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AND TECHNOLOGY

Public acceptance of CCS/CCUS technology in onshore areas in NW Poland

Dariusz Wojakowski (AGH University of Science and Technology),
Oluf Langhelle (University of Stavanger),
Mohsen Assadi (University of Stavanger),
Stanislaw Nagy (AGH University of Science and Technology)

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Aims of the research

The aim of the research on public acceptance of CCS/CCUS technology is to identify social awareness in terms of knowledge about technologies, social obstacles and potentials for that kind of acceptance.

The presentation also focuses on the application of new methodological solutions for this type of research by extending the field of quantitative research (from local to regional).

This paper presents such research implemented in western Poland, where a novel combination of CCS and UNGS technology is being experimentally developed within the AGaStor project.

Main topics in CCS's public acceptance research

As Tarkowski and Uliasz-Misiak note, one way that limits carbon dioxide emissions into the atmosphere is through capping, or sequestering CO₂ in the geosphere.

This process involves capturing carbon dioxide at industrial facilities, such as cement plants and gas-fired power plants, for example, and then placing it in geological reservoirs, or further use in manufacturing.

Recently, carbon storage has gained popularity as a possible technology that can have a positive impact on climate change mitigation.

Leaving aside the issues of technological solutions, it seems important to pay attention to the social context, more specifically the perception, i.e. the way carbon storage is perceived by the public.

CCS's public acceptance research in Poland

Identifying the socio-cultural contexts that determine the level of public acceptance of the CCS is possible in survey research by gathering knowledge about the demographic and social characteristics of respondents representing different views on the CCS and relating these views to other opinions. The first of these conditions is possible by using random sampling, as was the case in the two studies made in Poland. However, from the experience of the predecessors, it appears that a certain barrier to recognizing the influence of these factors (independent variables) is the very high percentage of people who have not encountered the term CCS, so, as Brunsting et al. recognized, they cannot be considered as bearers of specific views about this technology [Brunsting et. al. 2013].

This way of thinking seems ill-suited to the realities of today's world, where many beliefs are based on highly generalized stereotypes or even ignorance [Beck 2012]. That is, ignorance itself is an important context for social responses to technology [ibidem]. This is shown by the study of Kaiser et al. [2014], in which people who had not heard of the technology before were also asked about CCS. Despite this: "55% of the respondents had positive expectations of what CCS might bring to the area and only 18% thought that a CCS project would have a negative impact on the region".

Methodology of the research

Both the general principles of sociological research methodology [Babbie 2013] and the results of previous research on CCS PA in Poland indicate that survey research must be conducted on representative samples. This is primarily due to the fact that awareness of CCS technology is very limited in Poland. A research problem that has not yet appeared in such analyses is therefore not only the question of what people know about this technology, but also who has such knowledge?

The effective survey research preceding the collection of qualitative data should be conducted at least at the regional level. In the AGaStor project this type of survey was conducted in the whole West Pomeranian Province, which includes the local communities where the project is realized.

The second principle is the necessity to extend the questionnaire with world-view independent variables, such as: attitude to climate, state of environment or reception of the most important social problems. Generally, it means that the object of analysis should also include the value systems applied by the respondents [Ossowski 1967], which may influence the CCS PA as much as other conditions.

Methodology of the research

The AGaStor research has quantitative and representative character.

Sample is 695 adult respondents from Zachodniopomorskie, CAWI (Computer Assisted Web Interview) was made by survey company Ariadna in 15-22 September 2021.

We got 87 items for statistical analysis, which was made by SPSS Statistical Program.

The questionnaire contains 10 main questions and 12 independent variables.

Subjects of the questions: A/ Knowledge about UNGS, CDC and CCS - 3 one-item's questions; B/ CCS' acceptance: 2 questions - 14 items (indicators); C/ Risks and benefits connected with new technologies: 2 questions - 12 items; D/ NIMBY factor in CCS context: 1 question - 6 items; E/ System of values (pro-ecological worldview): 2 questions - 18 items; F/ Independent variables: demographic, economic, connected with the worldview: political orientation, religiousness, civic activism.



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Economic determinants of attitudes towards CCS and UNGS

Economic factors of the life quality and index of readiness to change the lifestyle

life quality: economic factors (stable employment, savings)

		to a very low degree	to a low degree	Moderately	to a high degree	to a very high degree	Total
index of readiness to change the lifestyle	definitely averse to greener lifestyle changes			0,6%		0,5%	0,3%
	rather averse to greener lifestyle changes		3,8%	1,8%	3,7%	3,2%	3,0%
	ambivalent	62,5%	53,8%	65,1%	35,1%	29,9%	41,7%
	rather eager for greener lifestyle changes	37,5%	23,1%	26,6%	45,4%	45,7%	40,0%
	definitely eager for greener lifestyle changes		19,2%	5,9%	15,9%	20,8%	15,0%
Total		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Economic determinants of attitudes towards CCS and UNGS

Acceptance for investments in new technologies beneficial to curbing climate change even if: They will provide specific economic and energy benefits to a given commune and county * life quality: economic factors (stable employment, savings)

economic factors (stable employment, savings)

life quality: economic factors (stable employment, savings)

		to a very low degree	to a low degree	moderately	to a high degree	to a very high degree	Total
acceptance for investments in new technologies beneficial to curbing climate change even if:	definitely no			3,0%	1,8%	1,8%	2,0%
They will provide specific economic and energy benefits to a given commune and county	rather no	12,5%	7,7%	7,1%	6,6%	5,0%	6,3%
	hard to say, I don't know	25,0%	46,2%	55,0%	32,1%	27,6%	36,7%
	rather yes	50,0%	42,3%	29,0%	50,2%	38,9%	41,2%
	definitely yes	12,5%	3,8%	5,9%	9,2%	26,7%	13,8%
Total		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Unawareness of the CCS technology as the social obstacle

Knowledge about CCS technology and place the residence (connection with industry)

associations: CO2 capture: the capture of CO2 emitted by industrial plants

size of the place of residence	no	yes	Total
village	65.7%	34.3%	100.0%
town up to 20 thousand of inhabitants	71.1%	28.9%	100.0%
city between 20 to 50 thousand of inhabitants	67.0%	33.0%	100.0%
city with more than 50 to 100 thousand of inhabitants	60.8%	39.2%	100.0%
city with more than 100 thousand of inhabitants	64.4%	35.6%	100.0%
Total	65.6%	34.4%	100.0%

Unawareness of the CCS technology as the social obstacle

Knowledge about
CCS technology
and place the
residence
(connection with
filters)

associations: CO2 capture: the
use of filters that capture CO2
from industrial production

size of the place of residence

	no	yes	Total
Village	61.6%	38.4%	100.0%
town up to 20 thousand of inhabitants	71.1%	28.9%	100.0%
city between 20 to 50 thousand of inhabitants	60.9%	39.1%	100.0%
city with more than 50 to 100 thousand of inhabitants	59.2%	40.8%	100.0%
city with more than 100 thousand of inhabitants	55.6%	44.4%	100.0%
Total	61.0%	39.0%	100.0%

Determinants of CCS public acceptance

Acceptance the local investments in new technology and the size of the place of residence (local benefits)

They will provide specific economic and energy benefits to a given commune and county

size of the place of residence	Definitely yes	Rather yes	Hard to say/I don't knowe	Rather no	Definitely no
Village	11.1%	39.4%	39.4%	7.1%	3.0%
town up to 20 thousand of inhabitants	11.1%	35.6%	43.0%	3.7%	6.7%
city between 20 to 50 thousand of inhabitants	14.8%	30.4%	42.6%	9.6%	2.6%
city with more than 50 to 100 thousand of inhabitants	16.2%	40.0%	37.7%	5.4%	0.8%
city with more than 100 thousand of inhabitants	15.7%	45.4%	28.2%	9.7%	0.9%
Total	14.1%	39.1%	36.8%	7.3%	2.6%

Determinants of CCS public acceptance

Acceptance the local investments in new technology and the size of the place of residence (local costs)

It will involve designating a part of the commune area you live in for investment

size of the place of residence	Definitely yes	Rather yes	Hard to say/I don't know	Rather no	Definitely no
	Village	5.1%	27.3%	52.5%	7.1%
town up to 20 thousand of inhabitants	7.4%	28.9%	44.4%	11.1%	8.1%
city between 20 to 50 thousand of inhabitants	12.2%	24.3%	40.0%	15.7%	7.8%
city with more than 50 to 100 thousand of inhabitants	6.9%	36.9%	40.0%	13.8%	2.3%
city with more than 100 thousand of inhabitants	6.5%	39.8%	38.0%	13.0%	2.8%
Total	7.5%	32.8%	42.0%	12.4%	5.3%

Determinants of CCS public acceptance

Agreement on
underground CO2
storage facilities and
size of the place of
residence (rejection of
a local investment)

agreement on underground CO2 storage facilities: Under no
circumstances would I want such technologies in my county,
even if they are safe

Size of the place of residence	Definitely yes	Rather yes	Hard to say	Rather no	Definitely no	To
Village	1.0%	10.1%	59.6%	25.3%	4.0%	100
town up to 20 thousand of inhabitants	3.0%	10.4%	57.0%	25.2%	4.4%	100
city between 20 to 50 thousand of inhabitants	4.3%	13.0%	54.8%	16.5%	11.3%	100
city with more than 50 to 100 thousand of inhabitants	4.6%	9.2%	52.3%	24.6%	9.2%	100
city with more than 100 thousand of inhabitants	3.2%	9.3%	54.2%	24.1%	9.3%	100
Total	3.3%	10.2%	55.3%	23.3%	7.9%	100

Determinants of CCS public acceptance

Agreement on
underground CO2
storage facilities and
size of the place of
residence (rejection
of a technology)

agreement on underground CO2 storage facilities: I believe
that any such technology is superfluous and should not be
invested in

size of the place of residence	Definitely	Rather	invested in		Definitely
	yes	yes	Hard to say	Rather no	no
Village	2.0%	5.1%	57.6%	23.2%	12.1%
town up to 20 thousand of inhabitants	2.2%	5.9%	55.6%	25.2%	11.1%
city between 20 to 50 thousand of inhabitants	3.5%	10.4%	47.0%	21.7%	17.4%
city with more than 50 to 100 thousand of inhabitants	3.8%	7.7%	50.8%	26.2%	11.5%
city with more than 100 thousand of inhabitants	0.9%	8.8%	52.3%	24.5%	13.4%
Total	2.3%	7.8%	52.5%	24.3%	13.1%

Conclusions

The main conclusion from the AGaStor research is that both the potential for trust and distrust in CCS and UNGS technologies in the West Pomeranian region is lack of knowledge about these technologies.

Only 19 % of respondents declare that they know something about CCS and 23 % have small knowledge about UNGS.

Therefore, the first recommendation is to identify in the qualitative research possible mechanisms of transferring popular knowledge about CCS and UNGS technologies.

The survey shows the specific potential of existence the „Not in my backyard” problem in medium towns, but there is no important statistical correlation between the NIMBY factors and the place of residence. By contrast, in rural areas and small towns there is more uncertainty than aversion to new technologies, implying a kind of silent NIMBY potential.

Conclusions

Generally, many worldview's elements strength the positive reception of new technologies, also those, which relate to a storage some natural substances.

Positively correlates with the acceptance of such technologies are attitudes focused the existence of material/economic values and scientific/pro-technological values which almost always notice the strongest correlation with such attitudes.

On the other hand the research shows there is no statistical correlation between pro-climate attitudes and public acceptance of CCS.



Thank you

wojakowski@agh.edu.pl;