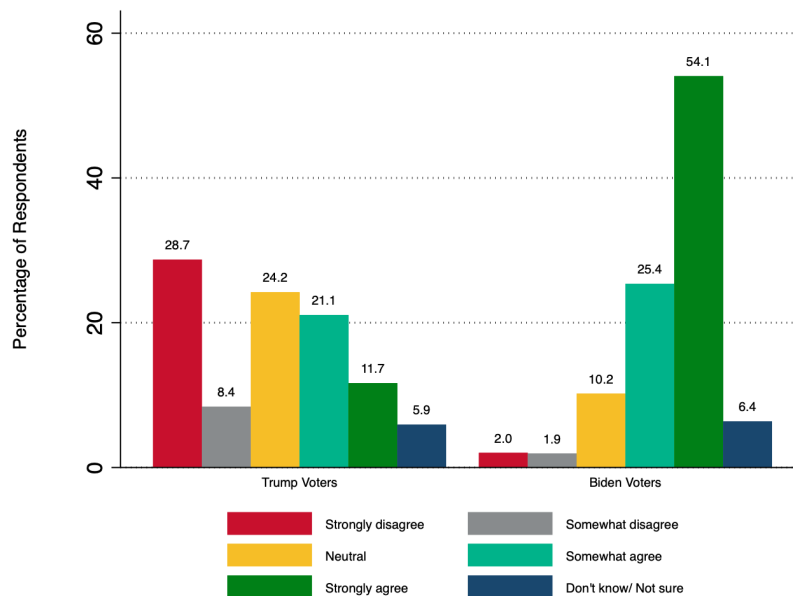
Note: Don't know/Not sure responses are included. N=1,124.

Continuing the theme of governmental action, respondents were asked their opinion about how the revenue from a carbon tax should be spent if introduced in the US. A plurality of Biden voters favored funding and supporting research about energy and the environment (Figure 1.4). Support for Research and De-

velopment (R&D) amongst Biden supporters proved five times greater than the next most preferred alternative of funding international climate programs and carbon reduction efforts in the least developed nations. Despite a Republican-led federal government at the time of the survey, a third of Trump voters expressed that the revenue should be used to reduce the federal deficit. Another third of Trump voters prefer revenue be returned to taxpayers through rebates, in other words a revenue-neutral carbon price. Both preferences are possibly driven by Trump voters' concern toward the state of the economy.[9] Nonetheless, a quarter of Trump voters support funding energy and environment R&D from the revenue.

Figure 1.5: If the government implements a tax on carbon emissions, what would you think is the best way to spend that revenue?
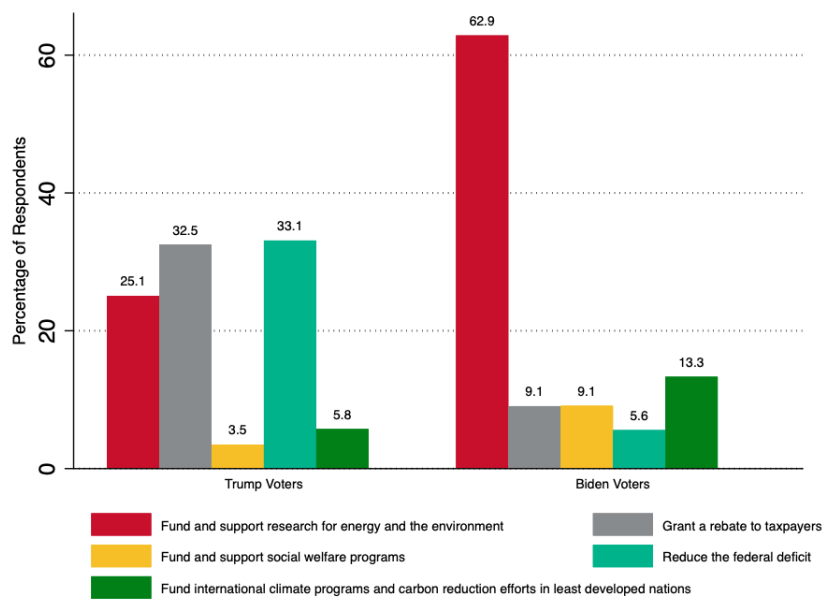
Note: Percentages calculated by including two respondents who skipped the question. N= 1,124.

1.4 Pipeline infrastructure

As US oil and gas production increased over the last two decades, one of the foremost challenges faced by producers is the lack of commensurate pipeline

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[9]Details in Appendix B, Figure B2

infrastructure connecting supply centers to demand centers.[10] Specifically, public opposition to pipeline expansion has resulted in many projects being indefinitely delayed, embroiled in litigation or canceled altogether. To gauge the strength of this opposition, the survey asked respondents if they support the expansion of pipeline infrastructure for natural gas projects in particular. Seventy-two percent of Trump voters expressed support for these expansions, whereas almost half of Biden voters (46%) expressed opposition (Figure 1.6). Concurrently, a third of Biden voters and a fifth of Trump voters took a neutral stance. Despite Joe Biden's pre-election commitment and his administration's eventual decision to cancel the expansion of the Keystone XL pipeline and ban new oil and natural gas projects on federal lands, more than half of Biden voters are either detached from the issue or support pipeline expansions.

Figure 1.6: Do you support or oppose an expansion of the pipeline networks for natural gas projects?
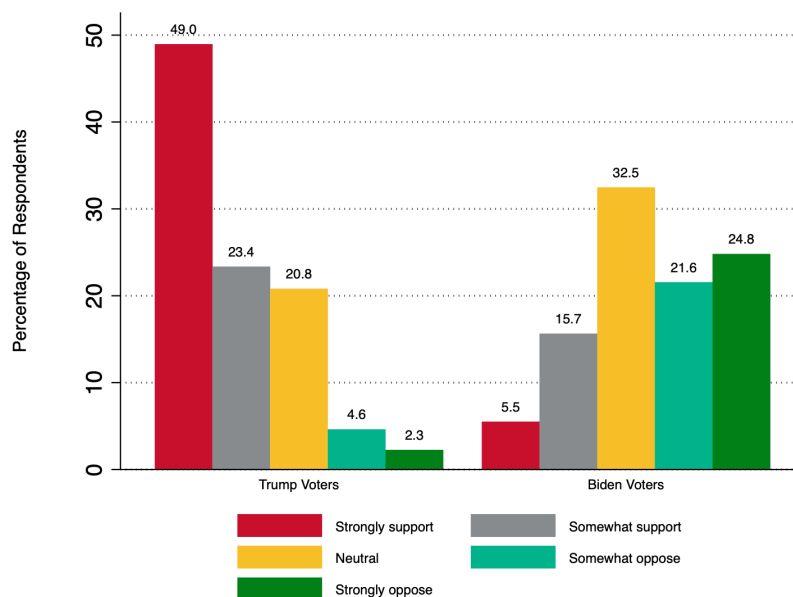
Note: All those who expressed they would vote for Joe Biden or Donald Trump answered this question. N=1,124.

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[10]Radhakrishnan, S., Krishnamoorti, R. and Datta, A. (2019). Opportunities and Challenges in the Permian. Texas: UH Energy, University of Houston.

Partisan Similarities and Opportunity for Bipartisanship

2.1   Support for Carbon Management

Even as a world leader in carbon management technologies, promising US projects are pending sustained success when scaled to commercial levels.[1] A recent example of the tepid marketplace response is reflected in reaction toward the 45Q tax credits for the removal of anthropogenic carbon oxides. The US Congress passed the Bipartisan Budget Act in February 2018, which included the expansion of 45Q tax credits to increase the uptake CCUS and direct air capture.[2]

Expanded tax credits provide $50 per ton of CO2 that is sequestered underground and $35 per ton of CO2 that is used for enhanced oil recovery (EOR) or to make new products like carbon-neutral fuels. Between 2018 and 2020, thirty-two new industrial-scale CCUS projects that would utilize the tax credits were announced in the US. [3] However, depressed demand for fossil fuels during the COVID-19 pandemic and supply chain disruptions led to equity shortage, considerable re-

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[1]EIA. (2017). Petra Nova is one of two carbon capture and sequestration power plants in the world Hawkins, D. and Peridas, G. (2017). Kemper County IGCC: Death knell for Carbon Capture? Not. McConnell, C., and Wells, B. (2019). CCME Report from the 45Q Symposium. Texas: Center for Carbon Management, University of Houston.

[2]Congressional Research Service. (2020). The Tax Credit for Carbon Sequestration (Section 45Q)

[3]Nagabhushan, D. (2020). The status of carbon CAPTURE projects in the US (and what they need to BREAK GROUND). https://www.catf.us/2020/04/the-status-of-carbon-capture-projects-in-the-u-s-and-what-they-need-to-break-ground/

structuring and stalled carbon management projects for many companies. [4]

Past setbacks have exacerbated these concerns. A prime example is the Kemper project in Mississippi [5], which was suspended in 2017 after a three-year delay, a total expenditure of $7.5 billion – $4 billion over its projected budget –and $387 million received in federal grants. Another example is the FutureGen project in Illinois [6], which went over budget and fell behind schedule. The project was canceled after two unsuccessful iterations despite $1 billion in federal funding from both the Bush and Obama administrations. The only large-scale CCUS facility in the US, the Petra Nova project in Texas, announced in mid-2020 that it would temporarily suspend its carbon capture activities until economic conditions improve.[7]

Carbon management must be based on scalable and robust projects so that market viability can be achieved without government support in the long term. To gauge public support for industry-led initiatives, respondents were asked if they agree that oil and gas companies should adopt carbon management technologies (Figure 2.1). Nearly nine in 10 Biden voters (88%) support (strongly agree or somewhat agree) the adoption of carbon management. By contrast, only 45% of Trump voters expressed support for the adoption of carbon management, while and another 26% expressed a neutral stance.

Despite somewhat partisan responses to the adoption of carbon management amid the ideological differences between conservatives and liberals on climate change (discussed in Section 1), the overall converging trend and small opposition (less than a quarter among Trump voters and less than 1% among Biden voters) indicates an opportunity for bipartisanship for the energy transition. The bipartisan support for the adoption of carbon management reflects how much the US has moved on

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[4]To boost investor certainty under these conditions, the Treasury Department and IRS released the final 45Q regulations in January 2021. While the credits have created a credible investment opportunity that would bring several projects online in the near-term, many fear that the long-term economic viability and sustainability of carbon management can only be supported by a strong business case.

[5]Wagman, D. (2017). The Three Factors That Doomed Kemper County IGCC.

[6]Kaeding, N. (2015). Admitting FutureGen's Failure.

[7]Martin, F. (2020). Low Oil Prices Lead to Shutdown of Much-Hyped Carbon Capture System Outside Houston. Houston Public Media, University of Houston.

the issue of emissions reduction and addressing climate change.

Figure 2.1: Level of agreement/disagreement expressed by respondents to whether oil and gas companies should adopt carbon management technologies
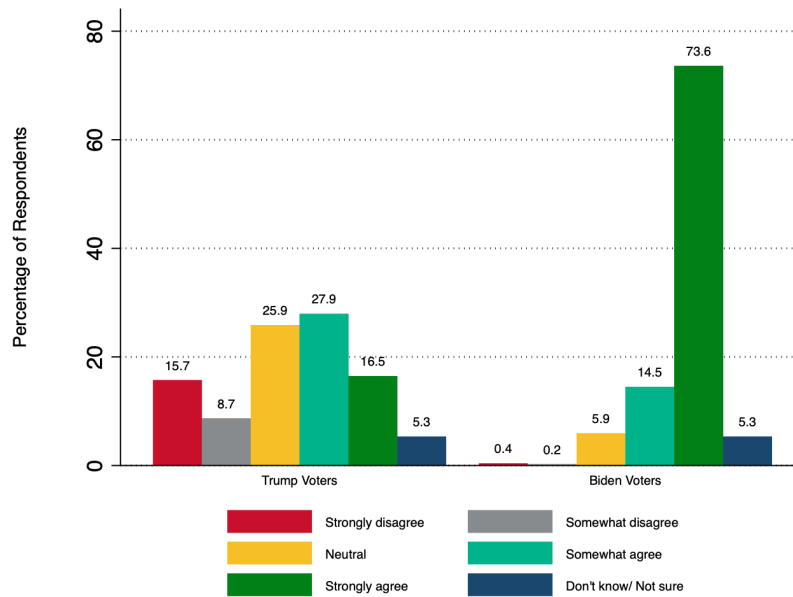

Note: Don't know/Not sure responses are included. N=1,124.

2.2 Carbon Management and Related Policy Instruments

To assess familiarity with carbon management policy instruments, respondents were asked if they had heard or read about the terms cap and trade, carbon management, carbon pricing, carbon tax, emissions trading system and carbon dividends. Overall, respondents expressed low levels of familiarity with these terms despite frequent and publicly salient discussions on these instruments over the last two decades and their deployment in other parts of the world. Strikingly, the familiarity with these carbon-related policy instruments and carbon management were virtually identical among Biden and Trump voters (Figure 2.2). Developing and advancing broad, bipartisan public education efforts can alleviate low levels of familiarity and knowledge. This will be critical for the US to keep pace with and

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potentially lead the global energy transition.

Figure 2.2: Respondents' familiarity with Carbon Management and Related Policy instruments based on the question: *Which of these terms you have heard or read about?*
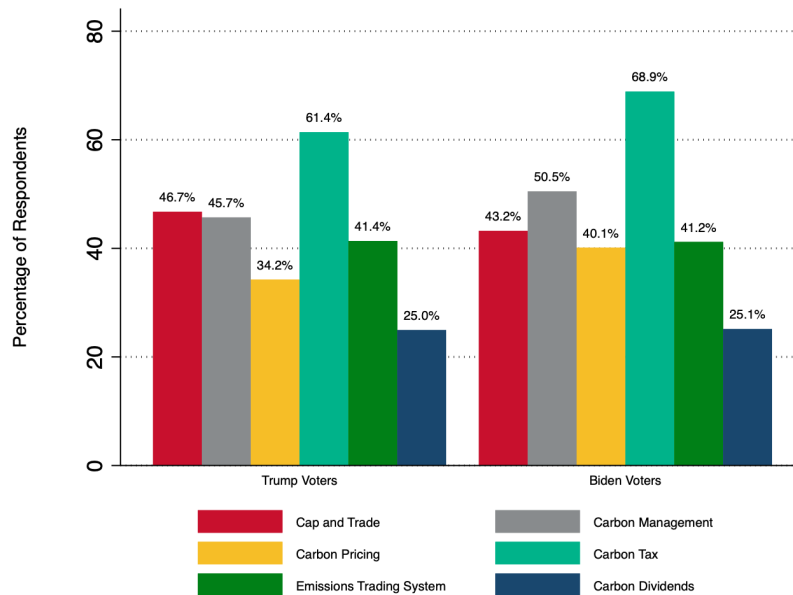
Note: All those who expressed they would vote for Joe Biden or Donald Trump answered this question. N=1,124.

2.3   Willingness to Pay

The average US coal power plant emits about 2.2 pounds of CO_2eq. Natural gas plants emit 0.9 pounds per kWh [8](operations). From a consumption standpoint, the average American has an annual carbon footprint of 16 tons of CO_2 or about 32,000 pounds. The cost of capturing a ton of CO_2 from point sources ranges from \$25–\$120, while direct air capture costs from \$90–\$350.[9] When combined

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[8]Electricity produced from sources such as nuclear, solar, wind, and hydroelectric release no CO_2, but emissions occur during upstream production activities like mining for raw materials, plant construction etc.The National Academies of Sciences Engineering and Medicine (2010). Electricity from Renewable Resources: Status, Prospects, and Impediments.

[9]IEA (2019). Levelised cost of CO_2 capture by sector and initial CO_2 concentration, 2019 – Charts – data & statistics.

with the cost of transportation and sequestration/use, a share of the total cost of reducing emissions and producing low-carbon and carbon-neutral alternatives would get passed on to consumers as higher prices for energy, fuel and general goods and services. To understand to what extent voters are willing to tolerate this extra cost, respondents were asked their willingness to pay for the following low-carbon products.[10]

- Carbon-neutral fuel in place of regular gasoline [11]

- 100% renewable energy delivered to homes [12]

- Natural gas produced without flaring or venting [13]

- Electricity produced with a $40 per ton tax on emissions (per ton CO2–basis)[14]

These questions were administered in two ways. First, respondents were asked an open-ended question on how much of an additional cost they were willing to pay to transition to these low-carbon products. After providing respondents with an estimate for the cost of transition and its impact on the price they would pay, respondents were asked about the value and affordability.

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[10]By random choice, the respondents were asked only one of the questions amongst those on natural gas produced without venting and flaring and electricity produced with a $40 carbon tax; such that only half of the respondents answered each question.

[11]Carbon-neutral fuels have no net greenhouse gas emissions. One class of carbon-neutral fuels are biofuels made from crops or organic material like animal fat or recycled cooking oil. Synthetic fuels produced by capturing CO2 are also carbon neutral.

[12]Such that all energy sourced and delivered to households is only from renewable energy sources.

[13]Natural gas is primarily made up of methane. Flaring is the controlled combustion of hydrocarbons, whereas venting is the direct release into the atmosphere. During flaring, methane is oxidized to water and CO2 through combustion, resulting in greenhouse gas emissions into the atmosphere. Although, flaring is considered better than venting from an environmental and climate standpoint since methane is twenty-five times more potent as a greenhouse gas than CO2 over a 100-year time period.

[14]A carbon tax of $40 per ton CO2 would increase the cost of gallon of gasoline by 36 cents and the cost of electricity by 2 cents per kilowatt-hour for the average electricity mix in the US.

Figure 2.3: Willingness to Pay for Carbon-Neutral Fuel: *How much more are you willing to pay for a carbon-neutral fuel per gallon?*
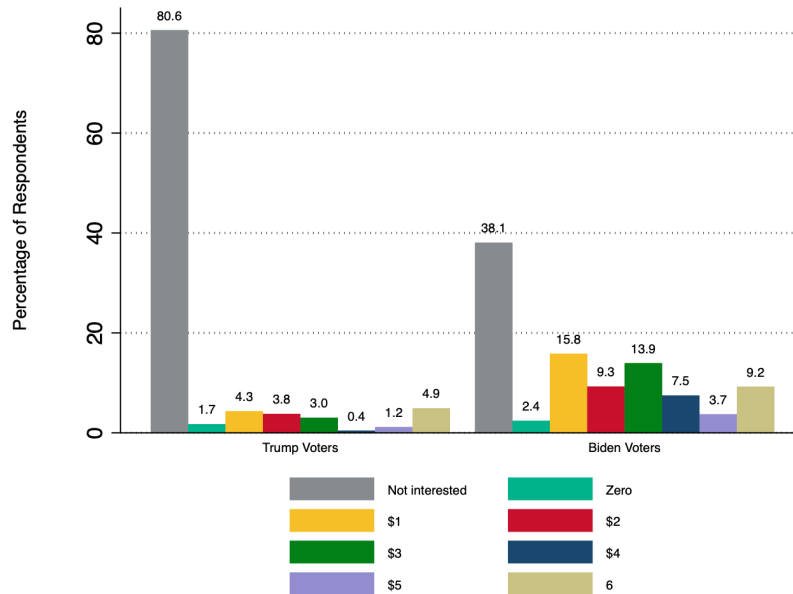
Note: Does not include six respondents who skipped the question. N=1,118.

Carbon-Neutral Fuel

A majority of Trump voters (81%) and about 40% of Biden voters expressed they were not interested in a carbon-neutral fuel (Figure 2.3). This was followed by the scenario that carbon-neutral fuels, based on current best estimates, would increase the price of fuel by $1.70 per gallon in the US. When this information was provided, fewer than 10% of Biden voters and 3% of Trump voters found the increase to offer good value. The share of those not interested in paying for a carbon-neutral fuel nearly halved in the open-ended response (Figure 2.4). About 36% of Trump voters find the increase too expensive, a plurality (34%) of Biden voters believes the increase is expensive but affordable.[15]

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[15]Keith, D. W., G. Holmes, D. St. Angelo, D., and K. Heidel. (2018).

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Figure 2.4: Willingness to Pay for Carbon-neutral Fuel: *$1.70 per gallon increase case*
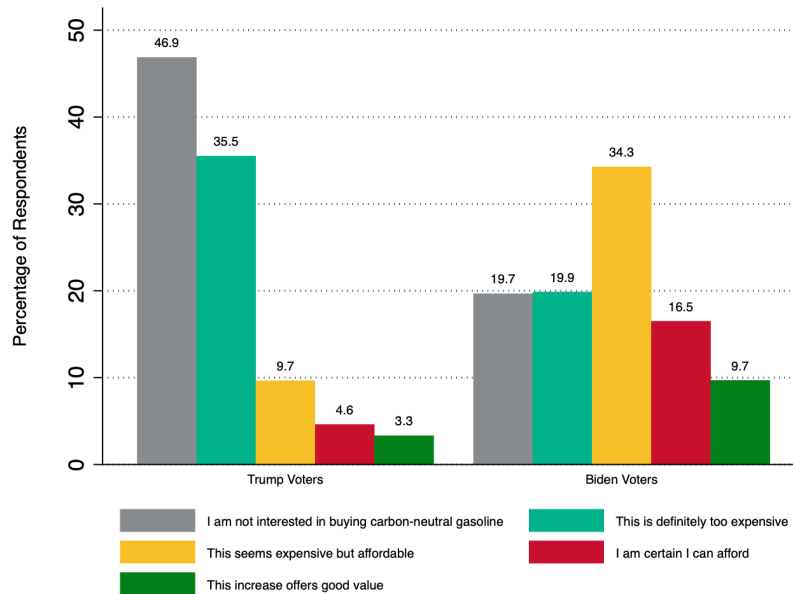
Note: All those who expressed they would vote for Joe Biden or Donald Trump answered this question. N=1,124.

These responses also reflected the partisan divide in respondents' opinions on the most important reason for them to own an electric vehicle (EV). Most Trump voters (61%) revealed that they are not considering owning an electric vehicle, while almost half of Biden voters would consider owning an EV to help the environment.[16] Overall, there is little support for the uptake of low-carbon transportation alternatives amongst Trump voters.

Renewable Energy

Respondents were asked how much of an increase they would be willing to pay on their monthly electricity bill for 100% renewable energy delivered to their homes. Seventy-four percent of Trump voters and 32% of Biden voters were not interested in the low-carbon alternative (see Figure 2.5). A third of Biden voters were willing to bear an increase of $11–$50 per month compared to less than 10% of Trump

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[16]Details in Appendix B, Figure B12.

voters. Given an average monthly electricity bill of $110 in the US, those willing to pay between $11–$50 would likely see a 10–45% increase on their monthly bill.

Figure 2.5: Willingness to Pay for Electricity from Renewable Sources: *How much of an increase in your monthly electricity bill are you willing to pay for only renewable energy for your home?*
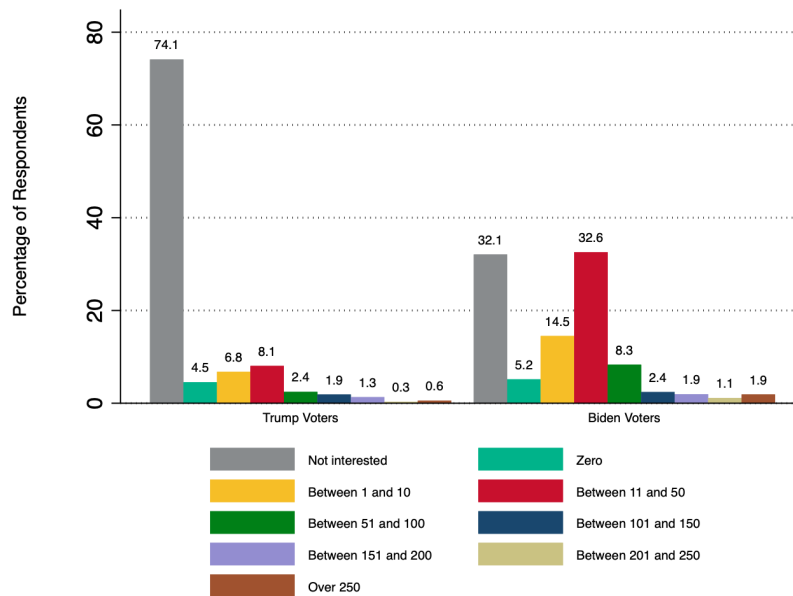
Note: Does not include respondent who skipped the question. N=1,122.

Respondents were then presented with a scenario that having 100% renewable energy delivered to American homes would result in an average increase of $250 per month on electricity bills.[17] When presented with this scenario, the proportion of Trump and Biden voters not interested in solely renewable energy dropped by more than half from 74% and 32% in Figure 2.5 to 36% and 13%, respectively, in Figure 2.6. At the same time, however, more than half the respondents on both sides expressed that the increase is "definitely too expensive." A quarter of Biden voters found the increase to be expensive but affordable compared to only 7% of Trump voters.

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[17] Sepulveda, N. A., J. Jenkins, F. J. De Sisternes, F. J., and R. K. Lester. (2018).

Figure 2.6: Willingness to pay for electricity from renewable sources: *$250 increase in monthly electricity bill from 100% renewable energy delivered to homes*
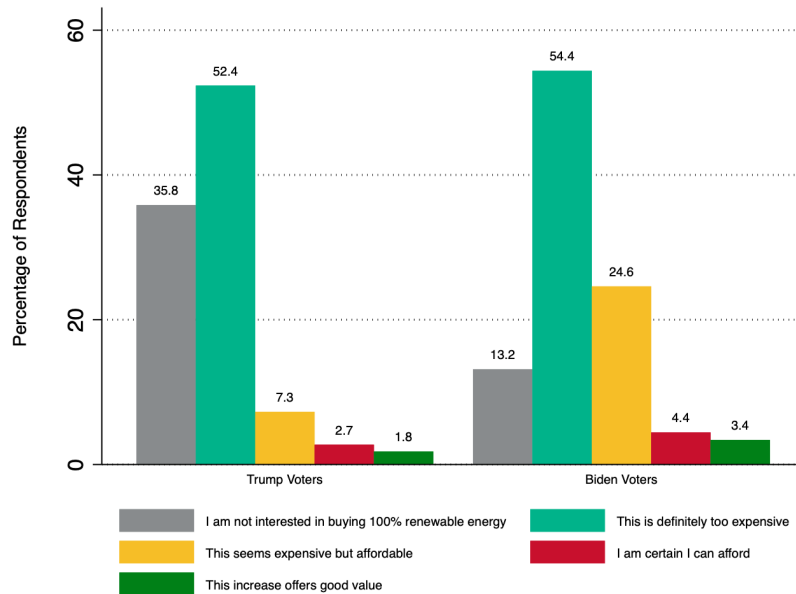
Note: Does not include one respondent who skipped the question. N=1,123.

Natural Gas Produced without Venting and Flaring

Respondents were asked how much of an increase they would be willing to pay on their monthly electricity bill for natural gas-based electricity produced without venting and flaring. Mitigating venting and flaring would reduce the methane emissions associated with natural gas-based electricity. Methane is a potent greenhouse gas which has about 28-36 times the greenhouse warming potential of carbon dioxide over a 100-year timescale.[18] About a quarter of the warming currently being experienced as an impact of climate change can be attributed to anthropogenic methane emissions.[19] The oil and gas sector account for 23% of global methane emissions – the largest source of methane emissions (41%) in the US.[20] Three-quarters of Trump voters and almost half of Biden voters (a significant increase for Biden voters compared to the previous scenarios) expressed they were

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[18]U.S. EPA. (2020). Understanding Global Warming Potentials.
[19]Environmental Defense Fund. (2021). Methane: A crucial opportunity in the climate fight.
[20]IEA. (2020). Global methane emissions from oil and gas – Analysis.

not interested in the low-carbon alternative (see Figure 2.7). Fifteen percent of Biden voters and 8.5% of Trump voters were willing to pay an increase of $1–10 on their monthly electricity bill for the same.[21]

Figure 2.7: Willingness to pay for natural gas-based electricity produced without venting and flaring: *How much of an increase in your monthly electricity bill are you willing to pay for natural gas-based electricity produced without venting and flaring?*
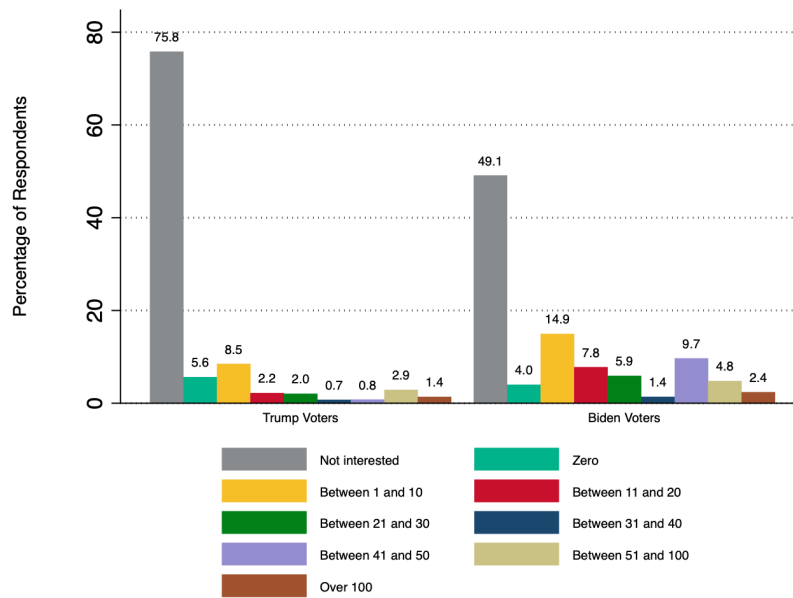
Note: By random assignment, only about half of the respondents were asked to answer this question. Of the 1,124 who responded they would vote for Joe Biden or Donald Trump, 555 were asked this question, and no respondent skipped. N=555.

Respondents were then provided an estimate that natural gas-based electricity produced without venting and flaring would add $5 to their monthly bill. Almost a quarter of Trump voters and a third of Biden voters expressed certainty toward being able to afford the increase. Moreover, 30% of Biden and 13% of Trump voters believe that the increase offers good value. The share of those not interested decreased by 15% and 30% for Trump and Biden voters, respectively. Nonetheless, almost half of Trump voters were not interested in the low-carbon alternative

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[21]U.S. EPA. (2020). Understanding Global Warming Potentials, Environmental Defense Fund. (2021). Methane: A crucial opportunity in the climate fight, IEA. (2020). Global methane emissions from oil and gas – Analysis., and U.S. EIA. (2011). U.S. Energy Information Administration - EIA - Independent Statistics and Analysis. Emissions of Greenhouse Gases in the US- Methane Emissions.

despite a marginal increase (<5%) to the average household electricity bill and the belief of 60% of Trump voters that flaring is bad for the environment (see Figure 2.8).[22]

Figure 2.8: Willingness to pay for natural gas-based electricity produced without venting and flaring: *$5 increase in monthly electricity bill for natural gas-based electricity produced without venting and flaring*
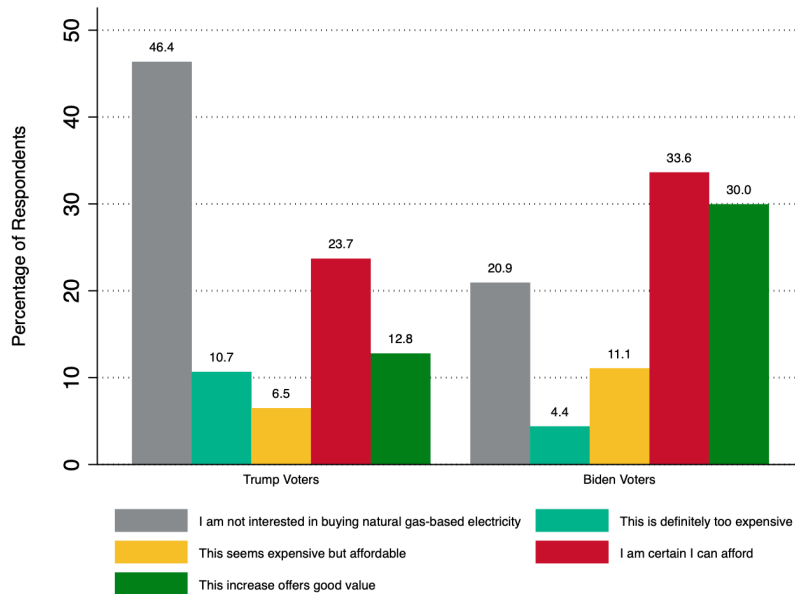
Note: By random assignment, only about half of the respondents were asked to answer this question. Of the 1,124 who responded they would vote for Joe Biden or Donald Trump, 555 were asked this question, and no respondent skipped. N=555.

Electricity Produced from a $40 per ton Tax on Carbon Emissions

Next, respondents were asked how much of an increase they would be willing to pay on their monthly bill for electricity produced with a $40 per ton tax on carbon emissions.[23] Seventy-eight percent of Trump voters and 38% of Biden

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[22]We provide more details in Appendix B, Figure B13.

[23]A $40 carbon tax would mitigate the externalities of air emissions associated with economic activities but would also increase the price of goods and services. Particularly, it would increase the price of gasoline

voters expressed they were not interested in the low-carbon alternative (Figure 2.9). [24]

Figure 2.9: Willingness to pay for electricity with taxes on carbon emissions: *: How much of an increase in your monthly electricity bill are you willing to pay for electricity produced from a $40 tax on carbon emissions?*
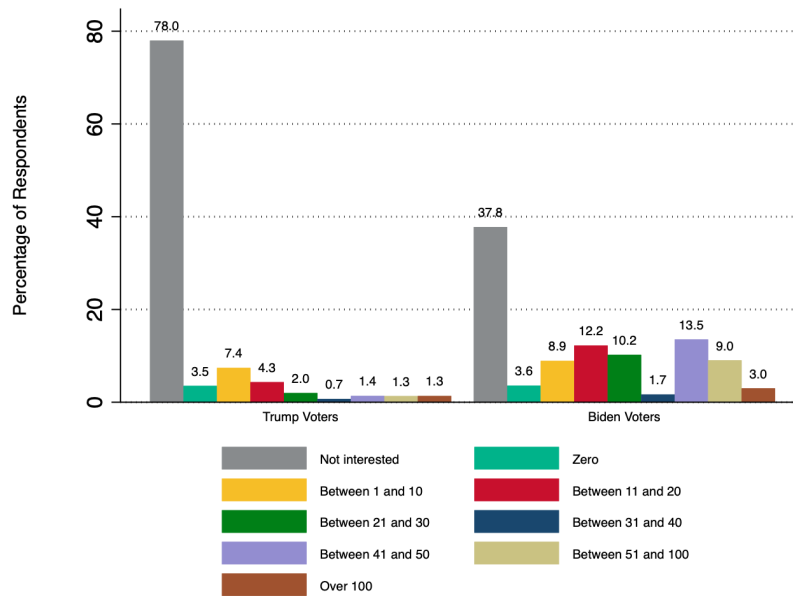
Note: By random assignment, only about half of the respondents were asked to answer this question. Of the 1,124 who responded they would vote for Joe Biden or Donald Trump, 569 were asked this question, and 1 respondent skipped. N=568.

Again, respondents were provided an estimate that electricity produced with a $40 per ton tax on carbon emissions would result in a $20 increase in their monthly electricity bill.About 22% of Biden voters and 12% of Trump voters believe this increase – nearly 18% of the average US household bill – offers good value (Figure 2.10). Similar shares expressed that the increase is expensive but affordable. Therefore, cumulatively almost half of Biden voters and a quarter of Trump voters are willing to accept the $20 increase in their monthly electricity

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by 36 cents per gallon and the price of electricity by 2 cents per kWh. Marron, D., Toder, E. and Austin, L. (2015). "Taxing Carbon: What, Why, and How." Washington, DC: Urban-Brookings Tax Policy Center.

[24]At the same time, 14%, 12%, and 10% of Biden voters were willing to pay increases between $41-50, $11-20, and $21-30, respectively.

bill from a carbon tax.[25]

Figure 2.10: Willingness to pay electricity produced with a carbon tax: *$20 increase in monthly electricity bill from $40 carbon tax*
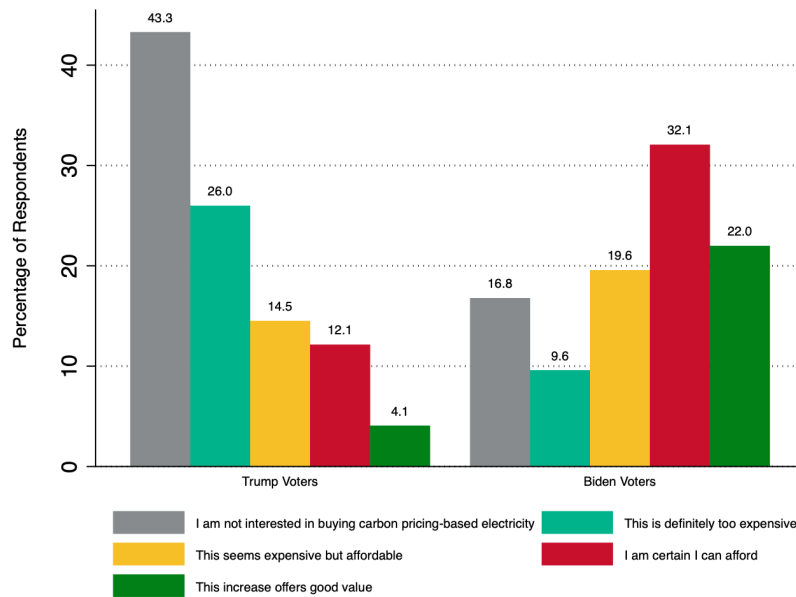
Note: By random assignment, only about half of the respondents were asked to answer this question. Of the 1,124 who responded they would vote for Joe Biden or Donald Trump, 569 were asked this question, and no respondent skipped. N=569.

Comparing the results from the three low carbon electricity scenarios, we found that renewables are the most preferred energy source among both Trump and Biden voters and had the lowest share of not interested responses. However, respondents are unwilling to internalize the full cost of transitioning to renewables and consider it too expensive. By comparison, even though overall interest and support for natural gas-based electricity produced without venting and flaring was lower than for renewables, the marginal cost of transition was found to be affordable and offer good value by both Biden and Trump voters.

Most respondents, irrespective of their vote choice do not want to pay for low-carbon energy if the cost of transition is considered deemed too high. They are

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[25]Once again, the share of those not interested dropped to almost half for both Trump (43%) and Biden (17%) voters.

willing to support the development and adoption of technologies and pay for the energy transition only at a low cost to them. Simultaneously, willingness to pay for methane abatement amongst most Trump voters and an overwhelming majority of Biden voters is indicative of an avenue for bipartisanship. President Biden's January executive order reduces methane emissions from oil and gas production and will review Trump era emissions standards. The executive order may increase the possibility of tighter restrictions around the flaring and venting of methane in several states, including Texas. Public support revealed by our findings can accelerate the pace of policy transition and assure energy producers that the cost of methane abatement will be shared by consumers as well.

Overall, most Trump voters express greater levels of disinterest in low-carbon alternatives compared to Biden voters. The difference is almost double in some cases. The share of those w not interested declines by nearly half when voters are informed about the cost of transition, irrespective of the magnitude of the increase. However, a significant share of the half appears to shift to the "this is definitely too expensive" response in most cases. This shift in responses from "not interested" to "definitely too expensive" suggests that the responses to the open-ended questions conflate those who are truly not interested with those who believe that low-carbon alternatives would be an expensive to transition. Therefore, the responses of those not interested in the open-ended questions are not driven by the true cost of the transition. These responses are potentially shaped by individual predispositions towards specific energy sources. Alternatively, they could also indicate that voters are not educated about the costs of climate change mitigation and low-carbon alternatives available to them, and are, therefore, not equipped to understand the true costs associated with the policies they prefer or those their parties align with. This lack of understanding is possibly also connected to the lack of familiarity with policy instruments discussed in the previous section. Finally, voters' unwillingness to pay, even if they understand the costs associated with the energy transition, might indicate that they do not want to pay additional costs for the energy they consume and want to force these costs on other stakeholders. Their unwillingness to pay and overall low responsibility attribution to individual consumption and behavior (discussed in section 1.2) indicates that even though a growing share of the American public is concerned about climate change (discussed in section 1.1), their concern does not signal support for increased collective action.

Conclusion

When President Joe Biden assumed office in January 2021, he assured Americans that he would work towards decreasing the partisan divide and deep polarization in the country. President Biden committed to a $2 trillion climate and environmental justice plan,[1] rejoined the Paris Climate Agreement and recently committed to reducing US carbon emissions by 2030. [2] The latter moves have been criticized by many Republicans as a threat to American jobs and the economy. But the US has also committed to helping developing countries fight climate change, which a majority of both Democrat and Republican voters see as responsible for climate change. Understanding public opinion on climate change, emissions reduction, carbon management, and the willingness of voters to pay for the energy transition can help identify the opportunities for ideological convergence and bipartisanship, while also emphasizing the issues where stark partisan and ideological differences exist.

Our analyses unveil that belief in and responsibility attribution for climate change are largely determined by the partisan and ideological identities of voters. Overall, a majority of those who expressed they would vote for Joe Biden in the 2020 Presidential Election are largely consistent and homogeneous. However, those who expressed they would vote for Donald Trump appear divided on the issues of future profitability and job creation in the oil and gas industry if it adopts carbon management practices and the role of the government in incentivizing, promoting and supporting carbon management. Nonetheless, both Biden and Trump voters are concerned with climate change and support the adoption of carbon management, which presents a timely opportunity for bipartisanship on

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[1]Biden For President Campaign. (2020). The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future.

[2]Biden, J. R. (2021). Paris Climate Agreement.

climate change mitigation and emissions reduction.

Voters, irrespective of their partisan and ideological identities, were generally found to be unaware of globally deployed emissions reduction tools and policy mechanisms such as emissions trading systems, cap and trade and carbon dividends. Additionally, voters were found to be unwilling to internalize and uninformed about the full cost of transition to low-carbon energy, which prevents them from understanding the implications associated with their policy preferences.

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Appendix A: Technical Note

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.

Appendix B: Summary Tables for Survey Questions

This appendix provides a complete review of the questions included in the report supplemented with related questions from the full survey.

Figure B1: Expressed vote choice of respondents based on the question: In the 2020 Presidential Election, who will you vote for? (N=1,124)
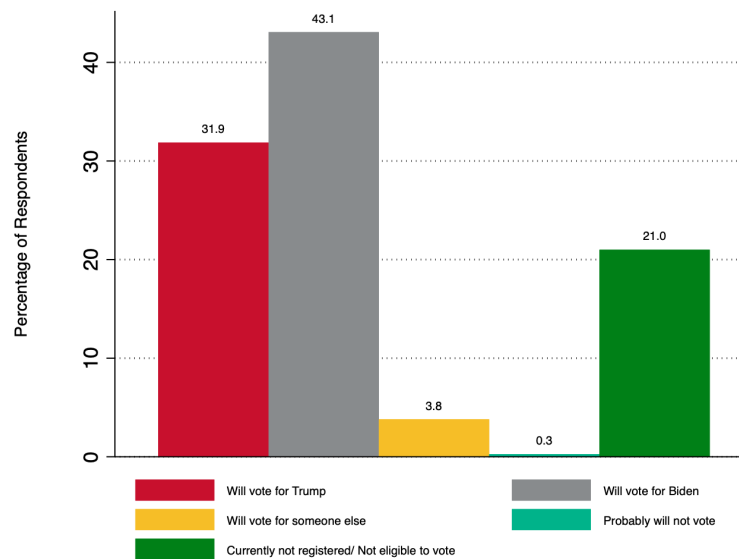
Respondents were also asked to rank how the stance of candidates on different policy issues would shape their vote choice. The highest share of Biden voters chose the COVID-19 pandemic while a similar share of Trump voters chose the state of the economy as the most important. For Biden voters, their second

and third choices were the state of the healthcare system and protecting the environment. Most Trump voters' second choice was terrorism and third choice was gun control/rights. Second and third choices by Trump voter proved more than 10-percentage points lower than the state of the economy in terms of issue importance.
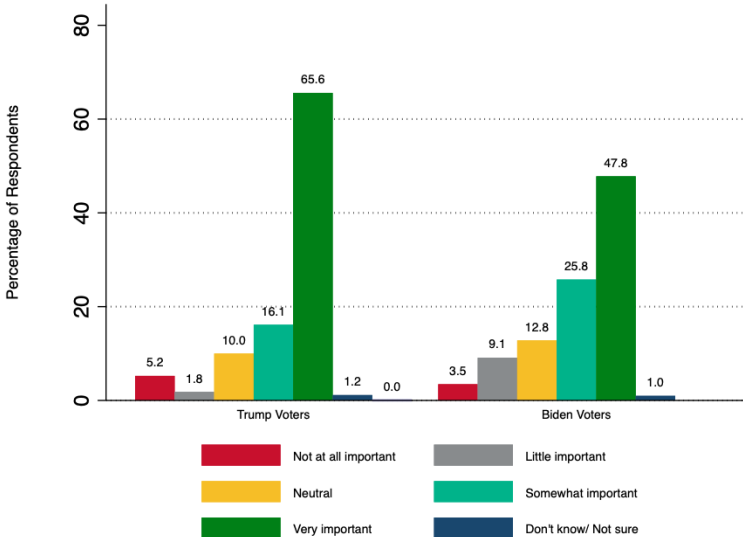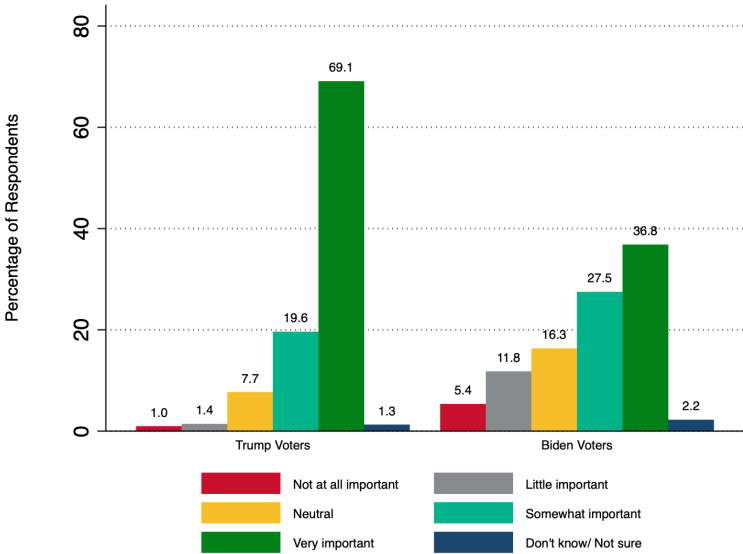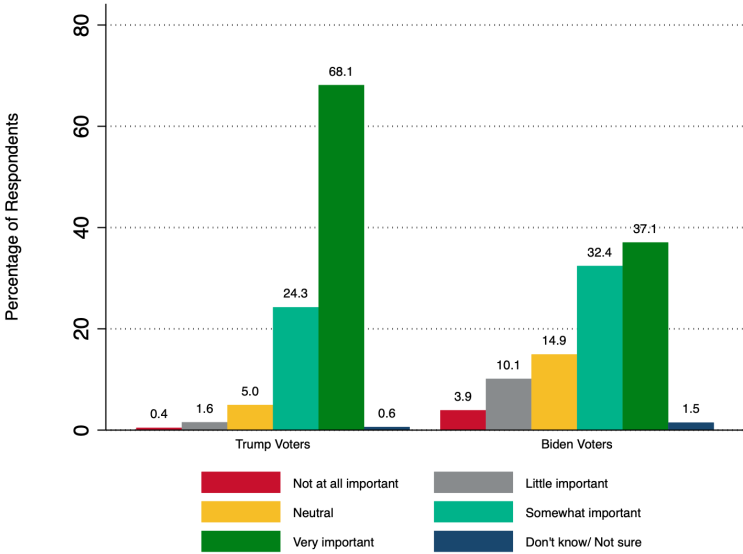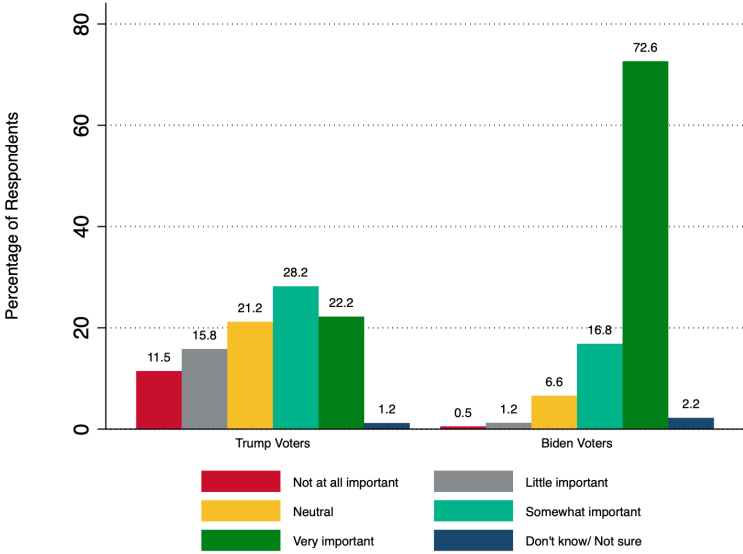
Figure B2: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **State of the economy** (N=1,124)
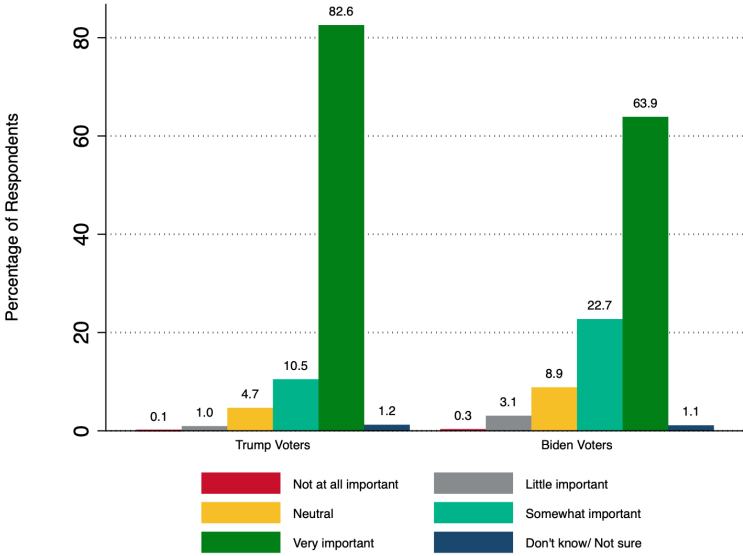
Figure B3: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **Healthcare system** (N=1,124)
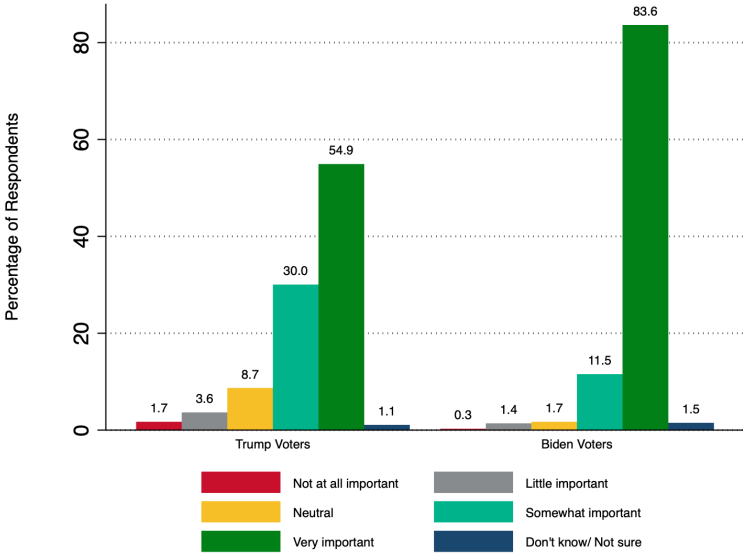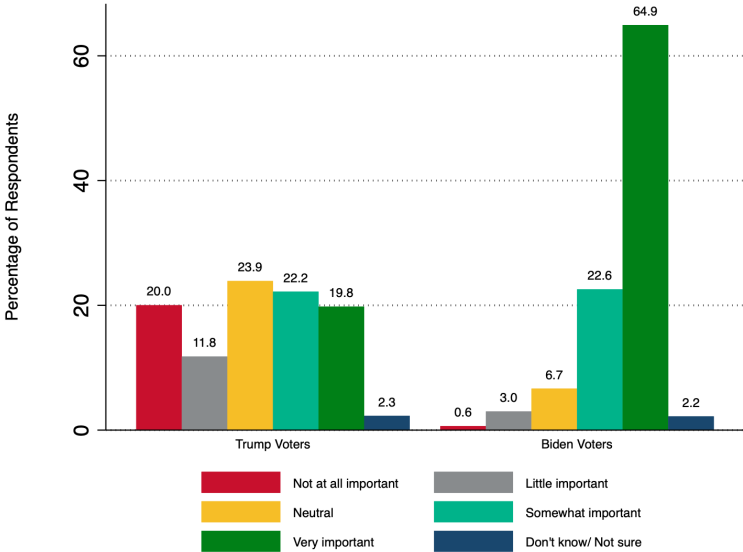

Figure B4: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **Education** (N=1,124)
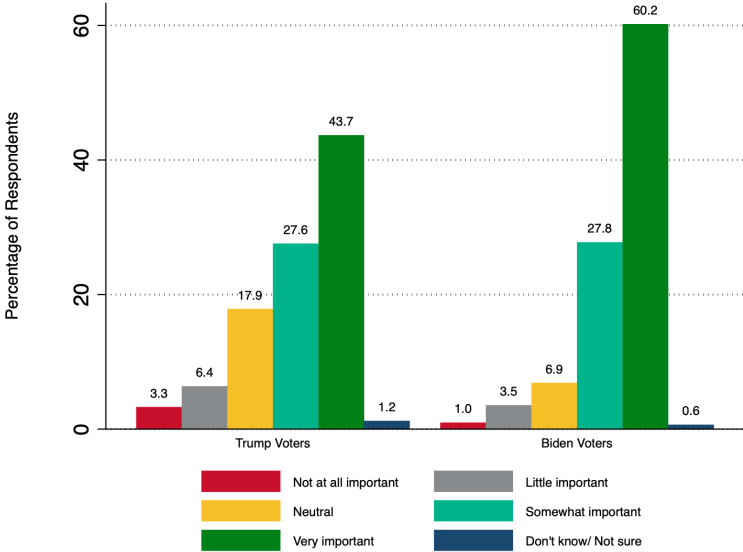
Figure B5: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **Gun control/rights** (N=1,124)
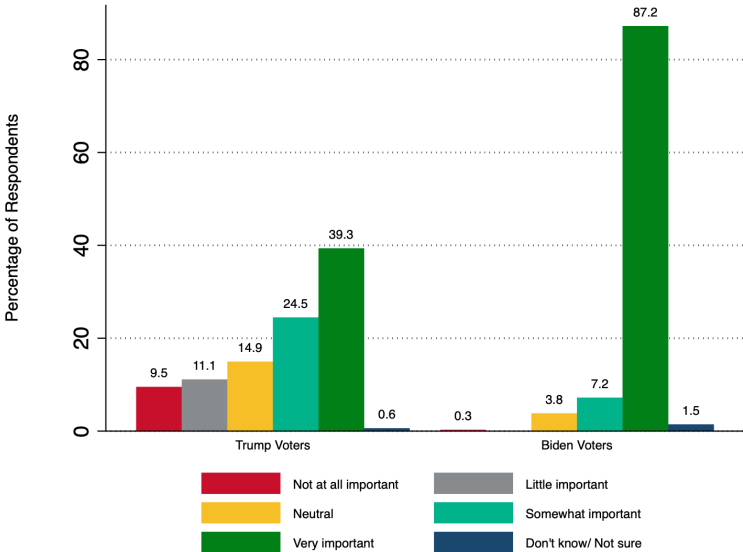

Figure B6: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **Terrorism** (N=1,124)

Figure B7: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **Immigration** (N=1,124)

Figure B8: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **Protecting the environment** (N=1,124)

Figure B9: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **The income gap between the rich and poor** (N=1,124)

Figure B10: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **COVID-19 outbreak** (N=1,124)

Figure B11: How important will the candidates' positions on the following issues be when you decide who you will vote for in the 2020 presidential election? **Nomination to the Supreme Court** (N=1,124)
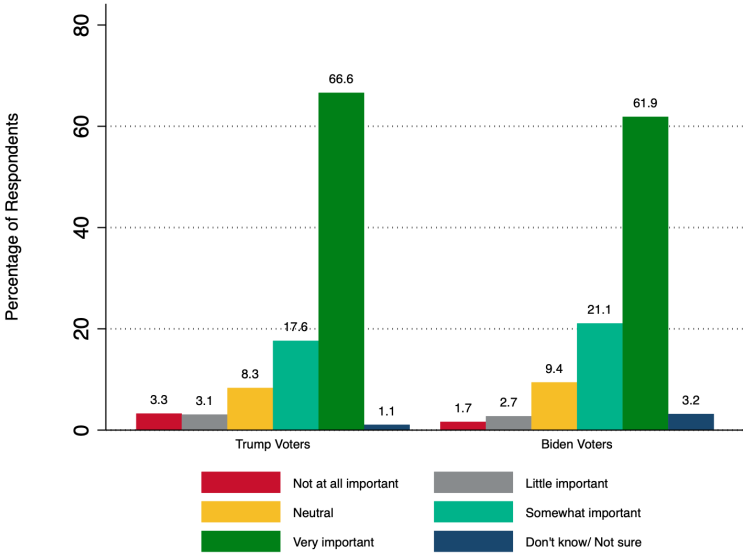
Figure B12: What would be the most important reason for you to own an electric vehicle? (N=1,124)
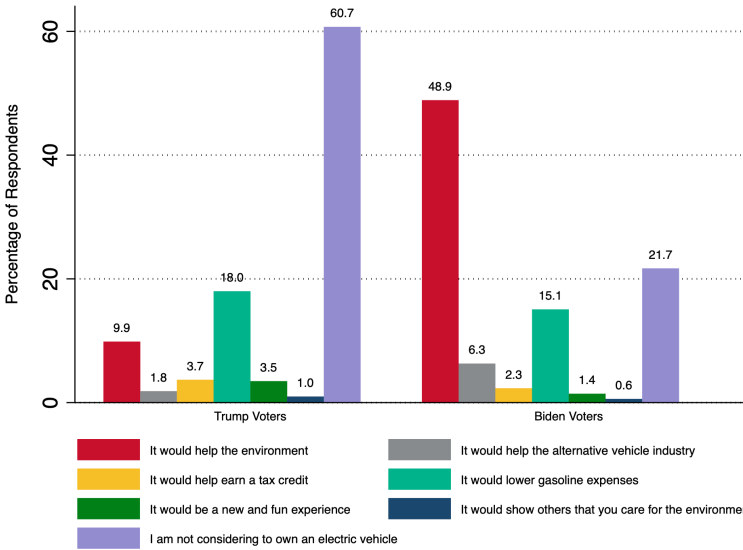
Figure B13: Flaring is good for the environment (Indicate True/False) (N=1,124)
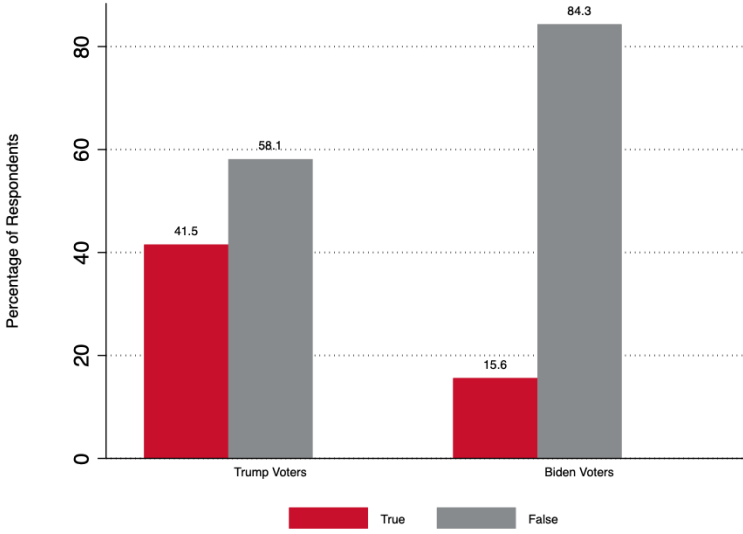

Figure B14: How responsible or not responsible for climate change do you think each of the following entities are? **Individual consumption and behavior** (N=1,124)
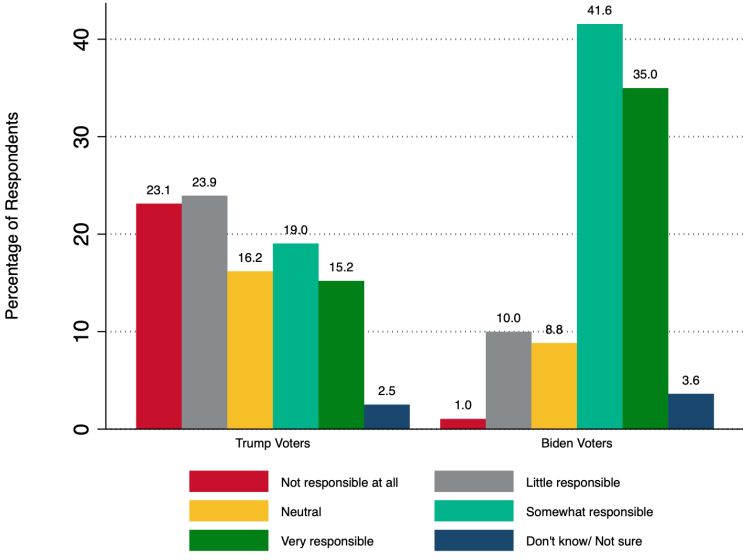
Figure B15: How responsible or not responsible for climate change do you think each of the following entities are? **Oil and gas industry** (N=1,124)
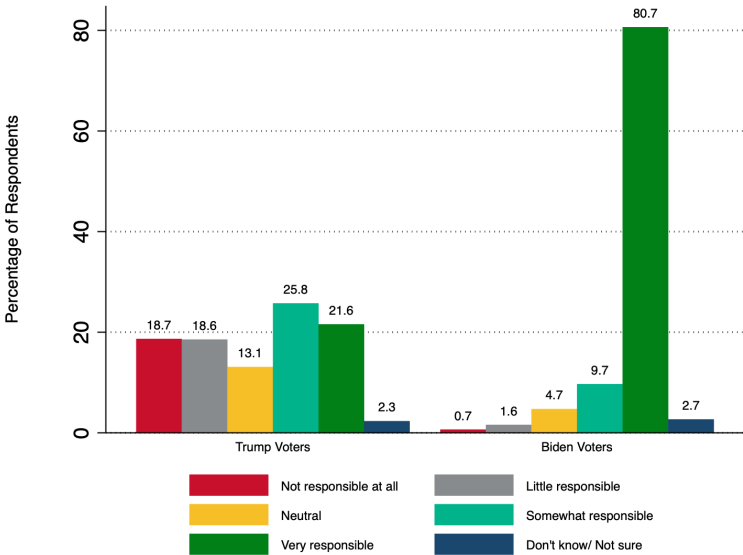

Figure B16: How responsible or not responsible for climate change do you think each of the following entities are? **Meat and dairy industry** (N=1,124)
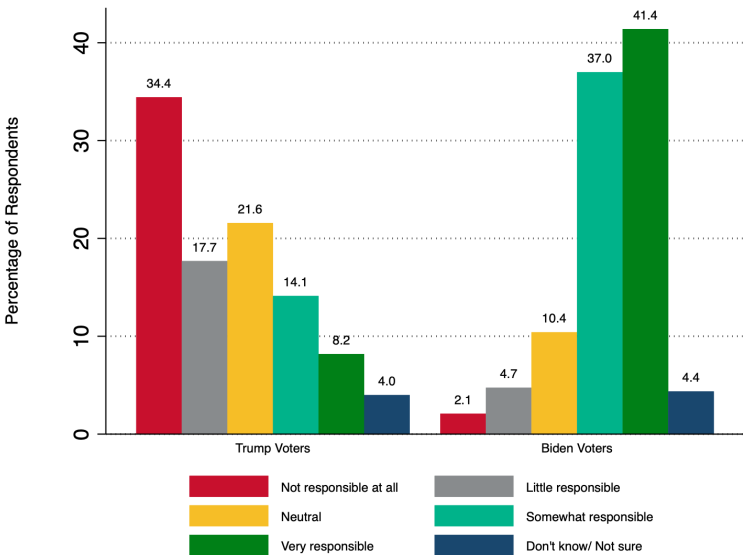
Figure B17: How responsible or not responsible for climate change do you think each of the following entities are? **Governments of developing countries** (N=1,124)
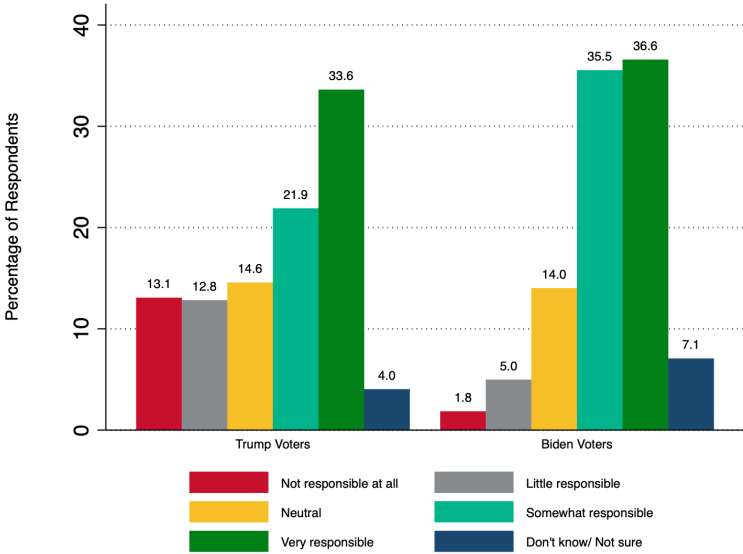

Figure B18: How responsible or not responsible for climate change do you think each of the following entities are? **Governments of developed countries** (N=1,124)
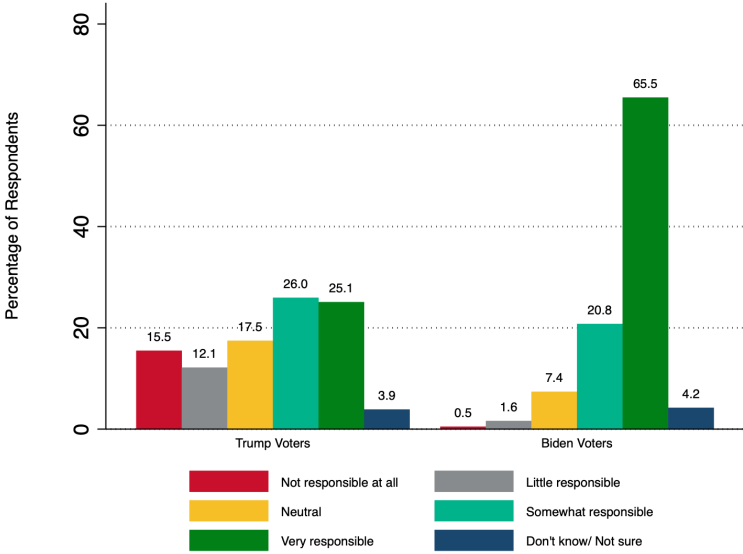
Figure B19: How responsible or not responsible for climate change do you think each of the following entities are? **Transportation industry** (N=1,124)
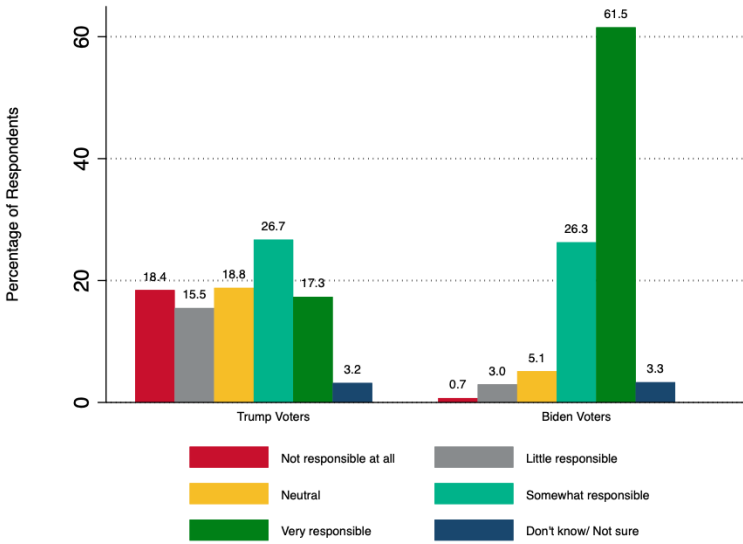

Figure B20: How responsible or not responsible for climate change do you think each of the following entities are? **Coal industry** (N=1,124)