

Not Under My Backyard: Geographic proximity and public acceptance of Carbon Capture and Storage (CCS) facilities

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ABSTRACT

Carbon capture and storage (CCS) is an innovative technical approach to mitigate the problem of climate change by capturing carbon dioxide emissions and injecting them underground for permanent geological storage. CCS has been perceived both positively, as an innovative approach to facilitate a more environmentally-benign use of fossil fuels while also generating local economic benefits, and negatively, as a technology that prolongs the use of carbon-intensive energy sources and burdens local communities with prohibitive costs and ecological and human health risks. This paper extends existing research on “Not In My Backyard” (NIMBY) phenomena in a direction that explores the public acceptance of CCS. We utilize survey data collected from 1,001 residents of the coal-intensive U.S. state of Indiana. Over 80% of respondents express support for the general use of CCS technology. However, 20% of these initial supporters exhibit a NIMBY-like reaction and switch to opposition as a CCS facility is proposed close to their communities. Respondents’ world views, their beliefs about the local economic benefits that CCS will generate, and their specific safety concerns – primarily water contamination – have the greatest impact increasing or decreasing the likelihood of NIMBY reactions. Both proponents and opponents of CCS may find these results useful for structuring targeted image-building campaigns around the technology.

KEY WORDS: Carbon capture and storage, NIMBY, Public acceptance

1. INTRODUCTION

Carbon capture and storage (CCS) has emerged as an innovative and important technical approach to help mitigate the problem of climate change. By capturing carbon emissions at large-volume sources, transporting compressed carbon dioxide (CO₂) via pipeline to storage sites, and injecting it underground for permanent storage in geologic formations, CCS technology has the potential to reduce significantly the volume of greenhouse gases now being released into the atmosphere. While CCS technology is proven in the context of enhanced oil recovery and small pilot projects, the feasibility of its use for commercial-scale carbon mitigation at large powerplants has not been demonstrated and therefore the economics and technical requirements remain open to question. Many experts predict that, if successfully deployed, CCS technology could help society reach long-term climate protection goals.^(1,2)

CCS has been perceived both positively, as an innovative technology that will facilitate a more environmentally-benign use of fossil fuels while also generating local economic benefits, and negatively, as a technology that prolongs the use of carbon-intensive energy sources and burdens local communities with prohibitive costs and ecological and human health risks. Both of these perspectives have been expressed at the community level and have succeeded in influencing the outcome of proposed CCS facilities. For example, the FutureGen project, a joint venture between the U.S. Department of Energy (US DOE) and a consortium of industry partners, is currently moving forward due in part to support from local residents in Illinois, USA who view the project as an economic opportunity.⁽³⁾ In other cases – such as in Beeskow, Germany and Barendrecht, Netherlands – strong local opposition has resulted in the abandonment of well-established plans for CCS deployment.^(4,5) This type of resistance from

local residents may reflect a classic “not in my backyard” (NIMBY) sentiment, which, in this context, may be better viewed as a “not *under* my backyard” (NUMBY) reaction.

Classic NIMBY phenomena have been extensively researched in the context of more familiar technologies and land uses, but few scholars have closely considered NUMBY reactions associated with CCS deployment. This paper examines the phenomenon of resistance to CCS by those with NUMBY sentiments in the state of Indiana, USA, where two commercial-scale CCS projects are in the planning and feasibility assessment stages.^(6,7) This analysis is based on survey data collected from a random sample of 1,001 Indiana residents, and examines the factors that predict support and opposition to the placement of hypothetical CCS facilities at varying proximities to respondents’ homes and communities. Approximately 21% of the respondents who support CCS shift to opposing it when a proposed site moves closer to their community. Additional analysis focuses on this sub-group of individuals.

2. LITERATURE REVIEW

Projects that yield geographically diffuse benefits but carry localized costs often result in resistance from the nearby residents who would bear the burden of these costs.⁽⁸⁾ The recent cancellations of planned CCS facilities in Germany and the Netherlands in response to community opposition have raised the specter of NIMBYism acting as an obstacle to CCS implementation. This “not in my backyard” phenomenon has been well studied in the context of siting undesirable or potentially hazardous facilities, such as prisons,⁽⁹⁾ municipal waste facilities,^(10,11) nuclear power plants,⁽¹²⁾ and radioactive and hazardous waste storage facilities.^(13,14) Opposition to these socially beneficial but locally undesirable land uses is frequently tied to concerns about health and safety, decline in property values, general decline in

quality of life, emotional attachments to existing local land uses, and a desire to preserve existing rural aesthetics.⁽¹⁵⁻¹⁸⁾ In order to represent “true” NIMBY, however, individuals have to support a project in the abstract, and oppose it only if it occurs near their place of residence. That is, a free-rider preference must be identified.⁽¹⁹⁾ Critics contend that this dynamic is rarely witnessed, and that the NIMBY concept is both an over-used and insufficient characterization of more general opposition.^(19, 20)

A significant number of studies have been conducted that examine public attitudes towards CCS and assess the factors that enhance or diminish its likely acceptance. One major strand of this research uses case studies to examine the social dynamics that are observed within a community during the planning or construction of CCS pilot facilities and how those activities shape individuals’ attitudes toward the development.^(4, 5, 21, 22) A second strand of research assesses opinions expressed towards hypothetical CCS deployment, since the technology has not yet been brought to commercial scale.⁽²³⁻²⁶⁾ These baseline studies have identified an overall lack of awareness of CCS technology; findings indicate that only between 5%⁽²⁷⁾ and approximately 20%^(25, 28, 29) of the general public living in countries with active CCS agendas have ever heard of the technology. Despite this, the uninformed public associates a relatively consistent set of risks with it, including CO₂ leakage, induced seismicity, explosions, and groundwater contamination.^(26, 30, 31) The risk perception literature makes it clear that, irrespective of probabilities, people are less likely to accept risk if it includes potentially catastrophic effects, is unfamiliar, or is involuntarily imposed.^(32, 33) Other opposition is based on the idea that CCS is, for a variety of reasons—including its potential to perpetuate reliance on fossil fuels and divert investment away from renewables—an inappropriate means to address climate change.^(26, 34)

In order to indicate NIMBYism, opposition must be linked to a free-rider preference, which is often identified when decreased support for a socially beneficial project accompanies its increased proximity to people's homes. Findings on NIMBY-driven reactions to CCS have been mixed, with some survey-based and quasi-experimental studies finding that the hypothetical placement of underground CO₂ storage in and away from respondents' own municipalities yield similar levels of opposition, suggesting the absence of true NIMBY-based opposition.^(35, 36) On the other hand, in a small Swiss sample, Wallquist et al. (2012) were able to explicitly identify NIMBY-driven attitudes toward certain components of CCS facilities, namely pipelines and storage sites.⁽³⁷⁾ To date, no studies utilize a sufficiently large sample able to support a multivariate analysis that can identify both the presence of NIMBY-based responses and the factors that predict this type of reaction.

3. DATA AND SAMPLE

Data for this study were collected from 1,001 Indiana residents in late 2011 using the Indiana University School of Public and Environmental Affairs (IU-SPEA) Energy, Climate, and Environment Survey. Indiana is a coal-intensive state with significant mining and electric power production from coal. Public acceptance and potential NIMBYism in coal-intensive states is of particular interest because they are common venues for early planned CCS deployment activities and the public debate and opinion formation that will take place within them may influence the future of CCS.⁽²⁵⁾

The survey instrument utilized a three-part telephone-mail-telephone design. The first stage secured participation and asked background questions about demographics and general environmental attitudes. It did not specifically mention CCS. The response rate in the first phase was 24.3%. The mailing stage involved the dissemination of a CCS diagram and factsheet,

with a request that participants view these materials prior to the second telephone interview. The factsheet and diagram were designed to provide limited educational information about CCS, without any detail on possible advantages, disadvantages, costs, risks, and benefits. It was reviewed by several policy and technical CCS experts for accuracy. This factsheet served as the only source of CCS information for a majority of respondents, who were previously unfamiliar with the emerging technology. The final stage of the survey asked the respondents a series of questions about CCS designed to assess (1) their impressions and associated concerns about the technology, (2) the extent of their agreement with a series of asserted advantages and disadvantages of CCS, (3) their impressions as to whether CCS is a good approach to protecting the environment, (4) whether they believe CCS should be located in the U.S., Indiana, and their own community, and (5) who they think will and should pay for the added costs of CCS. The second interview had a response rate of 75.3 percent. The 1,001 respondents used in this analysis completed all three waves of the survey.

4. METHODS AND RESULTS

Survey participants described their level of support for the construction and operation of a CCS facility using various geographic points of reference. Specifically, they were asked: “If experts determine there is a suitable site for underground CO₂ storage, would you strongly support, somewhat support, somewhat oppose or strongly oppose the operation of a Carbon Capture facility *somewhere in the U.S.*?” The same question was later repeated, but the reference location was changed to “*near your home or community.*” Answers reflecting gradients of support and opposition for each question were condensed and the resulting dichotomous variables serve as dependent variables in the analysis.

Separate logit regressions, using post-stratification weights, are run on each dependent variable and their results are compared to assess how the factors that predict the support (or opposition) for a hypothetical CCS facility change as its location moves closer to individuals' residences. Independent variables are described in Table 1 and include respondents' demographic characteristics, their cultural world view, as described by Douglas and Wildavsky (1982),⁽³⁸⁾ characteristics about the community or region in which they live, and their level of concern over the expense of CCS and the various safety risks that are frequently associated with the practice.

We hypothesize that owning a home, having a large concern about perceived CCS risks (i.e. explosions, earthquakes, suffocation, and groundwater contamination), and the belief that state taxpayers or utility rate payers would absorb the additional cost burden of CCS will decrease the likelihood that respondents will support the placement of a facility near their home or community, but have less of an impact on their opinions regarding its national placement. On the other hand, we hypothesize that people who live in rural areas or coal producing regions and think that a CCS facility would provide an important local economic benefit are more likely to express support for CCS in their community. The belief that climate change is a serious problem is expected to lead to a greater acceptance of CCS regardless of location.

Previous research suggests that a respondent's worldview or "cultural bias" creates a predilection toward new technologies, although the direction of that predilection for CCS is not obvious, particularly as its location changes in proximity to respondents' communities. Three world views are relevant.⁽³⁹⁾ Holders of the individualistic bias typically view technology as an opportunity for growth and are supportive as long as it is not perceived to interfere with market functioning. Those with a hierarchical bias are comfortable with existing patterns of authority

and tend to view technology positively if it has been recommended by experts and officials.

Those with an egalitarian bias view inequality as the largest risk to society and favor actions that increase equality. Egalitarians often perceive large centralized technologies as contributing towards inequality; however, climate change is projected to have uneven effects and cause disproportionate suffering among the poor, thus increasing inequality. CCS, therefore, might be perceived as the lesser of two evils. We hypothesize, therefore, that individuals with hierarchical, individualistic, or egalitarian cultural biases will be favorably inclined toward CCS, regardless of its location.

Table I: Description of Independent Variables

Gender	A dichotomous variable representing respondents' gender (1 = male).
Race	A dichotomous variable representing respondents' race (1 = non-Hispanic White)
Age	Respondents' age in years.
Income	An ordinal variable indicating whether respondents' annual family income is less than \$25k, \$25-\$50k, \$50-\$75k, \$75-\$100k or over \$100k.
Home-ownership	A dichotomous variable indicating whether respondents own their home.
Education	A dichotomous variable indicating whether respondents have a college education or higher.
Liberal	A dichotomous variable indicating whether respondents self-identify as politically liberal.
Coal region	A dichotomous variable indicating whether respondents live in counties where coal is actively mined.
Rural area	A dichotomous variable indicating whether respondents self-identify as living in a rural area.
Climate change problem	A dichotomous variable indicating whether respondent agrees (somewhat or strongly) that climate change is a problem.
Effectiveness concern	A dichotomous variable indicating whether respondents have a large Concern that CCS will not be effective.
Expense concern	A dichotomous variable indicating whether respondents have a large concern that CCS will be expensive.
Explosions concern	A dichotomous variable indicating whether respondents have a large concern that CCS could cause explosions.
Earthquake concern	A dichotomous variable indicating whether respondents have a large concern that CCS could cause earthquakes.
Suffocation concern	A dichotomous variable indicating whether respondents have a large concern that CCS could cause suffocation.
Water contamination concern	A dichotomous variable indicating whether respondents have a large concern that CCS could cause ground water contamination.
Economic benefit	A dichotomous variable indicating whether respondents think CCS would

	provide a important economic benefit to the surrounding community.
Individualistic	An 8 point index indicating the strength of respondents individualistic world view.
Hierarchical	An 8 point index indicating the strength of respondents hierarchical world view.
Egalitarian	An 8 point index indicating the strength of respondents egalitarian world view.

The empirical results presented in Table 2 suggest that the factors associated with support for proposed CCS facilities located “somewhere in the United States” largely differ from those related to the support of such facilities closer to respondents’ homes. Living in a coal producing region – where respondents are over three times more likely to have worked, or have a family member who has worked, in mining and coal industries¹ – and agreeing that climate change is a problem are associated with higher levels of expressed support for CCS in the U.S., but do not have a significant effect on attitudes towards its local placement. The concern that underground CO₂ storage will cause earthquakes decreases general support but does not impact local support, all else equal. Concern over groundwater contamination has the opposite effect: it decreases support for the placement of CCS storage facilities near respondents’ communities, but has no significant effect on support for facilities in the U.S. generally. All else equal, the belief that CCS will provide an economic benefit predicts increased support regardless of a facility’s proposed location, as does having a hierarchical worldview. Egalitarian and individualistic world views only significantly affect support for CCS near respondents’ communities, with the former significantly increasing support and the latter significantly decreasing it.

¹ Thirty-four percent of respondents who live in a coal producing region in Indiana have themselves or a family member worked in coal or mining. This falls to 10% when considering respondents who do not live in a coal producing part of the state.

Table II: Weighted Logit Assessing the Factors that Predict Support for CCS Facilities “Somewhere” in the USA and Near one’s Home or Community

	CCS in USA		CCS near Community	
	<i>Coeff.</i>	<i>Std. Error</i>	<i>Coeff.</i>	<i>Std. Error</i>
Gender	-0.068	(0.316)	0.263	(0.262)
Race	0.234	(0.553)	0.527	(0.417)
Age	-0.007	(0.008)	0.005	(0.007)
Income	-0.034	(0.141)	0.091	(0.107)
Home-owner	-0.434	(0.491)	0.118	(0.350)
Education	0.278	(0.359)	0.336	(0.349)
Liberal	-0.262	(0.471)	0.212	(0.350)
Coal region	0.546*	(0.315)	0.434	(0.271)
Rural	-0.423	(0.372)	-0.112	(0.305)
Climate change a problem	0.796**	(0.362)	0.412	(0.289)
Effectiveness concern	-0.125	(0.353)	-0.133	(0.281)
Expense concern	0.058	(0.308)	-0.143	(0.272)
Explosions concern	0.270	(0.628)	-0.660*	(0.365)
Earthquake concern	-1.153**	(0.487)	-0.305	(0.355)
Suffocation concern	-0.415	(0.513)	0.292	(0.421)
Water contamination concern	-0.198	(0.473)	-0.812**	(0.339)
Economic benefit	1.314***	(0.320)	1.556***	(0.253)
Indiana taxpayers/ratepayers	0.351	(0.380)	0.100	(0.305)
Individualistic	-0.203	(0.232)	-0.473**	(0.209)
Hierarchical	0.271**	(0.133)	0.268**	(0.114)
Egalitarian	0.004	(0.139)	0.197*	(0.115)
Constant	0.542	(1.175)	-1.876	(0.988)
	n = 806 F = 3.08 (0.000)		n = 797 F = 4.06 (0.000)	

As described previously, a NUMBY effect is witnessed when people show a free-rider preference by supporting a project in the abstract, and opposing it only if it occurs near their home.⁽⁴⁰⁾ The data reveal a modest free-rider preference for CCS: 779 of the respondents to this survey stated that they would support or strongly support the operation of a CCS facility on a geologically suitable site “somewhere in the U.S.” Of these respondents, 166 switch from support at the national level to opposition when the proposed site shifts to “near your home or community,” a 21.3% reduction in support. While 174 respondents oppose CCS in both

locations, it is only the former group – those who switched from support to opposition – that displays a NUMBY-like reaction (see Table 3).

Table III: Distribution of Support for CCS at Various Locations

	Support CCS near home		
Support CCS in the US	NO	YES	Total
NO	174	10	184
Yes	166*	613	779
Total	340	623	963
* Display a NUMBY-like reaction			

Table 4 presents descriptive statistics characterizing the relevant three groups of individuals: those who express opposition to the placement of a CCS facility, both in the general U.S. and near their own community; those who express support for a CCS facility in both locations; and those who exhibit NUMBY-ism and switch from support in the first case to opposition in the second. Compared to the individuals in the sample who consistently oppose CCS, those that display a NUMBY reaction and oppose it only when near their home or community have a lower average rate of homeownership, express a higher average belief that climate change is a problem and that CCS will provide an economic benefit. They also reflect a lower average concern that CCS will not be effective. Compared to those that express consistent support for CCS, the NUMBY group on average is again more female, has a lower household income, lower educational achievement, and expresses a higher average degree of concern about all of the expense, effectiveness and safety risks associated with CCS (significant at $\alpha = 0.05$).

Table IV: Descriptive statistics of Respondents Exhibiting Different Patterns of Support for CCS

	Consistent Opposition to CCS (n = 174)		Consistent Support of CCS (n=613)		Switch Support - NUMBY (n = 166)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gender	0.427	0.496	0.462	0.499	0.325*	0.469
Race	0.920	0.273	0.922	0.269	0.867	0.340
Age	59.70	15.20	56.81	17.52	57.23	19.23
Income	2.436	1.387	2.558	1.281	2.274*	1.165
Home-ownership	0.876	0.330	0.821	0.384	0.758^	0.429
Education	0.333	0.473	0.343	0.475	0.253*	0.436
Liberal	0.201	0.402	0.210	0.408	0.174	0.381
Coal region	0.247	0.433	0.330	0.470	0.277	0.449
Rural	0.183	0.389	0.166	0.373	0.181	0.386
Climate change problem	0.592	0.493	0.736	0.441	0.765^	0.425
Effectiveness concern	0.634	0.480	0.393	0.489	0.512*^	0.501
Expense concern	0.608	0.490	0.402	0.491	0.575*	0.496
Explosions concern	0.608	0.490	0.317	0.466	0.601*	0.491
Earthquake concern	0.561	0.497	0.275	0.447	0.540*	0.499
Suffocation concern	0.624	0.486	0.350	0.477	0.648*	0.479
Water contamination	0.715	0.453	0.364	0.482	0.673*	0.471
Economic benefit	0.180	0.386	0.623	0.485	0.430*^	0.497
Indiana taxpayers/ ratepayers	0.770	0.422	0.728	0.446	0.783	0.413
Individualistic	5.282	1.590	5.731	1.692	5.810^	1.624
Hierarchical	7.270	2.185	8.080	2.219	8.236^	2.069
Egalitarian	8.069	2.197	8.530	2.209	8.509	2.089

^ - mean of NUMBY group is significantly different from mean of opposition group at $\alpha = 0.05$
* - mean of NUMBY group is significantly different from mean of support group at $\alpha = 0.05$

Whereas the logit results in Table 2 separately show the factors that predict support for the operation of CCS facilities “somewhere” in the United States and near respondents’ homes or communities, Table 5 presents the results of a third logistic regression that focuses on the factors that influence individuals to *switch* from support to opposition as a proposed facility moves closer to their residence. Observations are restricted to the respondents who expressed support for CCS in the U.S., and the dichotomous dependent variable indicates NUMBY respondents. The individuals who express opposition to CCS anywhere in the U.S. are excluded from this analysis because it eliminates the possibility of displaying a NUMBY pattern.

The results suggest that being liberal, believing CCS will benefit the community economically, and having an egalitarian world view is associated with a reduced likelihood of displaying a NUMBY response, all else equal. On the other hand, concern about water

contamination and an individualistic world view are associated with a higher likelihood of NUMBY-ism.

Table V: Weighted Logit Assessing the Factors that Predict NUMBY Reactions for CCS

	<i>Coef.</i>	<i>Std. Err.</i>
Gender	-0.366	0.315
Race	-0.306	0.434
Age	-0.010	0.009
Income	-0.144	0.143
Home-ownership	-0.551	0.402
Education	-0.368	0.472
Liberal	-0.923**	0.423
Coal region	-0.467	0.344
Rural	0.018	0.402
Climate change problem	0.030	0.378
Effectiveness concern	-0.228	0.374
Expense concern	0.182	0.312
Explosions concern	0.517	0.454
Earthquake concern	0.264	0.411
Suffocation concern	-0.133	0.561
Water contamination concern	0.957**	0.462
Economic benefit	-1.159***	0.321
Indiana taxpayers/ ratepayers	0.491	0.392
Individualistic	0.386*	0.231
Hierarchical	-0.081	0.147
Egalitarian	-0.335***	0.124
Constant	1.215	1.203
	n = 652	
	F = 2.25 (0.001)	

5. DISCUSSION

Carbon Capture and Storage has the potential to serve as a bridging technology enabling the continued use of fossil fuels – without adding to the build-up of greenhouse gases in the atmosphere – until clean energy technologies advance sufficiently. This global benefit, however, is accompanied by local costs; namely, the risks and uncertainties that some communities will have to bear associated with being located near CCS facilities and underground CO₂ storage areas. Such scenarios of shared benefits and localized costs provide fertile ground for NUMBY-

like reactions where opposition to local placement can stall or stop project development. Indeed, this has already happened at several planned CCS locations in Europe.^(4,5)

The sample of Indiana residents who participated in this study was largely unaware of CCS prior to the survey. After being presented with a basic explanation of its purpose and functioning, however, over 80% expressed general support for CCS. A modest but notable NUMBY-reaction was observed, with over a fifth of the initial supporters changing to opposition when the hypothetical facility moved near respondents' communities. Because these views reflect relatively uniform preferences, they are likely highly malleable and could be influenced, either positively or negatively, by image building campaigns. The results presented in this paper thus represent a baseline assessment of Indiana residents' acceptance of CCS facilities.

Respondents' world views, or cultural biases, emerge as strong predictors of CCS support, opposition, and NUMBY-like reactions. This corresponds with Douglas and Wildavsky's (1982) hypothesis that people's perceptions of what does and does not pose risks reflects their preferred patterns of social relationships.⁽³⁸⁾ Individuals with a strong hierarchical worldview support the existing patterns of superior-subordinate relationships in society. Our results show that, all else equal, hierarchicalists express greater support of CCS both in general and when facilities are near one's home. This view thus does not contribute to NUMBY-ism. To the extent that a hierarchical world view indicates trust in established authorities (e.g. government and utilities) to ensure safety and effectiveness, this reflects the findings of previous CCS research, particularly in regard to nearby storage.⁽⁴¹⁾ The egalitarian world view does not significantly affect general CCS support and increases the likelihood of support for nearby facilities, making a NUMBY-like reaction less likely. Egalitarians place a high value on fairness and not accepting to personally take on the risks that they would bestow on others may be viewed as counter to this value. Finally, people holding a strong individualistic world view are significantly more likely to display a NUMBY sentiment, all else equal. This may reflect the high value individualists place on freedom and self-regulation^(38,39) and the fear that CCS may be "imposed" on their locale.

Demographic variables have minimal impact on respondents' attitudes towards CCS. However, political leanings and attitudes towards climate change show a modest impact, with

political liberalism predicting reduced NUMBYism and recognition of climate change as a problem associated with an increased general support of the technology.

The above findings about the worldviews and beliefs associated with CCS acceptance may prove practically useful when conducting social site characterizations for potential CCS facilities. However, respondents' perceptions about CCS's economic benefits and safety provide the more functional policy levers and communication "hooks". The strongest and most consistent predictor of support for CCS is individuals' belief that it will generate economic development. This belief increases support for facility placement both in the U.S. as a whole and near respondents' communities. It also reduces the likelihood that a NUMBY sentiment will be expressed. Indeed, when offsetting local benefits (e.g. jobs, tax revenue, economic stimulus) accompany undesirable land uses, they are often able to shift the majority position to favor local acceptance.⁽⁴²⁾ This suggests that if CCS proponents can ensure and communicate the incidence of local economic benefits, local acceptance will become much more likely.

Concerns about specific safety risks associated with CCS significantly reduce respondents' likelihood to support its development. Before proceeding with this discussion, however, it is important to point out that the questions used to generate the dependent variables that quantify CCS support in this study begin with the phrase "If experts determine there is a suitable site for underground CO₂ storage..." Thus, some degree of testing and safety is already implied in the question its-self. None-the-less, the perceived risks of water contamination and explosions emerge as the primary concerns which reduce the support expressed for local CCS facilities. Only concern about water contamination is a significant predictor of NUMBY, and it represents the single largest potential barrier to CCS acceptance among our sample of respondents. Interestingly, earthquakes are not a significant concern locally, but do reduce support for CCS nationally. The New Madrid fault line runs through Southern Indiana. However, it is relatively inactive and seismic activity in Indiana does not receive popular attention similar what is given to locations such as California. These distant but more familiar earthquake zones might anchor participants' responses and account for the finding that concerns about earthquakes reduce support for geographically distant CCS facilities, but not local ones.

Although our respondents are largely uninformed about CCS and these safety concerns are based more on assumption and fear than facts, they resonate with the public and are something that CCS opponents may capitalize on. It thus will be important for CCS proponents

to inform and assure the public of the technology's true risks, particularly as they concern water contamination.

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