Perceived risks and benefits of CCS in the UK, and implications for communication

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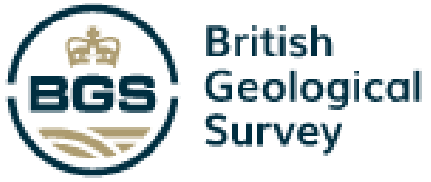
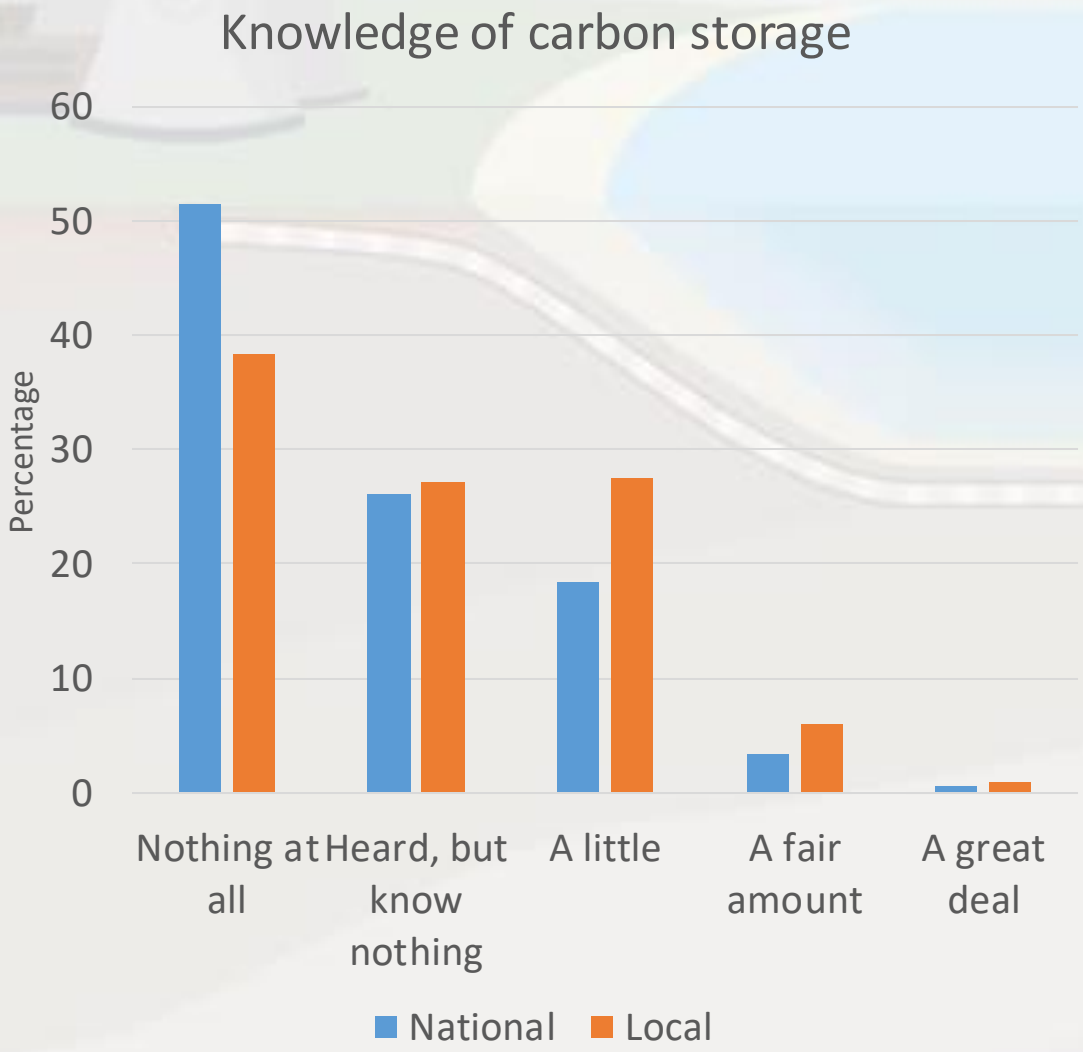
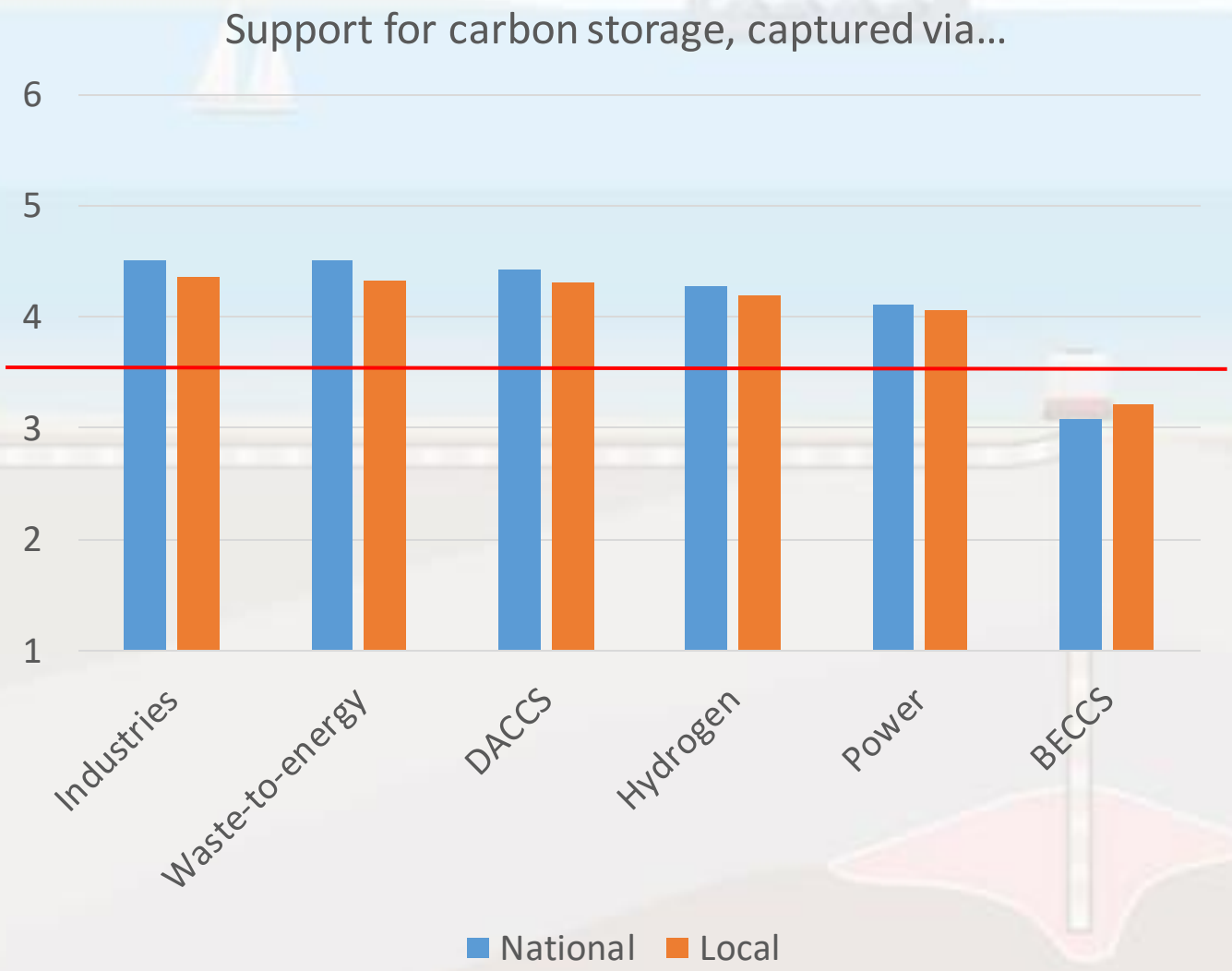


UK public perceptions baseline survey

- Nationally representative survey of UK on: age, sex, region, social grade, education, vote in 2019 election, vote in 2016 EU referendum, and attention paid to politics
- Designed to generate longitudinal sample
- 4-13 July 2023: N=5,125
  - National sample = 4,109
  - Localised sample = 1,016
  - Run through YouGov (online panel)
- Median time: 17 min., 50 sec.

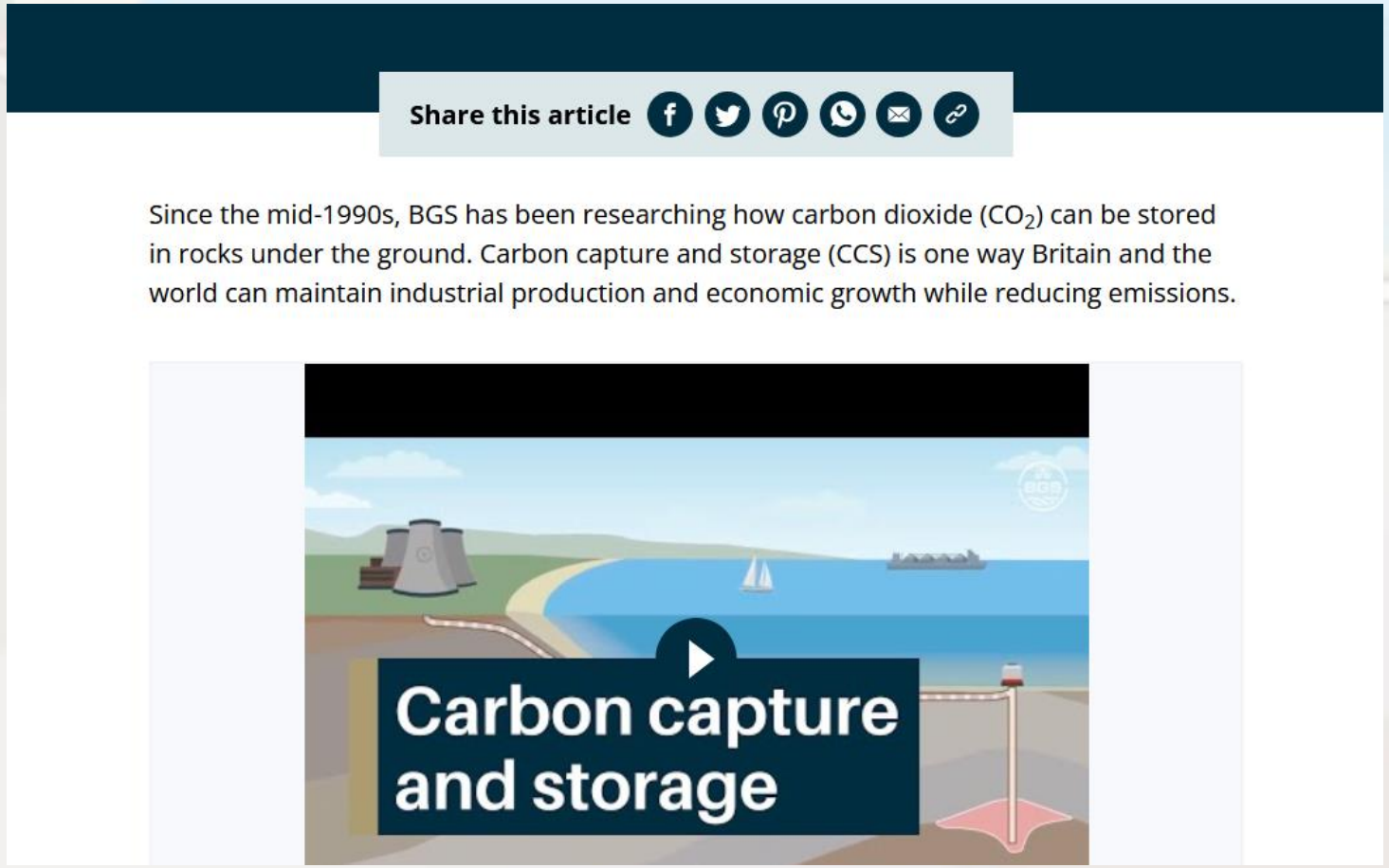
Knowledge of and support for carbon storage



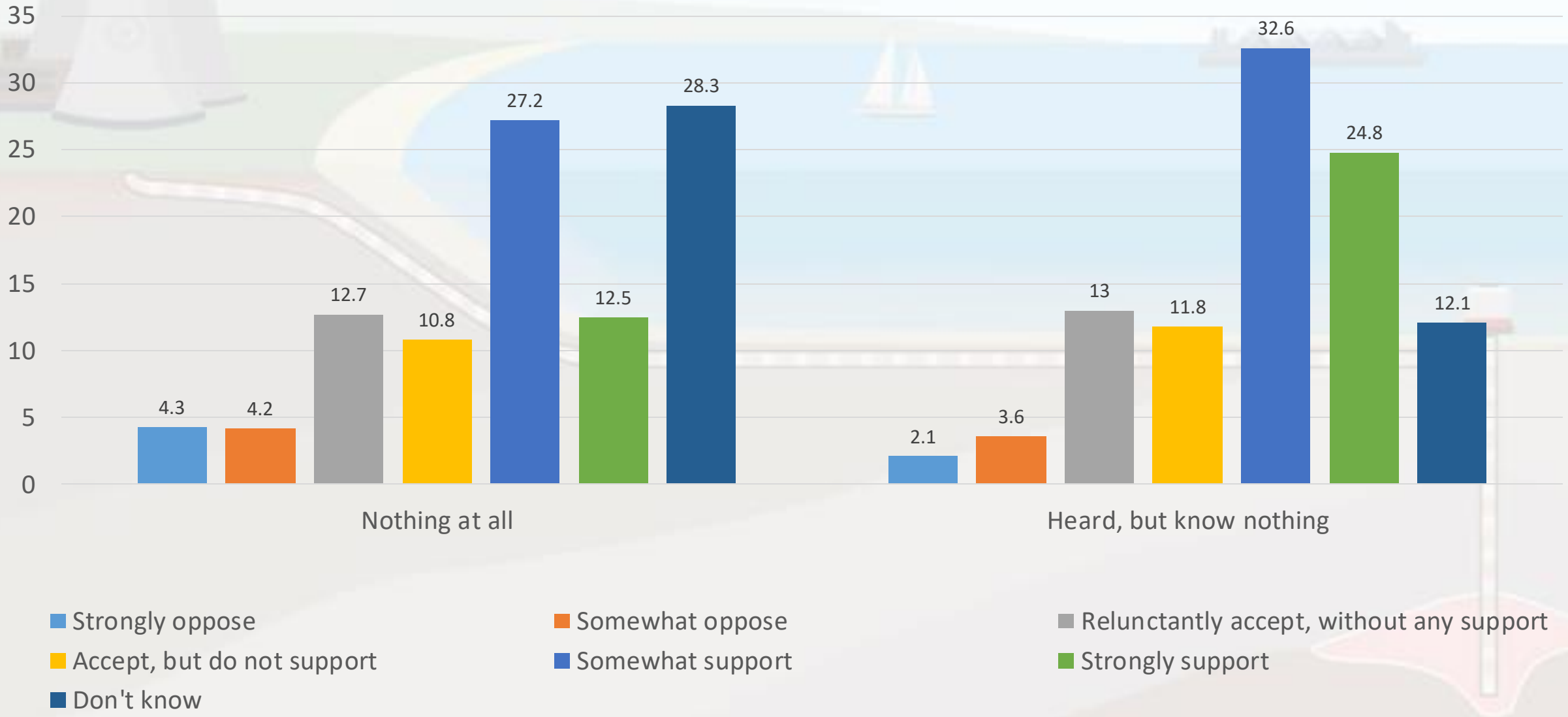


Information provision…

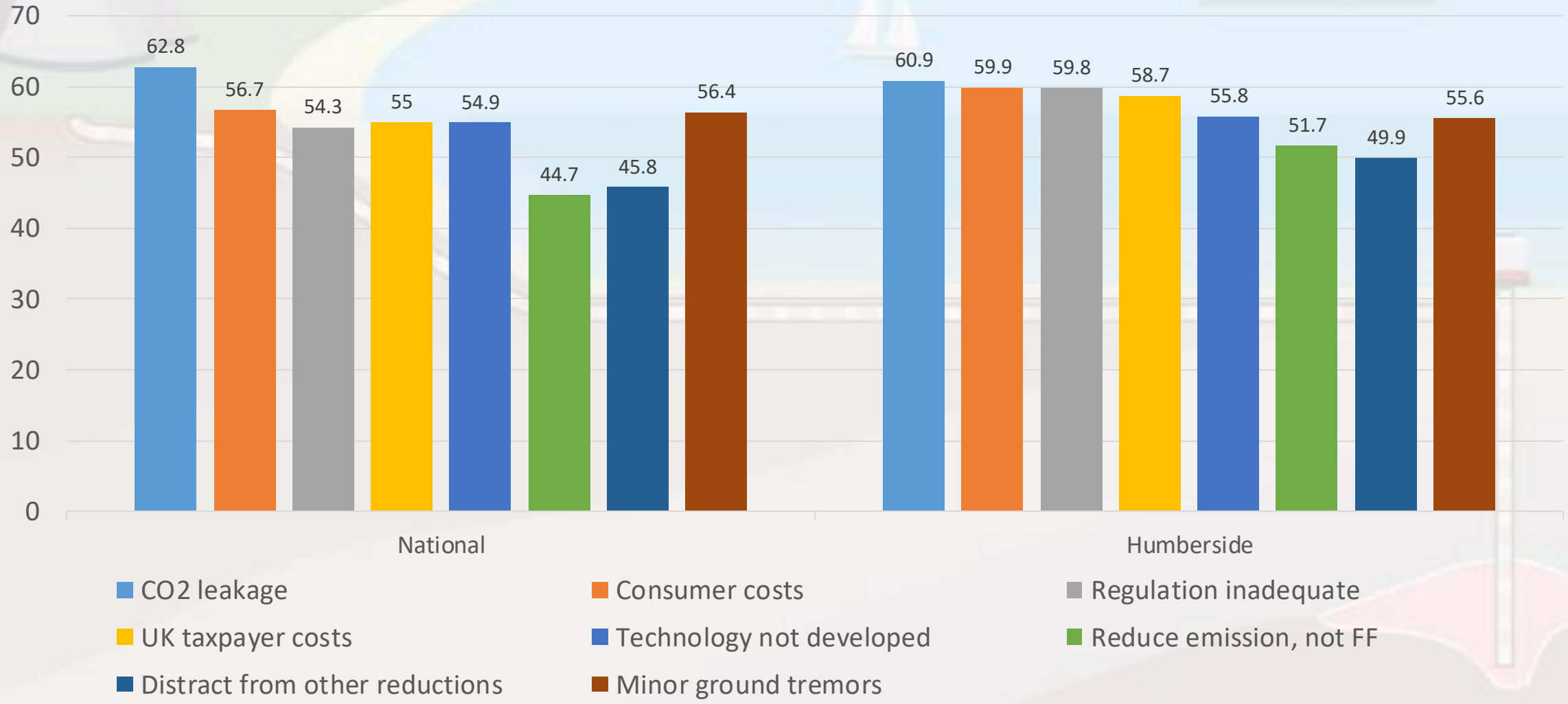
- https://www.bgs.ac.uk/discovering-geology/climate-change/carbon-capture-and-storage/



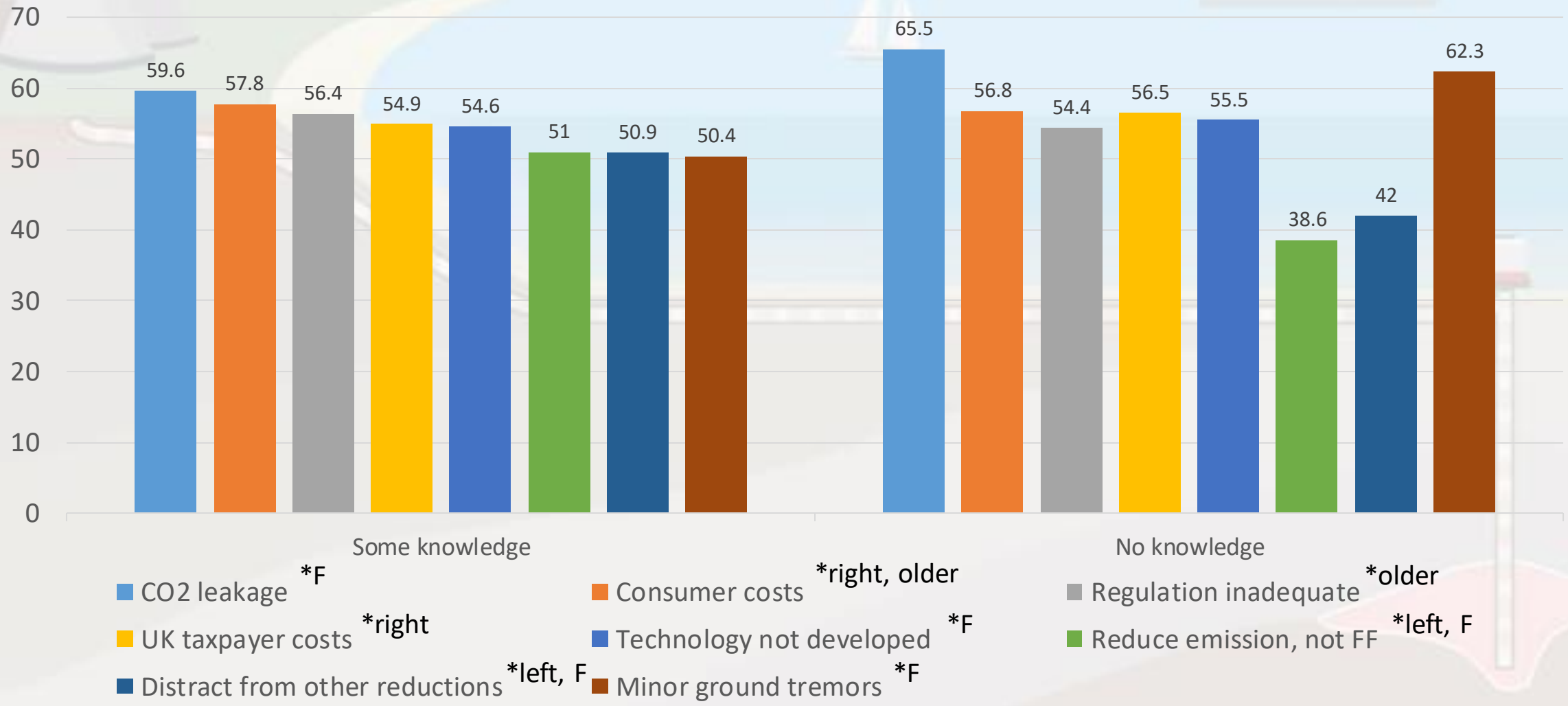
Support, after information (diff. to decarb. industry)



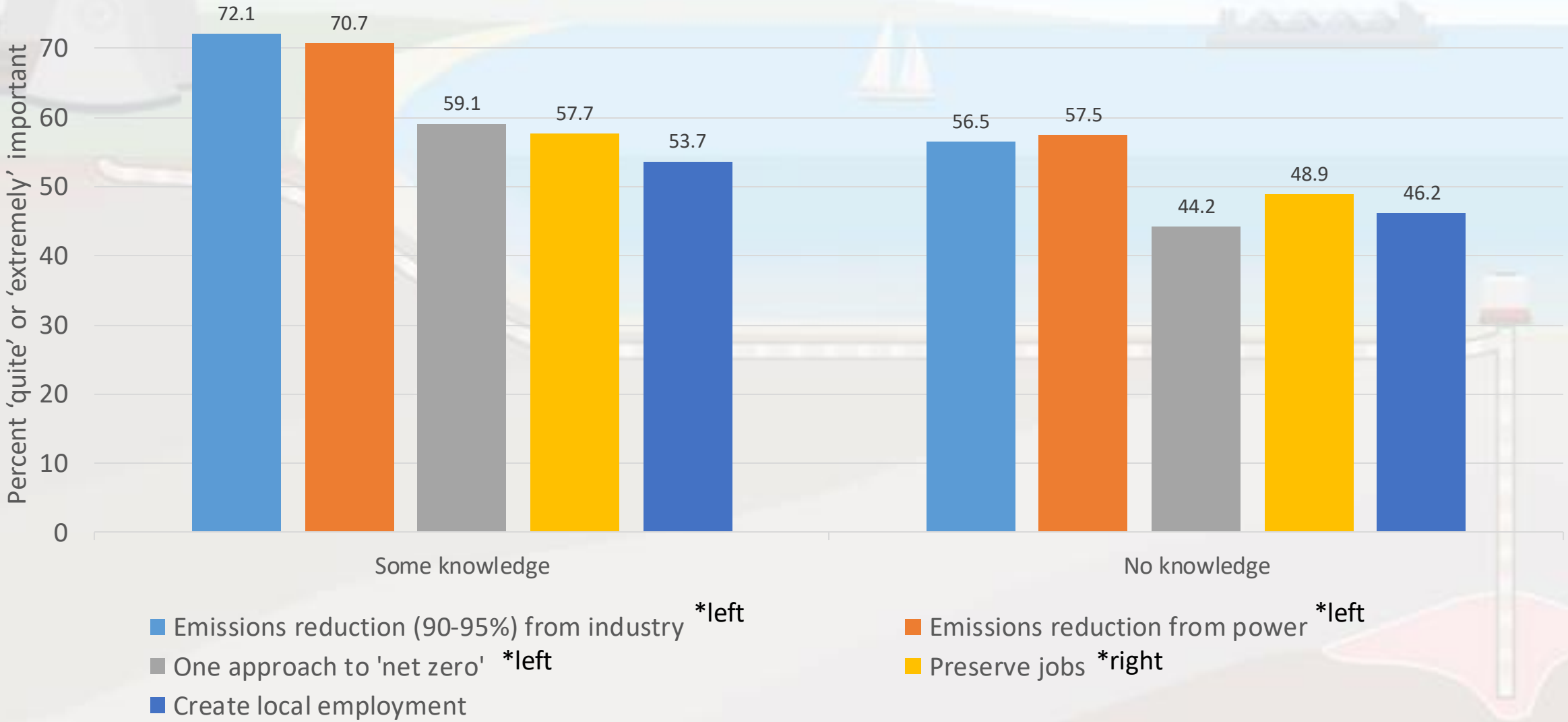
Concerns


70
60
50
40
30
20
10
0
62.8
56.7
54.3
55
54.9
44.7
45.8
56.4
60.9
59.9
59.8
58.7
55.8
51.7
49.9
55.6
National
Humberside
CO2 leakage
Consumer costs
Regulation inadequate
UK taxpayer costs
Technology not developed
Reduce emission, not FF
Distract from other reductions
Minor ground tremors

Concerns, split by knowledge level



Benefits, split by knowledge level



Q5b: From what you now know about CO_2 storage, what are your immediate thoughts about most important negatives using this in the UK

Word cloud

- Main negative is the **uncertainty** associated with the technology, particularly around the safety and long-term impacts on the underground.
- Cost is also raised as a significant concern

Thematic analysis

- Currently 20% (1025) of the total responses (5125) have been coded and analysed
- A further 10% are being randomly selected & analysed
- Could change as negative responses are more varied, overlapping & complex.
- Four key themes identified
  - **Financial implications of the technology**
  - **Confidence in technology**
  - **Spatial and temporal scales**
  - **Knowledge and understanding**

Q5b: From what you now know about CO_2 storage, what are your immediate thoughts about most important negatives using this in the UK:

Theme 1: Financial implications of the technology

Cost of technology
- Dominant sub-theme
- Often one word answers
- Commonly linked to safety & the long-term viability of the technology

Justice
- Concerns around who was going to bear the cost (broadly)
- Who would benefit

Theme 2: Confidence in technology

Safety and risk
- Leaks, stability, earthquakes, sinkholes, impact on geology, wildlife, oceans

Feasibility
- Concerns around reliability

Not a solution to the problem
- Alternatives available
- Encourages business as usual
- Action needed

"I wonder what the cost would be and how it would be funded? How certain is it that the CO2 can be stored safely underground. Does anyone know for how long?"

Q5b: From what you now know about CO_2 storage, what are your immediate thoughts about most important negatives using this in the UK:

Theme 3: Spatial and temporal scales

- Long-term impacts on environment and society
- Impact of geological and environmental change on storage
- Permanency of storage
- Capacity, scale, location

Theme 4: Knowledge and understanding

- Need for more research – personally & science community
- Concerns associated with knowledge gaps & uncertainties – **posing questions & question marks**

Uncertainty common thread through all four themes - common questions

- Is it safe?
- What are the risks?
- What are the environmental impacts?
- Is it permanently stored?
- Will it work long-term?
- What happens if there is a leak?
- How much will it cost? Who will fund it?
- Where will it be stored?
- How much can we store? What do we do when we run out of space to store it?
- How will it be transported?

How much can it hold underground, any dangers to this? How much will all this cost? Can it be used for something else. Really don't understand enough of it to make any comment but fear certain people will benefit from it at the cost to the general public

I've heard nothing about the potential dangers of CO2 storage - are there are side effects of this storage? What happens if the CO2 escapes? Will we ever run out of storage space?

I have not read or seen anything to do with CO2 storage so do not understand it

Do we really know any long term affects of storing this, could it cause problems years later?

what if there's a leak? or an earth tremour? what if the capture process is outsourced to the lowest bidder?

Why can we not transform the CO2 into some kind of use? How much storage do you need? Will it be safe? How long does it need to be stored forever?

I'm worried it might explode or something underground, sounds new and untested and therefore dangerous

Is it dangerous?

I didn't understand what "permanently stored" meant. Does CO2 just stay in these underground storage facilities forever or does it leak out or dissipate? Won't we be creating massive caverns in the earth?

not enough info about long lasting studies

Q5a: From what you now know about CO_2 storage, what are your immediate thoughts about most important positives using this in the UK:

Word cloud

- Clear message from the word cloud is that **reducing carbon emissions in the atmosphere** is the main positive impact of CO_2 storage.

Thematic analysis

- Currently 20% (1025) of the total responses (5125) have been coded and analysed
- A further 10% are being randomly selected & analysed
- Unlikely to change significantly as saturation has been reached
- Two key themes identified
  - **Environmental benefits**
  - **Confidence in the technology**

Q5a: From what you now know about CO_2 storage, what are your immediate thoughts about most important positives using this in the UK:

Theme 1: Environmental benefits

Broad environmental benefits

- Important but many of the responses were non-specific
- Protecting the environment, cleaner air, reducing pollution and emissions to tackle climate change and the ozone layer.

"Help the environment and planet going forward"

"Good for stopping the environmental crisis"

"Good for the ozone layer and planet"

Reduction of CO_2 in the atmosphere

- Most prevalent response was that it would reduce CO_2 emissions going into the atmosphere.
- Responses generally short and factual.
- Few contained any sentiment
- Potentially demonstrates a relatively basic understanding and/or low engagement with the topic.

"Reduced emissions"

"Lowering of co2"

"Reducing effects of CO2 emissions"

Linking CO_2 emissions with climate change

- Recognition of the link between CO_2 emissions and climate change
- Potentially evidence of deeper level of existing knowledge

"Reduces greenhouse effects; reduce carbon dioxide into the environment"

"Reduce carbon dioxide in atmosphere, which reduces impact on global warming"

"Stops excess emissions helps achieve net 0"

Q5a: From what you now know about CO_2 storage, what are your immediate thoughts about most important positives using this in the UK:

Theme 2: Confidence in the technology

Positive initial perceptions of technology

- Potentially an important way of addressing the problem of carbon emissions and climate change.
- Being either a short-term or a long-term solution
- Described it as "innovative", "efficient" and "clever".
- **BUT** many were prefixed "potentially", "could be" and "sounds like".

*"**It may** provide an answer to CO2 emission problems"*

*"**It sounds a possible** idea to reduce emissions."*

*"**It would appear** to be a safe way of storing CO2 and help ending CO2 transmissions."*

Knowledge and uncertainty

- Recognition that they don't have the knowledge to have an informed opinion on the benefits.
- Goes beyond "don't know", rather they state that they "don't know enough".
- More information needed
- Some cautiously supportive.

"I don't know very much about CO2 storage, if it is a Safe way of storage underground then yes I would agree, however, I have never heard of this before"

"Would need to know more to have an opinion"

"I mean, it sounds good, if it's genuinely safe"

"Not really sure - looks good but often we are only told part of the truth"

Take-home messages:

- Added knowledge seemingly decreases some concerns, increases others
- Quantitative – CO_2 *leakage* and *cost* lead concerns
- Qualitative – *as above*, but uncertainty of these effects
- Benefits – emissions reduction (quant. & qual.), but still uncertain
- Communication?
  - Caution: more information does not necessarily decrease concerns
  - Yet, demand / opportunity for information
  - Some clear misunderstandings
  - Information could calm some fears, show established technology
  - Normative issues are more difficult (e.g., keeping FF, distracting, *how much* knowledge is enough)

Questions, Discussion

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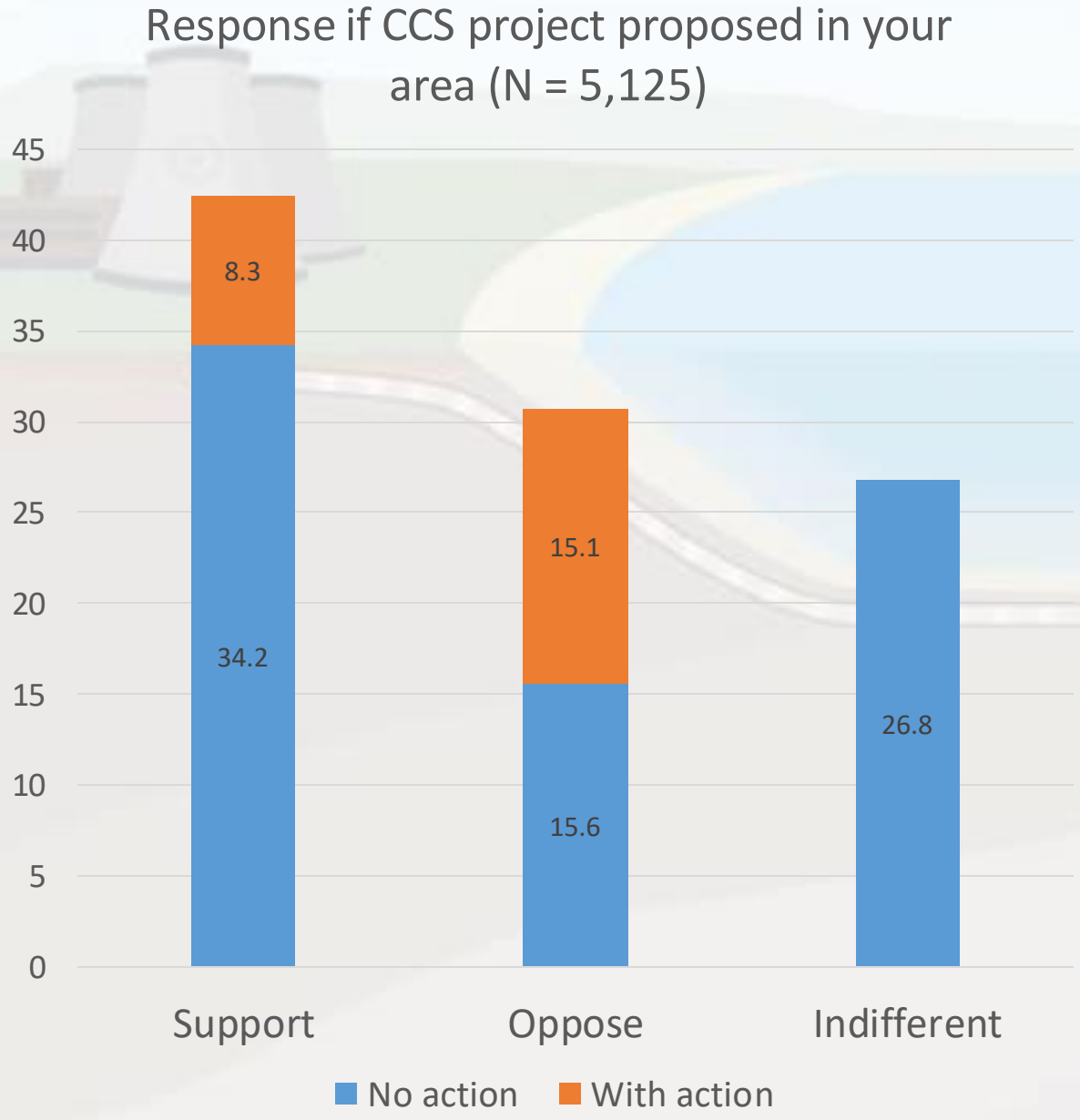
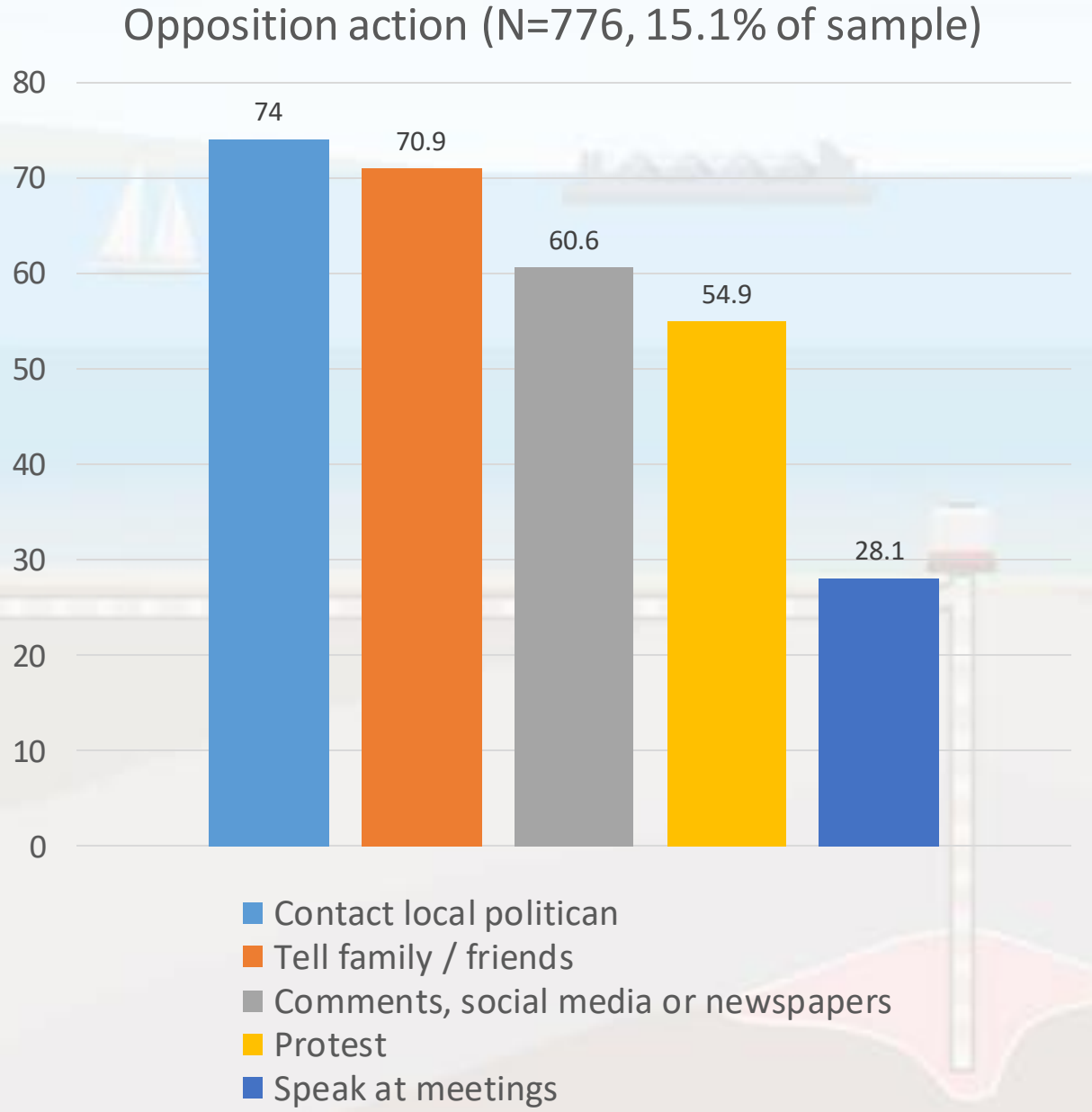

Response if CCS project proposed in your area (N = 5,125)
45
40
35
30
25
20
15
10
5
0
8.3
34.2
15.1
15.6
26.8
Support
Oppose
Indifferent
No action
With action


Opposition action (N=776, 15.1% of sample)
80
70
60
50
40
30
20
10
0
74
70.9
60.6
54.9
28.1
Contact local politican
Tell family / friends
Comments, social media or newspapers
Protest
Speak at meetings