



# Promoting Direct Air Capture Technology

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Strategic findings from a national online survey of 1,269 opinion elites,  
including 930 climate elites

July 2023



# Methodology

National online survey of 1,269 opinion elites, including 930 climate elites.

Conducted July 7-13, 2023

Credibility intervals:

±2.8 percentage points for the full opinion elites sample

±3.2 percentage points for the climate elites sample

Error is higher for subgroups of each sample

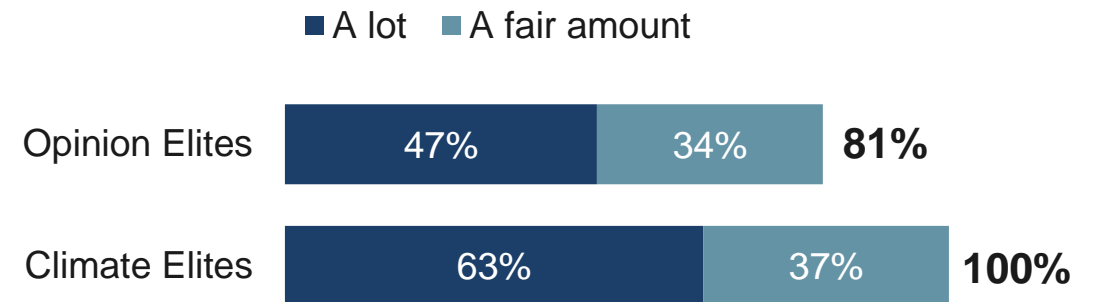
**Opinion elites** are defined as registered voters who:

- Have a 4-year college degree or more education.
- Have a great deal or quite a bit of interest in news about current events.
- Consume news about national events at least five days a week and do so from select outlets at least twice a week.

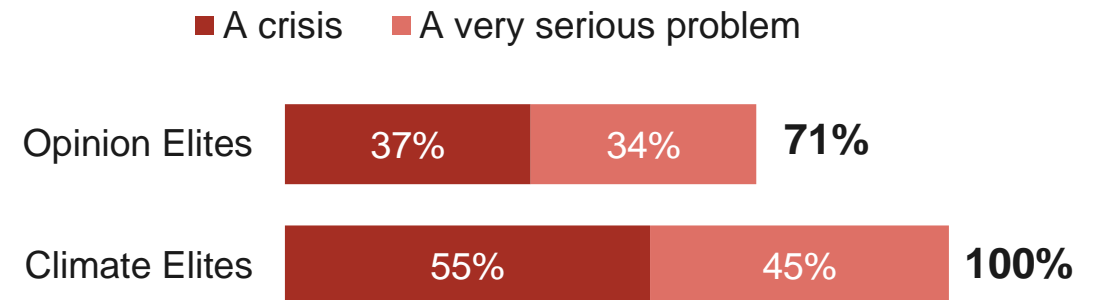
**Climate elites** are a subset of opinion elites who:

- Pay a lot or fair amount of attention to the issue of climate change.
- Believe that climate change is a crisis or very serious problem.
- **66% of opinion elites qualify as “climate elites.”**

*How much have you been paying attention to issues of climate change in the country?*

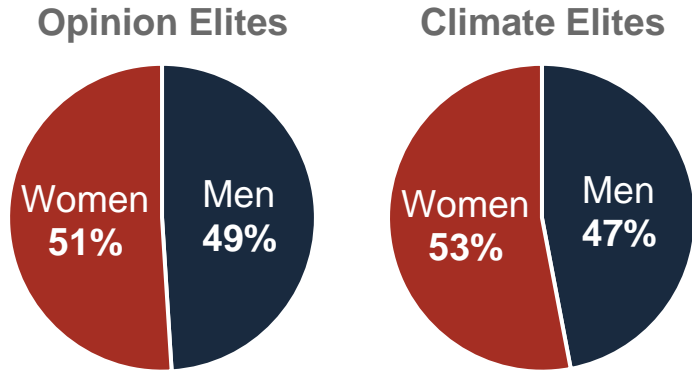


*Do you consider climate change to be...?*

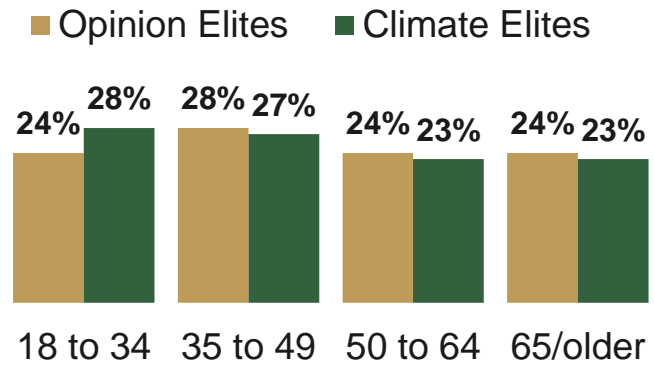


# Demographic & Political Profile of Respondents

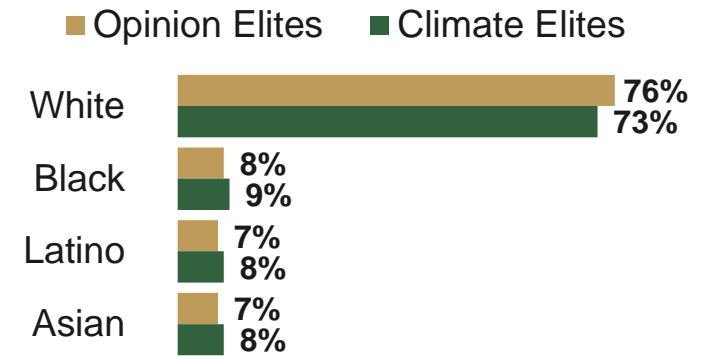
## Gender



## Age

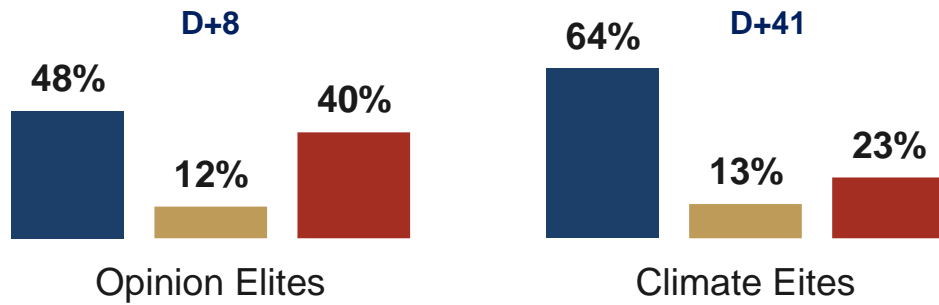


## Race



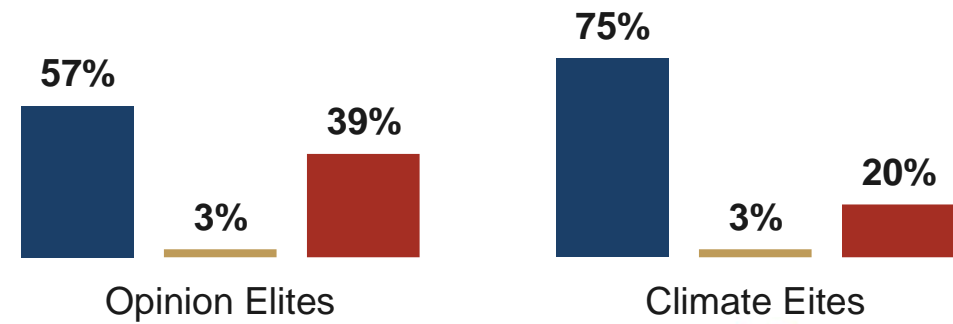
## Party ID

■ Democrat ■ Independent ■ Republican



## 2020 Vote

■ Joe Biden ■ 3rd Party ■ Donald Trump



# Key Takeaways

1

Opinion elites do not need to be convinced of the importance of removing CO<sub>2</sub> from the atmosphere—three in four say we need to do more of this. But they do need to be educated about DAC specifically, as a large majority are either neutral toward it or totally unaware of the technology.

2

This limited awareness (including among climate elites) means that elites are open-minded and optimistic about DAC, but support is soft and susceptible to criticism.

3

An in-depth explanation of the technology—including its necessity in avoiding the worst impacts of climate change—significantly increases support, particularly among climate elites, Democrats, and, notably, elites who live in small town and rural areas.

4

Key messaging points include DAC's role in remediating legacy emissions and getting to net-negative, as well its potential in job creation. Republican elites are drawn to the idea that DAC could elongate the transition away from fossil fuels so fewer people are left behind.

5

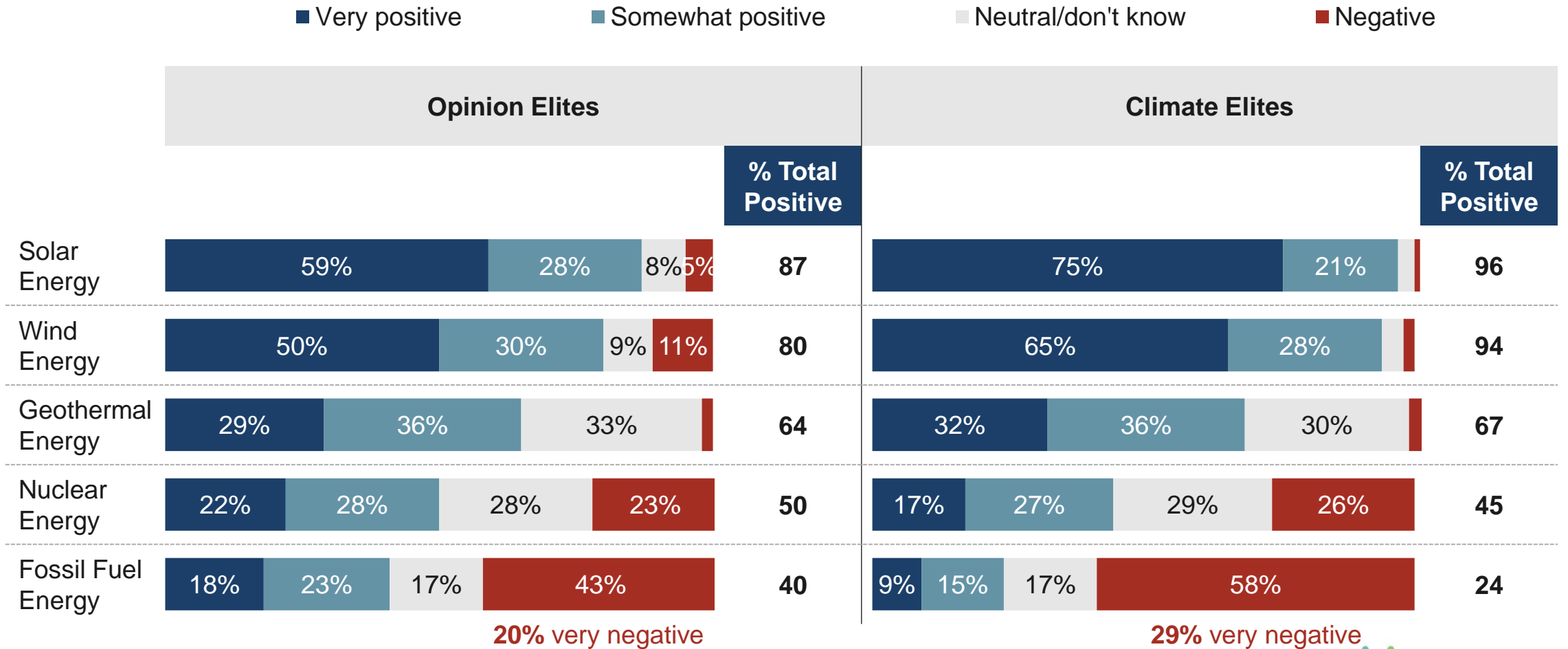
This latter point uncovers a minor tension: right-leaning elites can envision using DAC in conjunction with fossil fuels, while left-leaning elites (especially climate elites) want to see fossil fuel use ended.

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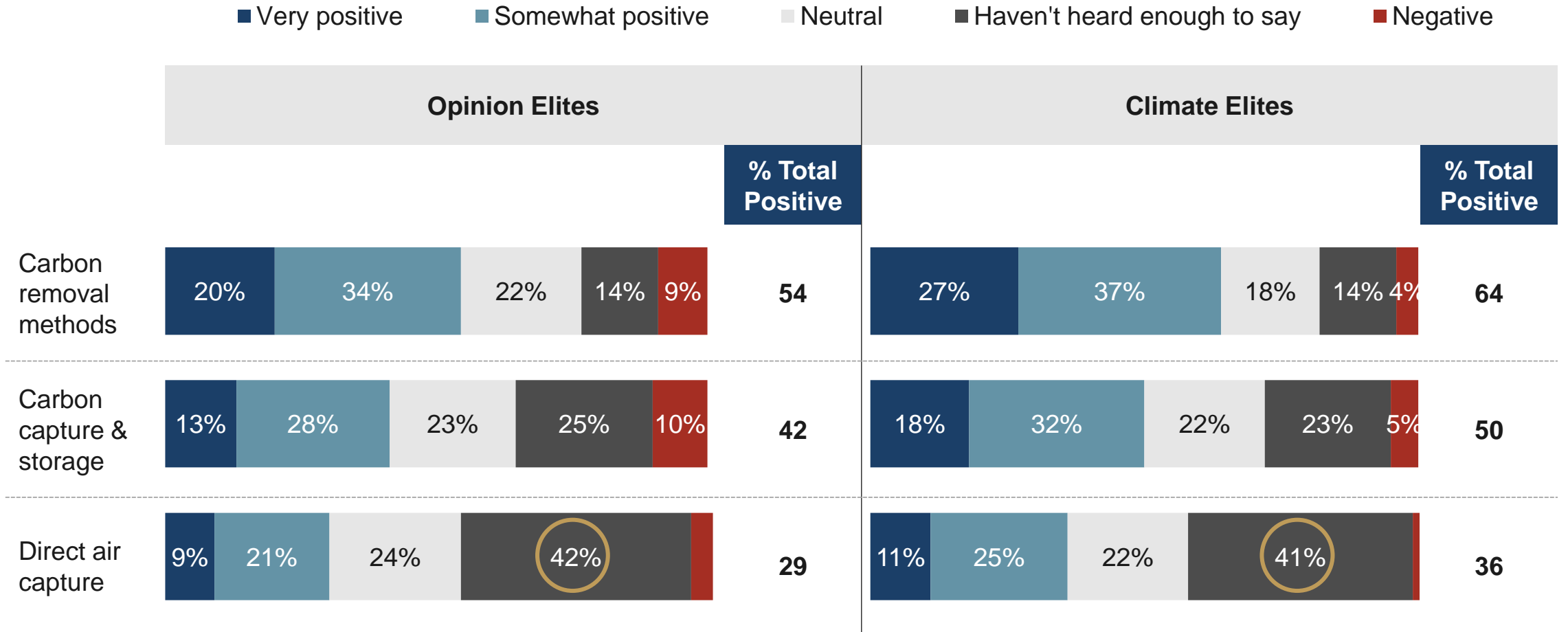
High cost, substantial energy requirements, and concerns around safety are among the most compelling critiques of DAC. The historical absence of leaks is a fairly weak rebuttal to safety criticisms and concerns.

# Current Landscape

# Positive feelings far outweigh negative feelings toward clean energy sources.



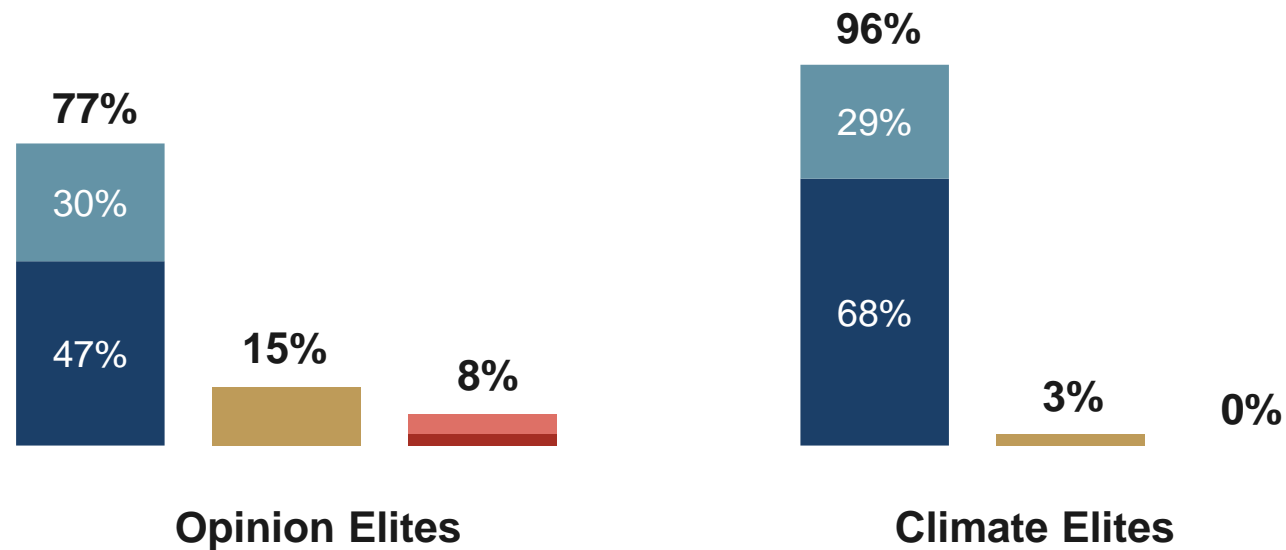
# Carbon removal in general has a positive image, but pluralities are unfamiliar with DAC specifically.



# There is broad consensus about the need to do more to reduce the amount of carbon dioxide in the atmosphere.

*Do you think we should be doing more, less, or the same amount to reduce the amount of carbon dioxide in the atmosphere (to fight climate change)?*

■ Much more ■ Somewhat more ■ The same amount ■ Somewhat less ■ Much less



## % Total Do More Opinion Elites

Democrats	96
Independents	78
Not very conservative Republicans	60
Very conservative Republicans	41

In a split-sample experiment, there was no meaningful difference in the results when citing the need “to fight climate change.”



# **Knowledge and Opinions of Direct Air Capture**

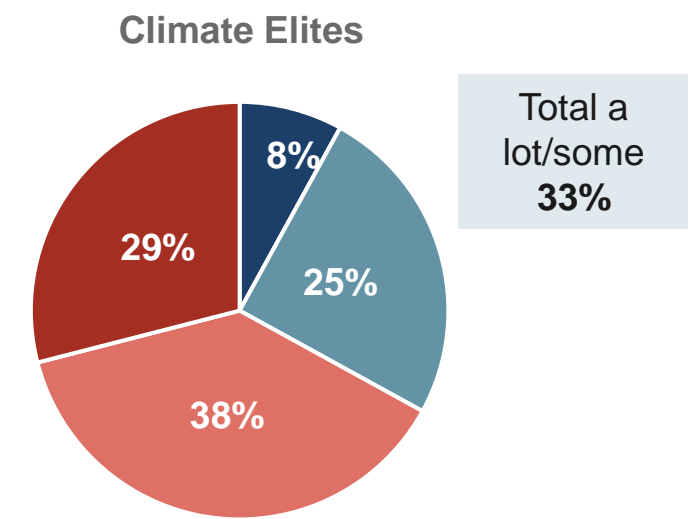
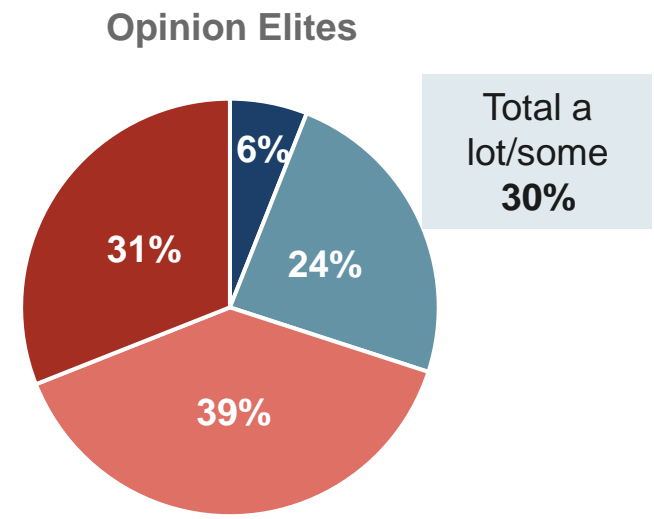
# True awareness of DAC is low, even among climate elites; younger opinion elites profess the highest awareness.

This part of the survey is about direct air capture (also called DAC), which is a technology that removes carbon dioxide, a greenhouse gas that contributes to climate change, directly from the air and stores it thousands of feet underground.

*How much have you heard or read about direct air capture?*

■ A lot      ■ Some      ■ Just a little      ■ Nothing

	<b>% Total A lot/Some Opinion Elites</b>
18-34	42
35-49	35
50-64	24
65 and older	19

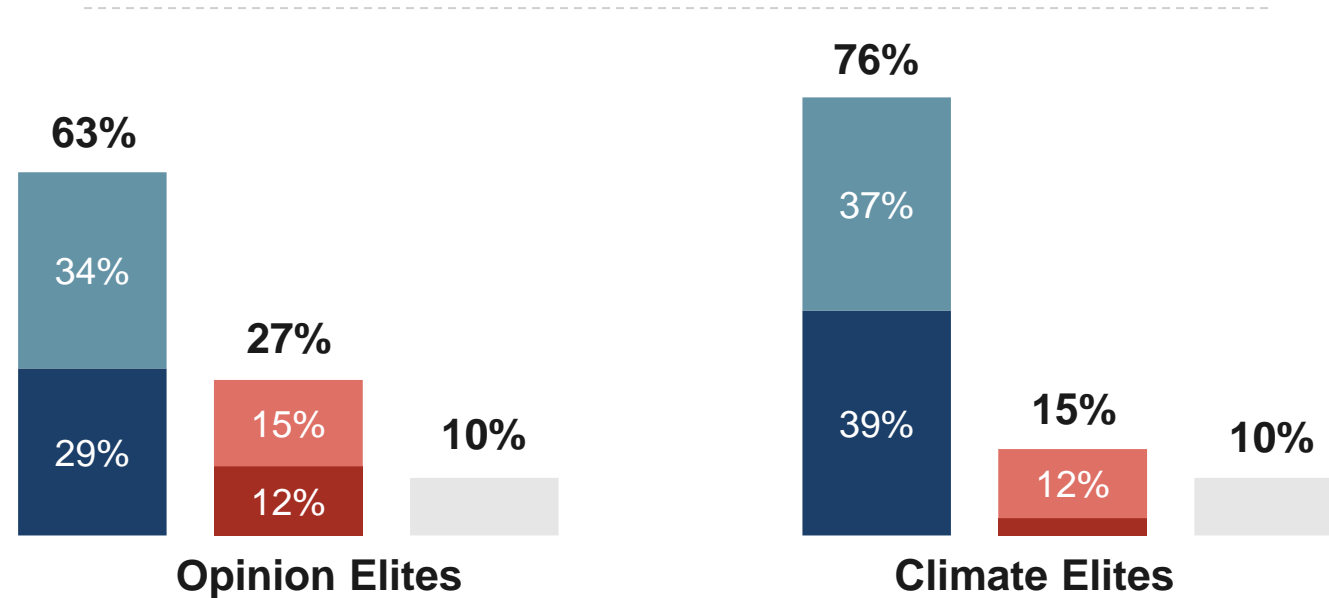


# Belief in DAC's importance in getting to net-zero is broad across the partisan spectrum, but somewhat soft.

*From what you have heard, how important do you think direct air capture is to helping the United States meet its goal for getting to net-zero carbon emissions by 2050?*

*(Net-zero carbon emissions means removing the same amount of carbon from the atmosphere as we are putting in.)*

■ Very important ■ Fairly important ■ Somewhat important ■ Not that important ■ Not sure

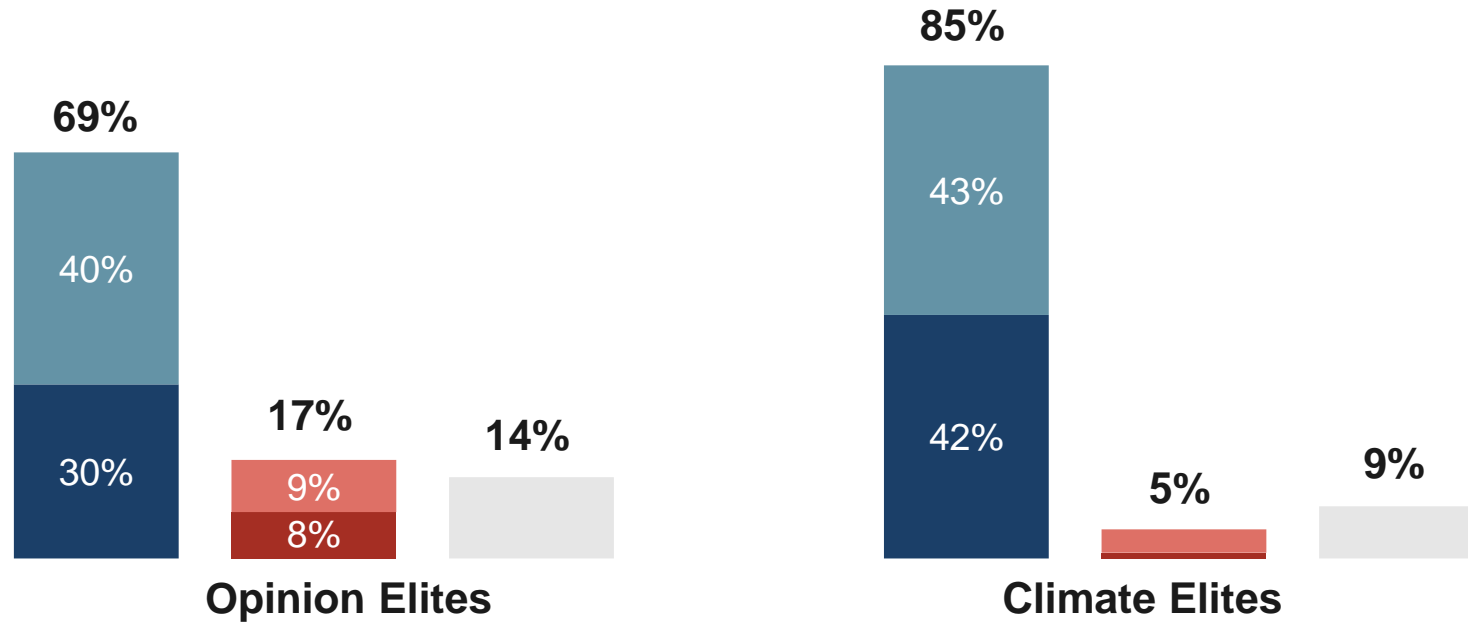


	Total Very/Fairly Important	
	Opinion Elites %	Climate Elites %
Democrats	73	76
Independents	55	67
Republicans	52	81
Heard a lot/some of DAC	74	85
Heard a little of DAC	64	77
Heard nothing of DAC	50	63

# Majorities (including of Republicans) approve of recent significant government investments in DAC.

*In the past year, the federal government has made significant investments in direct air capture here in the United States. Do you approve or disapprove of these investments?*

■ Strongly approve ■ Somewhat approve ■ Somewhat disapprove ■ Strongly disapprove ■ No opinion



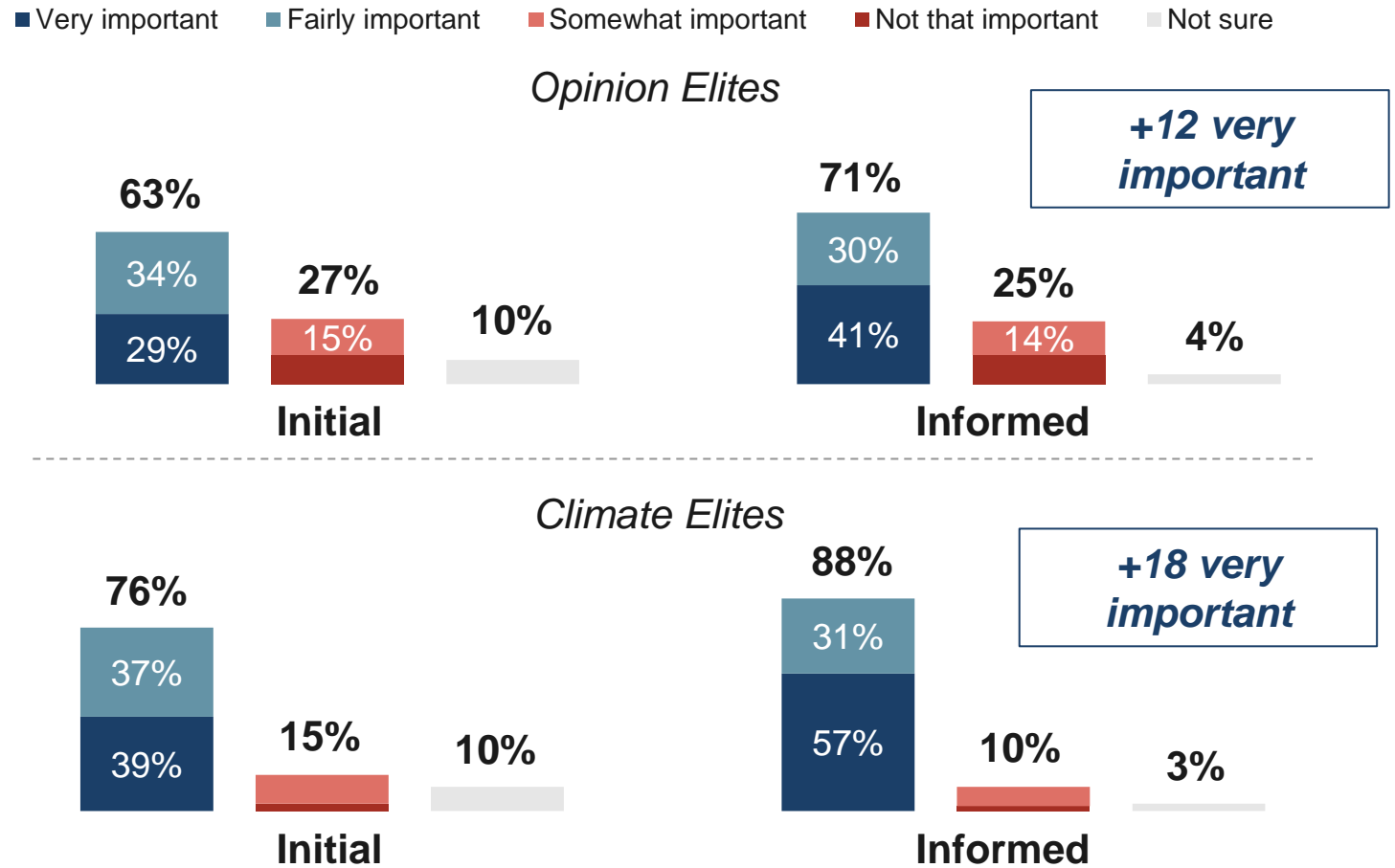
	Total Approve	
	Opinion Elites %	Climate Elites %
Democrats	85	87
Independents	66	80
Republicans	52	84

# Filling in knowledge gaps dramatically increases the perceived importance of DAC.

Direct air capture is an innovative solution that plays a role in fighting climate change by removing carbon dioxide directly from the air and storing it safely thousands of feet underground.

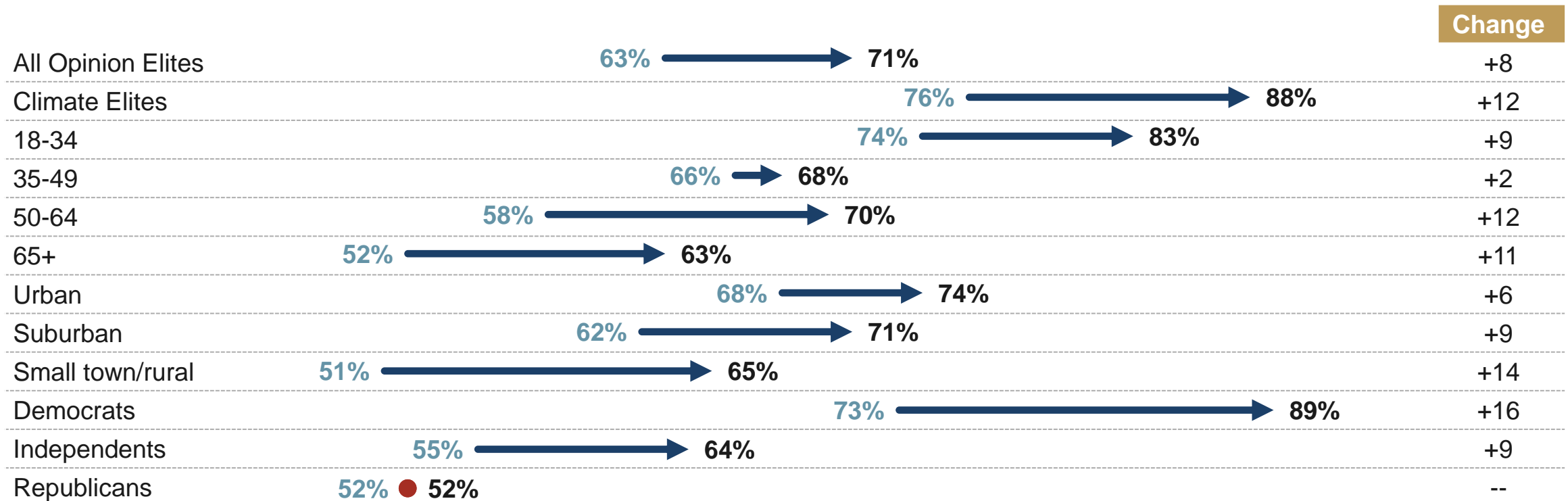
Meeting the goal of fighting climate change by getting to net-zero carbon emissions by 2050 requires transformation across almost every sector of modern life. The transition to clean energy sources is an essential part of the solution, but scientific experts from around the world agree that will not be enough. Direct air capture is essential to avoiding the worst impacts of climate change because some industries, like steel and cement manufacturing, will take longer to clean up and therefore will create some amount of carbon emissions for years to come. As global temperatures are likely to rise above international targets, we need direct air capture to reverse the harm of climate change and bring the world back to safer temperatures.

How important do you think direct air capture is to help the United States meet our goal for fighting climate change by getting to net-zero carbon emissions by 2050?



# Movement toward believing DAC is an important tool in meeting emissions goals is significant across most groups, though Republicans remain more challenging.

Initial Total Important to Informed Total Important



# Several parts of the description draw attention, including the ideas of “avoiding the worst impacts” and “reversing the harm” of climate change.

*Respondents were asked to read the statement and highlight words, phrases, or ideas they found to be the most important. Larger words correspond to greater percentages of respondents highlighting that word or phrase.*

*Words that respondents found **IMPORTANT** or that stood out to them are marked in **GREEN**.*

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Direct air capture is an **innovative solution** that plays a role in **fighting climate change** by **removing carbon dioxide directly from the air** and **storing** it **safely thousands of feet underground**.

Meeting the goal of fighting climate change by getting to **net-zero carbon emissions** by **2050** requires transformation across almost every sector of modern life. The transition to **clean energy** sources is an essential part of the solution, but scientific experts from around the world agree that will not be enough. **Direct air capture** is **essential** to **avoiding** the **worst impacts** of **climate change** because some industries, like steel and cement manufacturing, will take longer to clean up and therefore will create some amount of carbon emissions for years to come. As global temperatures are likely to rise above international targets, we need **direct air capture** to **reverse** the **harm** of **climate change** and **bring** the **world back** to **safer temperatures**.

# **Messaging Opportunities & Vulnerabilities**



# Pro-DAC Messages Tested: Full Text

<b>JOBS</b>	If direct air capture reaches full scale it will create hundreds of thousands of good-paying jobs across the country in high-wage fields like construction, engineering, and equipment manufacturing. Jobs in cement and steel manufacturing alone could increase by 50%. A lot of these jobs could be filled by workers in the oil and gas industry, with minimum training because the skills involved are similar.
<b>GETTING TO NET-NEGATIVE</b>	The carbon pollution from the last century that humans created is still in the atmosphere. The latest science is showing it's not enough to simply stop emitting new pollution. We must also remove from the air some of that carbon from the past 100 years in order to avoid the worst effects of climate change. This is called net-negative emissions, and direct air capture is key to making it happen.
<b>LEGACY EMISSIONS</b>	To stop the worst effects of climate change, we need to remove hundreds of billions of tons of carbon dioxide that has been emitted over hundreds of years of industrialization. Direct air capture has the unique ability to remove carbon pollution from the atmosphere, as opposed to from the source of the pollution, such as factory smokestacks.
<b>HARD TO ABATE</b>	While we continue to reduce harmful carbon emissions by transitioning away from fossil fuels, scientific experts agree that direct air capture is needed to get at the hardest-to-abate emissions that are created by certain energy intensive industries that make a lot of pollution, like long-haul trucking, aviation, steel and cement manufacturing.
<b>SUPPLY CHAINS</b>	If direct air capture reaches full scale there will be significant growth in manufacturing all along the supply chain, from cement to steel, chemicals, and electricity. New demand for steel and manufacturing equipment will exceed the total current U.S. demand in these two sectors, providing economic growth and increased tax revenues for communities across the country.
<b>SLOWING THE TRANSITION</b>	Using direct air capture will allow us to continue using fossil fuels like oil and gas for a longer time while still reducing the carbon that they create. This will mean a slower and less disruptive transition to clean energy that leaves fewer people behind.
<b>PUBLIC GOOD</b>	Direct air capture is an emerging but rapidly growing industry that will one day serve the same function that waste management does today. Cleaning the atmosphere of carbon dioxide and locking it away safely for thousands of years is a public good.
<b>GOOD FOR DEVELOPING WORLD</b>	Direct air capture will be good for the developing world. The biggest world economies like in the United States and Europe have used fossil fuels for centuries to help successfully grow their economies. Countries in the developing world need a chance to catch up, but for many putting modern clean energy technologies in place is out of their price range. Direct air capture would help these countries to grow their economy while the cost of clean energy comes down by pulling from the atmosphere some of the carbon they are emitting.

# There are several convincing messages in support of DAC, but intensity is tepid.

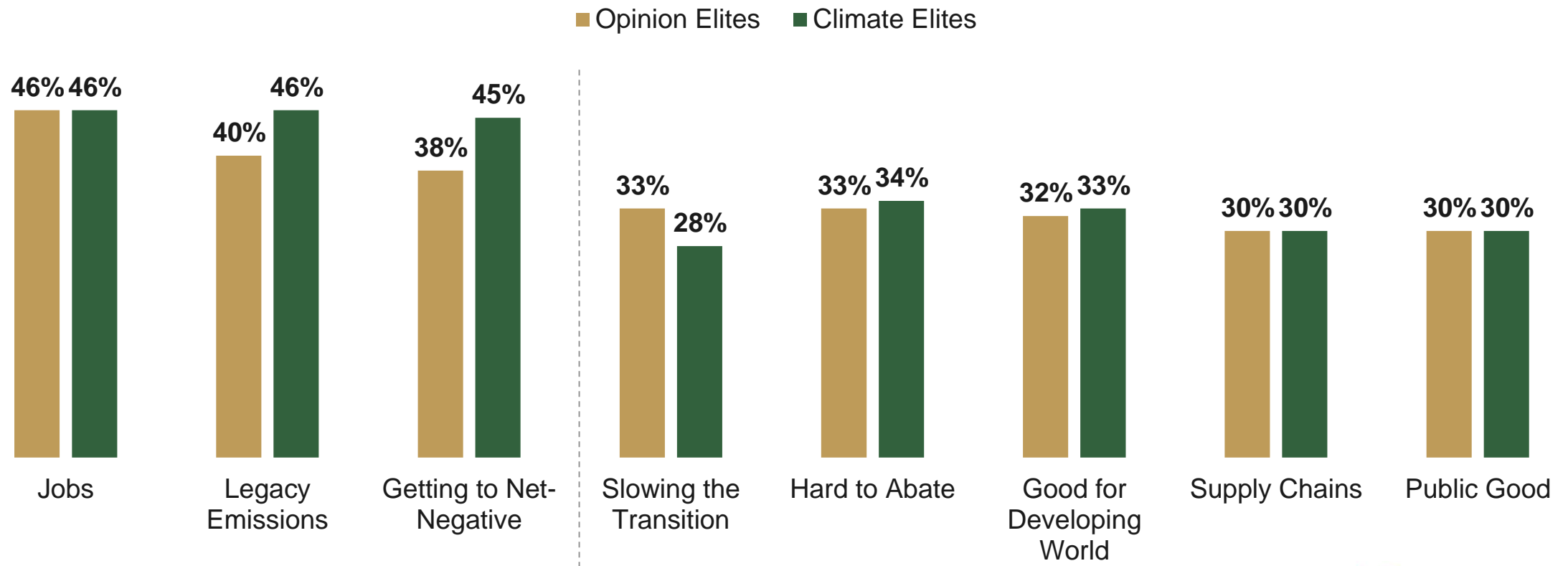
*How convincing each statement is IN FAVOR of direct air capture.*

■ Very convincing      ■ Somewhat convincing

	Opinion Elites			Climate Elites		
Jobs	30%	34%	<b>64%</b>	37%	36%	<b>73%</b>
Getting to Net-Negative	28%	35%	<b>63%</b>	38%	38%	<b>76%</b>
Legacy Emissions	25%	36%	<b>61%</b>	33%	40%	<b>73%</b>
Hard to Abate	23%	37%	<b>60%</b>	30%	43%	<b>73%</b>
Supply Chains	24%	33%	<b>57%</b>	30%	37%	<b>67%</b>
Slowing the Transition	24%	33%	<b>57%</b>	25%	35%	<b>60%</b>
Public Good	22%	34%	<b>56%</b>	30%	37%	<b>67%</b>
Good for Developing World	23%	32%	<b>55%</b>	28%	37%	<b>65%</b>

# Job creation, dealing with legacy emissions, and getting to net-negative are the most convincing messages making the case for DAC.

*BEST reasons in favor of direct air capture (three chosen)*



# Legacy emissions, net-negative, and jobs are key themes for base and “swing” audiences.

*BEST reasons in favor of direct air capture*

Climate change is a crisis	Move to positive feelings on DAC	Not sure about importance of DAC	Climate Elites: No Awareness of DAC
Legacy emissions	Jobs	Legacy emissions	Getting to net-negative
Getting to net-negative	Legacy emissions	Jobs	Legacy emissions

Democrats	Independents	Republicans
Legacy emissions	Jobs	Jobs
Jobs	Getting to net-negative	Slowing the transition



# Among conservatives, the idea that DAC will slow the transition away from fossil fuels and therefore fewer people will be left behind is a top-tier reason to support DAC.

Slowing the Transition is the 2<sup>nd</sup> most convincing message in favor of DAC (after jobs) among:

- Less and more **conservative Republicans** (including Climate Elites)
- **Trump voters** (including Climate Elites)
- Opinion elites who believe **climate change is less/not a problem**

## SLOWING THE TRANSITION

Using direct air capture will allow us to continue using fossil fuels like oil and gas for a longer time while still reducing the carbon that they create. This will mean a slower and less disruptive transition to clean energy that leaves fewer people behind

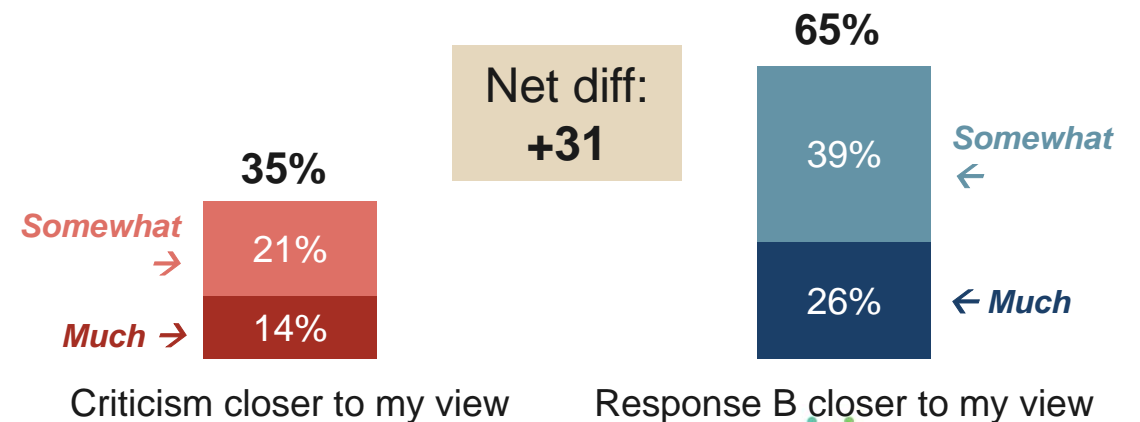
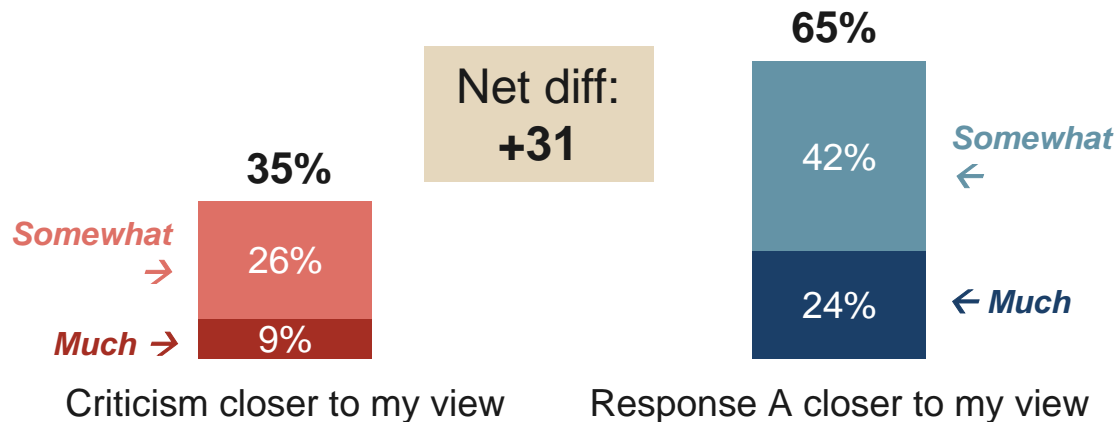
# At a high level, we “win” a debate about DAC enabling fossil fuel use whether we frame DAC (a) as needing to be an addition to ending fossil fuels or (b) as a bridge while we do so.

*Which statement comes closer to your point of view?*

**CRITICISM: ALL RESPONDENTS:** Direct air capture is just an excuse to continue burning fossil fuels. Big oil and gas companies are investing billions of dollars into direct air capture companies because they know DAC will slow the transition away from fossil fuels and encourage our continued use of oil and gas.

**(HALF SAMPLE) RESPONSE A:** Direct air capture is a necessary addition to reducing use of fossil fuels. **We need to stop burning fossil fuels that add new pollution to the atmosphere AND we need direct air capture** to remove the carbon that is already in the air from the last century to avoid the worst extremes of climate change.

**(HALF SAMPLE) RESPONSE B:** Even with the transition to using more clean energy, **the world is going to have to continue using fossil fuels for some time to come.** Some industries will transition to clean energy more slowly. Some countries will resist the transition. As long as the world is using any fossil fuels we will need direct air capture to minimize the harm of the carbon emissions that come from those fuels.



# But each response has greater value with different audience segments; climate elites in particular are not interested in continued use of fossil fuels.

*Margin by which we win the fossil fuel debate with each response*

	Net Difference Response A: DAC <i>and</i> stop burning fossil fuels	Net Difference Response B: DAC while continue burning fossil fuels
All opinion elites	+31	+31
Democrats	+33	+22
Independents	+39	+20
Republicans	+25	+44
Men	+38	+43
Women	+24	+19
18-34	+27	+23
35-49	+30	+23
50-64	+34	+30
65+	+32	+48
Climate elites	+36	+19

# Anti-DAC Messages Tested: Full Text

## Natural Methods

There are numerous, effective ways to remove carbon from the atmosphere naturally, including reforestation, agricultural soil management, and using sea water to dissolve carbon. Natural methods currently remove 30% of carbon emissions annually and are cheaper and safer than carbon air capture.

## Dirty & Inefficient

Direct air capture uses a lot of energy and when powered by fossil fuels, it creates more pollution than it captures. One study found that capturing one ton of carbon dioxide with coal-fired power direct air capture creates the equivalent of 3.5 tons of carbon pollution.

## Expensive

Direct air capture is incredibly expensive. Capturing just one-quarter of our nation's annual emissions would cost at least \$700 billion each year, this includes more than \$150 billion in taxpayer dollars that the government is giving to companies as tax credits.

## Safety

Moving captured carbon dioxide through pipelines to bury it deep underground is not safe. There is the potential for leaks at every point in the process. Pipelines break and injection of the carbon dioxide into storage wells can cause earthquakes, leading to leaks and threatening the safety of communities.

## Focus Should be Emissions Reduction

The window is quickly closing for us to cut carbon emissions and avoid the worst effects of climate change. We should not waste time and precious resources on this unproven technology, we should focus on what we know works-transitioning away from fossil fuels to clean, renewable energy sources.

## Backed by Big Oil

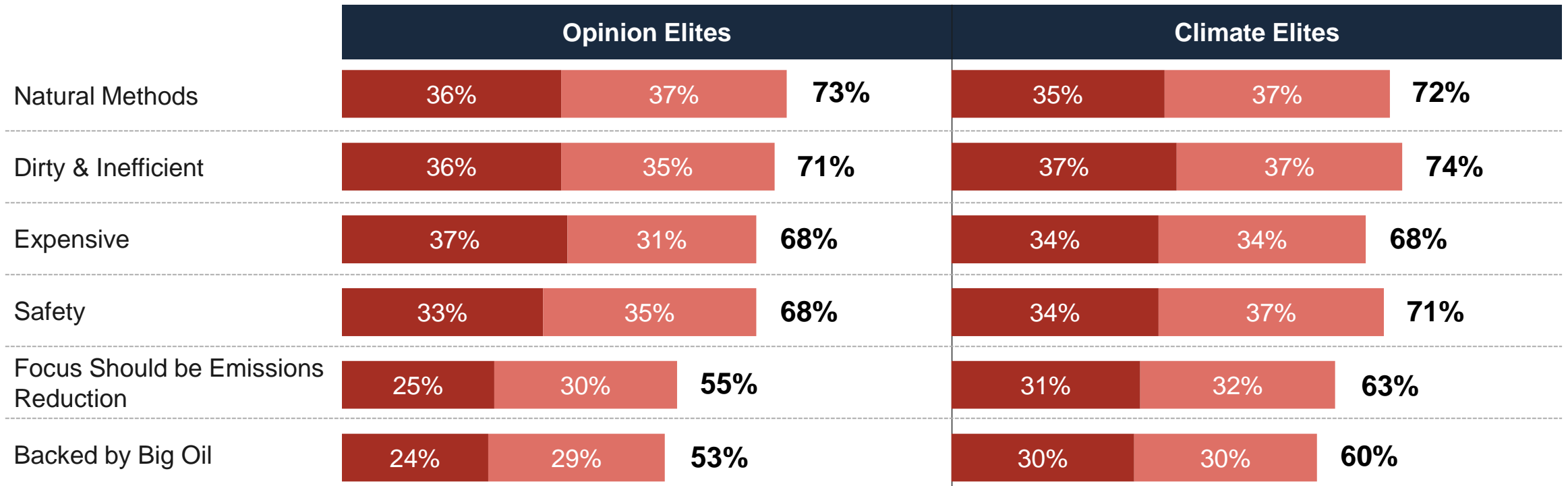
Oil and gas companies are investing billions of dollars into direct air capture companies because they know it will slow the transition away from fossil fuels and encourage our continued use of oil and gas, allowing them to continue to earn billions of dollars in profits.



# There are several criticisms of DAC that have resonance with elites.

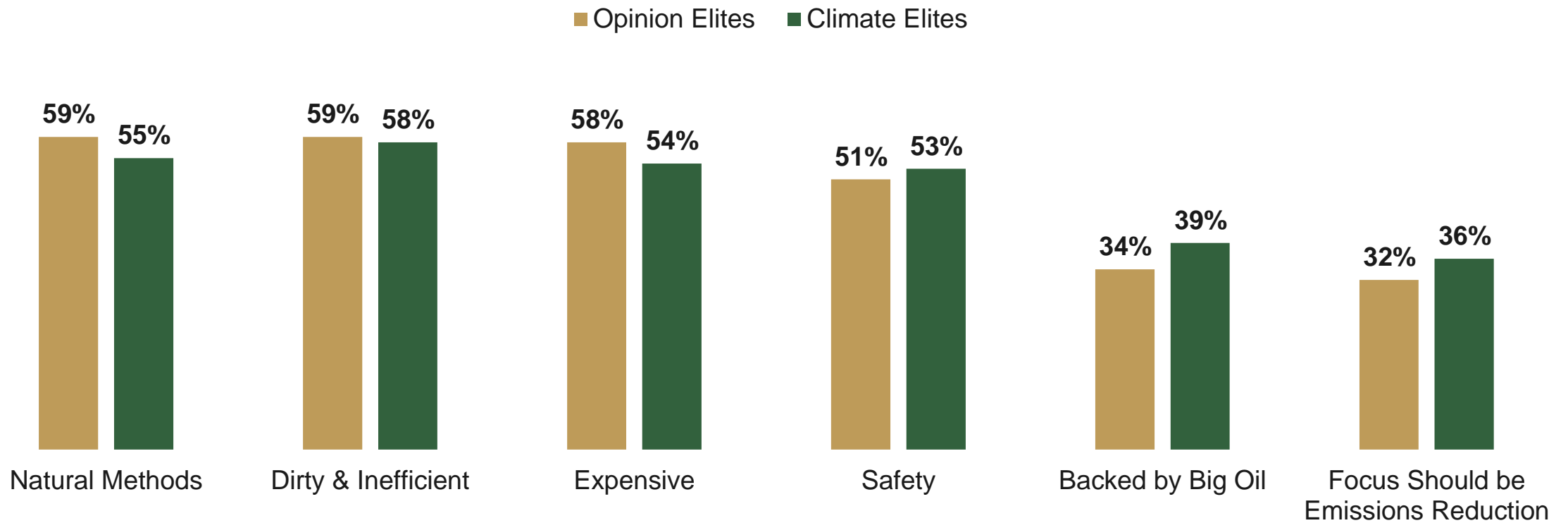
*How convincing each statement is AGAINST direct air capture*

■ Very convincing      ■ Somewhat convincing



# A few of these criticisms cluster at the top in terms of being most compelling.

*MOST convincing reasons to not make major investments in DAC (three chosen)*



# The most compelling criticisms are fairly consistent across the political spectrum; Safety concerns resonate with key persuasion groups.

*Top three messages*

Democrats	Independents	Republicans
Dirty/inefficient	Dirty/inefficient	Expensive
Natural methods	Natural methods	Natural methods
Expensive		
Safety		
<b>Not sure about importance of DAC</b>	<b>Move to DAC less/not important</b>	<b>Climate Elites: No Awareness of DAC</b>
Dirty/inefficient	Dirty/inefficient	Safety
Safety	Safety	Dirty/inefficient

Among Opinion Elites and Climate Elites

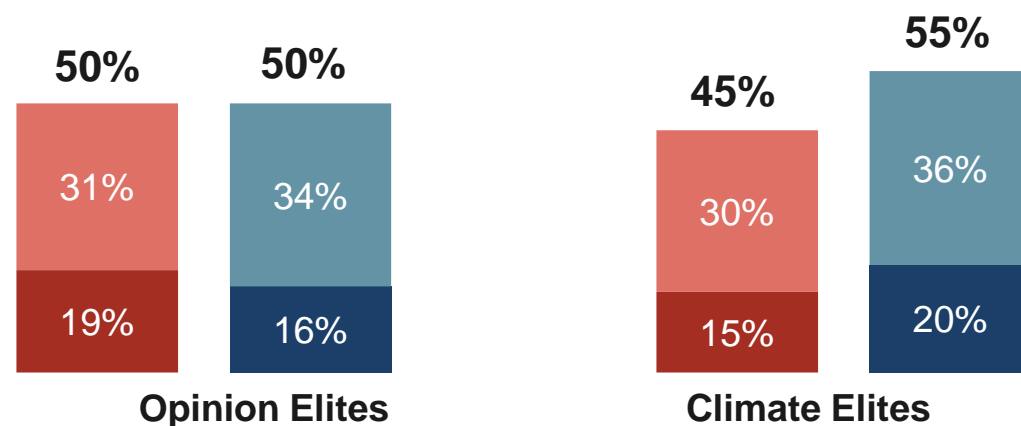
# The fact that there have been no major leaks is insufficient in fully alleviating safety concerns.

*Which statement comes closer to your point of view?*

**STATEMENT A:** Moving captured carbon dioxide through pipelines to bury it deep underground is not safe. There is the potential for leaks at every point in the process. Pipelines break and injection of the carbon dioxide into storage wells can cause earthquakes, leading to leaks and threatening the safety of communities.

**STATEMENT B:** Storing captured carbon dioxide deep underground is one of the safest climate technologies, with over 300 million tons of carbon dioxide stored since the 1990s with zero major leaks. In certain formations, the carbon dioxide can become solid rock in as little as a few months and stay that way permanently.

■ A much closer ■ A somewhat closer ■ B somewhat closer ■ B much closer



## Opinion Elites

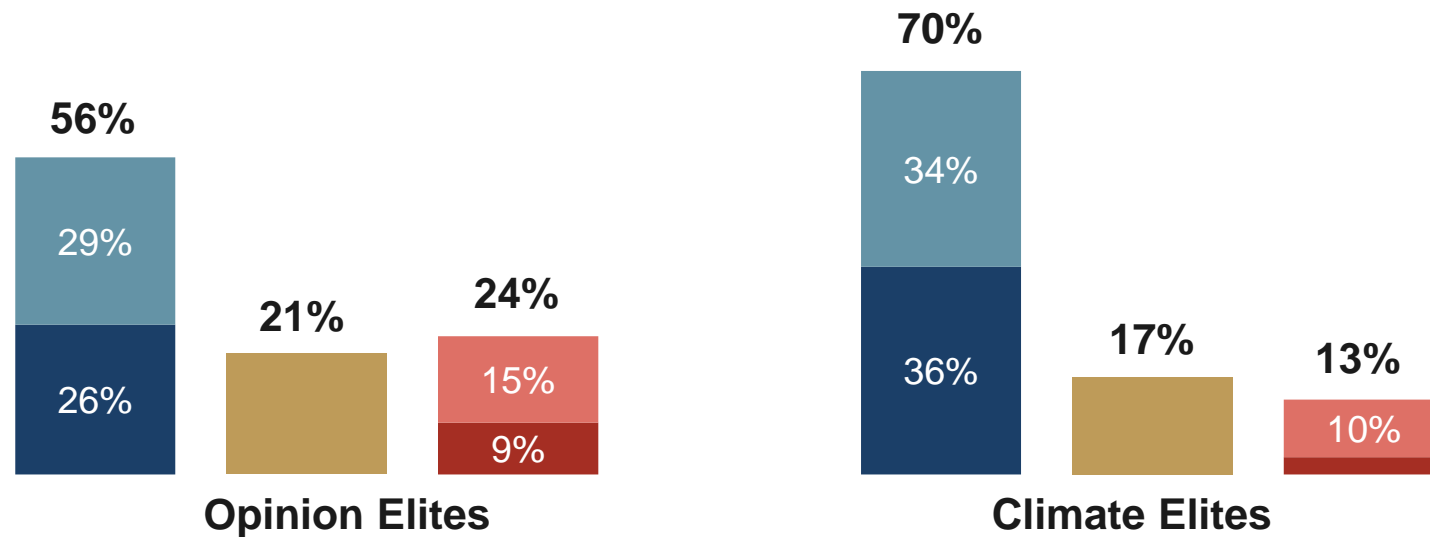
	DAC is not safe %	DAC is safe %
Men	44	56
Women	56	44
18-34	49	51
35-49	49	51
50-64	49	51
65+	52	48
Urban	50	50
Suburban	49	51
Small town/rural	52	48
No awareness of DAC	55	45

# Impact of Messaging

# After messaging on both sides of the issue, majorities see the value of government investments in DAC; support is solid among climate elites and softer among opinion elites.

*How important do you think it is that the federal government makes investments in direct air capture?*

■ Very important ■ Fairly important ■ Just somewhat important ■ Not that important ■ Not important at all

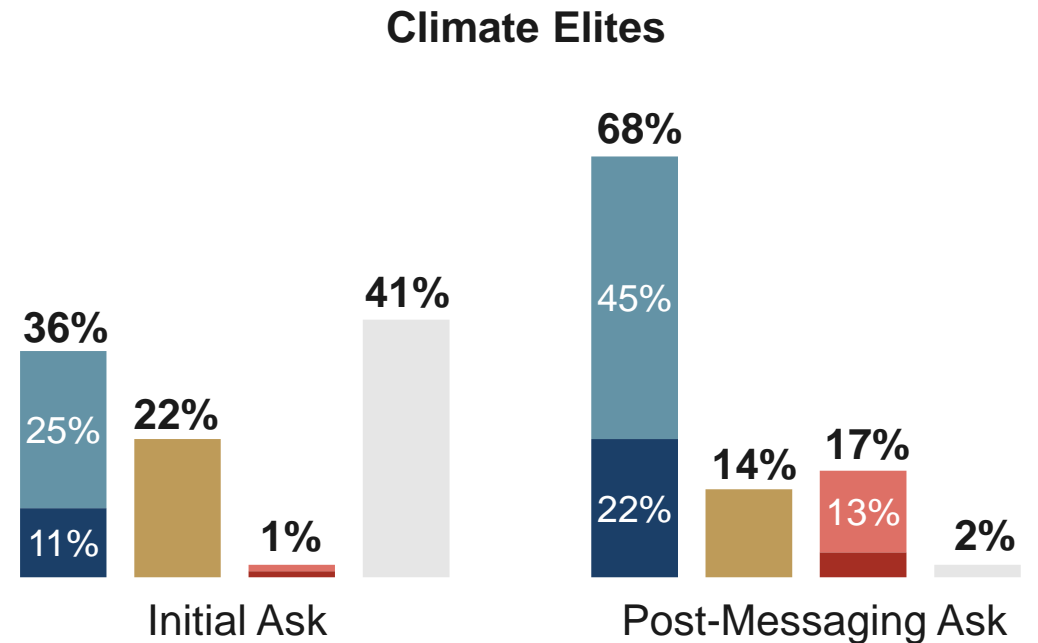
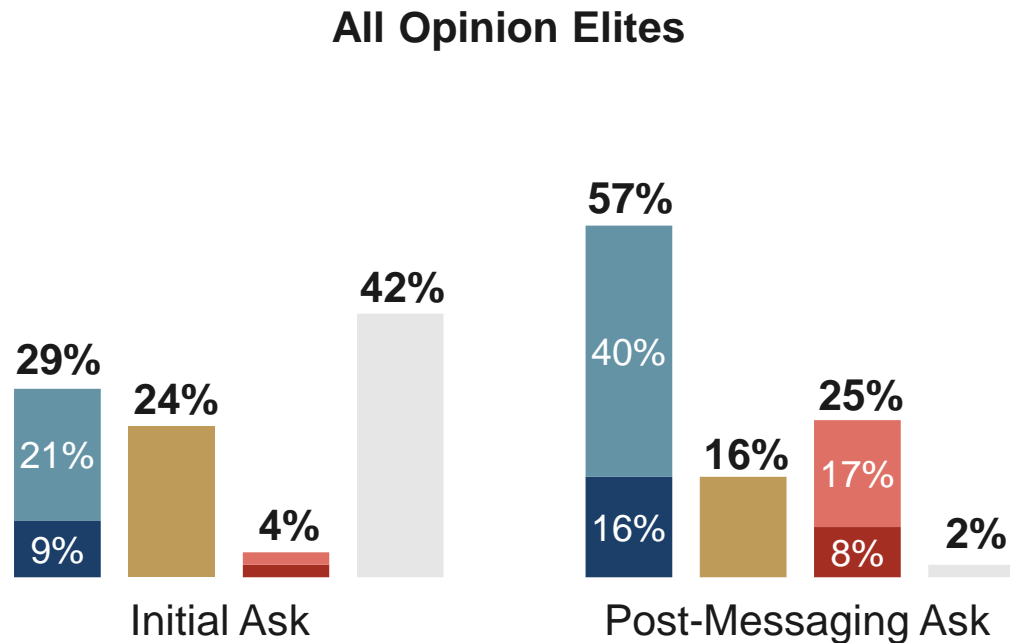


	Total Very/Fairly Important	
	Opinion Elites %	Climate Elites %
Democrats	68	70
Independents	50	62
Republicans	43	74

# After messaging on both sides, positive feelings toward DAC increase significantly.

*After everything we've covered in this survey, please rate your feelings toward direct air capture.*

■ Very Positive   ■ Somewhat Positive   ■ Neutral   ■ Somewhat Negative   ■ Very Negative   ■ No opinion

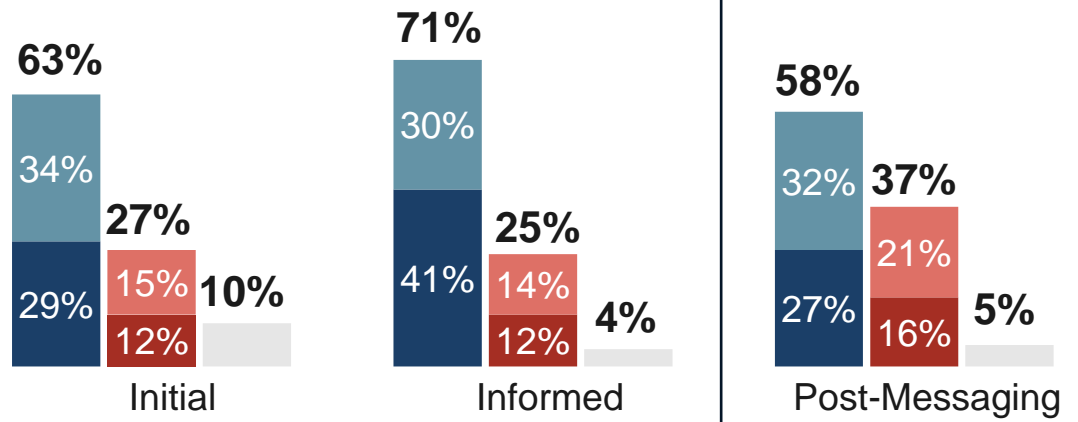


# After fully litigating the issue, we end up close to where we started on DAC as an important tool, though with modest growth on the negative side.

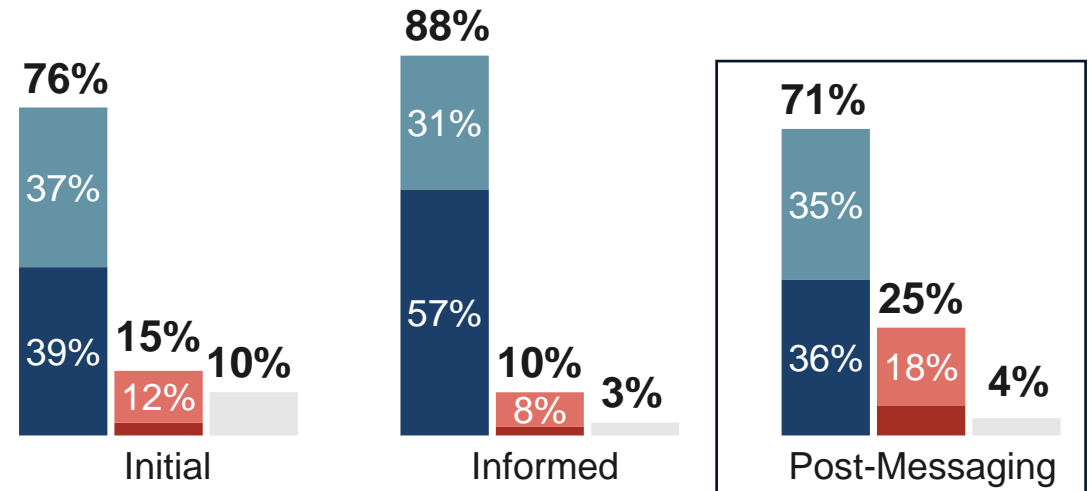
*How important do you think direct air capture is to help the United States meet its goal for fighting climate change by getting to net-zero carbon emissions by 2050?*

■ Very Important    
 ■ Fairly Important    
 ■ Just Somewhat Important    
 ■ Not that Important    
 ■ I'm not sure

## All Opinion Elites



## Climate Elites





# DAC's specific purpose, but also safety and cost criticisms, are especially “sticky” ideas.

*Please tell us one or two things that you learned that you think are especially important or that surprised you about direct air capture.  
(Coded open-ended responses)*

	Opinion Elites %	Climate Elites %
Cleans the air/removes pollution/decades old pollution	19	21
Possibility of earthquakes/concerned about safety/pipes leaking	19	20
Expensive/concerned about costs	18	13
Good/important/needed	16	17
Informative/learned the term DAC/how it works	15	16
Fights/helps climate change/the environment	13	16
Concerns about effectiveness/not practical/other ways are better	7	6
Storing carbon dioxide/building pipelines underground to store carbon dioxide	7	7
Use of fossil fuels/slows down the transition to clean/renewable energy sources	6	8
Creates jobs/easy transition for workers in energy and gas industries	6	6

# Select Verbatim Responses on What Surprised or Stuck with Respondents at the End of the Survey



“Direct air capture technology helps to remove carbon dioxide from the air which is good. Since the world is in a climate crisis, any technology that will help reduce carbon emissions is vital. This technology is needed to meet national and global climate goals.”

“The carbon would be removed and safely stored. The energy sources we use today would be eliminated safely and gradually.”

“DAC is part of our future to help reduce Carbon dioxide in our air.”

“I was not aware the govt was already making direct investments into the technology/infrastructure - but great to hear!”

“The devastating effect on economy from carbon emissions and fossil fuels. The huge possibility to eliminate air contamination by using direct air capture. Government involvement is a must. Not much time left to decrease effect of climate crisis and secure future of next generations.”



“I started off in favor of this but changed my mind after reading some of the negative statements such as potential oil leaks that can cause earthquakes and threaten entire communities.”

“I felt suspicious about this technology from the first statements, so I felt validated to hear that it is not very safe because it is based on creating pipelines and could cause earthquakes.”

“I think any messing around underground should be about tapping geothermal energy, not about burying carbon dioxide. I grew up with earthquakes and I know they are destructive. I do not support moving carbon dioxide underground and causing more earthquakes in more places.”

“This process is way too expensive with no guarantee of success.”

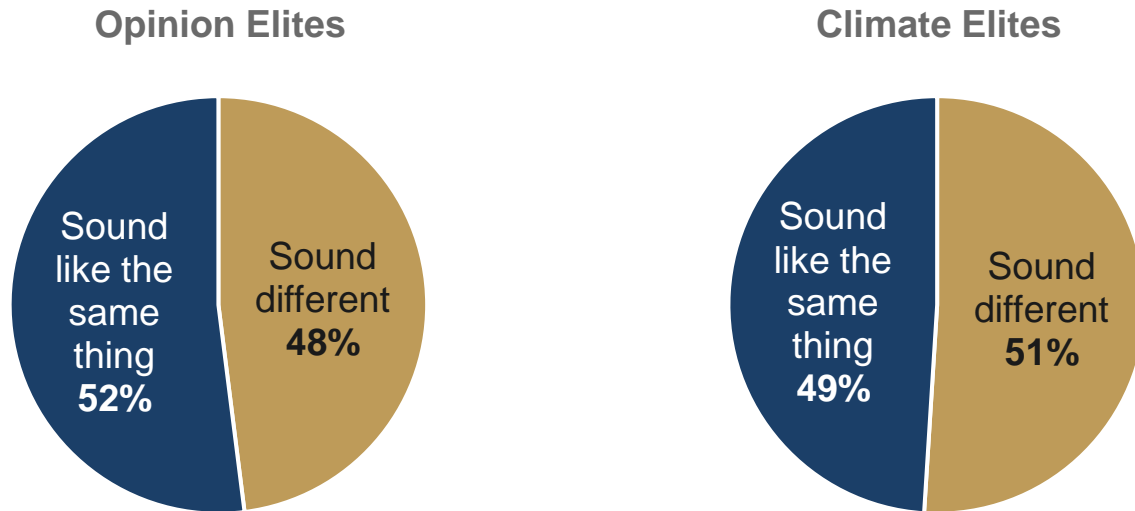
“Air capture causes more pollution than it saves. It is expensive and dangerous and is an excuse for us to stay addicted to oil and fossil fuels. We need to reforest and go solar!”

# Worth Noting: At a high level, many opinion elites have trouble differentiating between DAC and CCS.

As mentioned earlier in the survey, **direct air capture** removes carbon dioxide directly from the air and stores it safely deep underground.

There is another technology called **carbon capture and storage** that removes carbon dioxide as it is being created, from the source--such as removing it from factory smokestacks--and storing it deep underground.

*Do these two technologies sound like the same thing to you, or do they sound different?*



All Opinion Elites

Sound Same %

Sound Different %

*Heard about DAC:*

A lot/some	53	47
A little	52	48
Nothing	51	49

# A majority of elites are willing to acknowledge sincerity on the part of wealthy DAC boosters, but even more see self-serving motivations.

*There are some very wealthy individuals who purchase direct air capture credits as a way to offset their own personal carbon emissions. Below are a few reasons these individuals might purchase these credits. For each one, indicate whether you think this is or is not a reason they do so.*

