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## **What drives local public acceptance – comparing two cases from Germany**

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### **Abstract**

Local projects on carbon storage that have been started in Germany in recent years have induced positive to neutral reactions as well as strong opposition by the local public. In this paper, a comparative case study of two storage projects is presented: The first case under study is the CO<sub>2</sub>Sink research project at Ketzin which has started to inject CO<sub>2</sub> in 2008 and has been well accepted by local politicians and the local public. It is compared to a project initiated by Vattenfall at Beeskow where Vattenfall wants to explore whether the region is suitable for large scale commercial on shore storage and has already met strong local opposition by several societal stakeholders. Cases are compared regarding project properties, communication strategies and public perception, as well as local context and history in order to identify factors that contributed to the respective positive or negative reaction.

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### **1. Introduction**

Carbon capture and storage (CCS) is increasingly discussed as a feasible and maybe necessary option to mitigate climate change – at least from the perspective of actors from industry, politics, and science. In the general public, awareness of and knowledge on CCS is still low: A survey for Germany in 2009 showed that only 4 % of 1000 respondents indicated to know the term CCS. However, local projects on carbon storage that have been started in Germany in recent years have induced positive to neutral reactions as well as strong opposition by the local public. In this paper, two storage projects are analyzed systematically using a case study design: The first case is the CO<sub>2</sub>Sink research project at Ketzin which has started to inject CO<sub>2</sub> in 2008 and has been positively embraced by local politicians and the local public. It is compared to a project initiated by Vattenfall around Beeskow where Vattenfall applied for an exploration permit to find out whether the region is suitable for large scale commercial on shore storage. Announcing that the company intends to do exploration work has been met by strong local opposition by several societal stakeholders. As of today (August 2010), Vattenfall has formally fulfilled all conditions to start the exploration, however has not started yet, at least in part due to the ongoing protests.

It is the aim of this paper, to analyze and compare both cases in detail regarding (1) project properties, (2) communication strategies and public perception, as well as (3) local context and history in order to identify factors

that contributed to the respective positive or negative reaction. The data for the case study analyzed in this paper was collected in August-October 2009; where necessary and possible, it will also be referred to more recent events.

The paper starts with a short overview on CCS in Germany and a discussion of public acceptance for the two cases under study; next the research methodology is presented and the results of data analyses focusing on the three aspects mentioned in the previous paragraph. At the end, after shortly summarizing and discussing the main results conclusions are drawn for public acceptance of CCS.

## 2. Background: CCS in Germany

Backed by the federal government as well as the German *Bundesländer*, several CCS projects have been initiated over the past few years. The federal government is financially supporting two projects on carbon storage, CO<sub>2</sub>Sink at Ketzin, described in detail below, and the CLEAN-project (Altmark, Sachsen-Anhalt), which investigates the storage of CO<sub>2</sub> in a nearly depleted natural gas field. Up to now, the research projects have been well accepted by local residents. From industry, Vattenfall, RWE and eon are currently each running a pilot plant for carbon capture technology, and fourth one is currently constructed by eon. A demonstration plant is planned by Vattenfall at Jämschalde. The industry has also started to look for storage sites. While RWE is concentrating its search in Schleswig-Holstein, in northern Germany, Vattenfall is looking in Brandenburg, eastern Germany, in the area around Beeskow – analyzed in detail below – and in the Oderbruch (next to Beeskow). These explorations of possible storage sites by industry have been met by strong public resistance. In spring 2010, RWE have stopped their activities in Schleswig-Holstein, at least in part, due to public protests.

Germany does not yet have legislation on CCS, i.e. Directive 2009/31/EC has not been transposed into national law. The former government (the grand coalition by CDU/CSU and SPD, i.e. the conservative and the socialist party) developed a bill to fill this gap which was supposed to pass the parliament in the end of June 2009. Due to the upcoming elections in September 2009 and increasing protests against CCS-storage, e.g. in Schleswig-Holstein, the bill was postponed. A revised version has been presented for discussion by the new government (CDU/CSU and FDP, i.e. the conservative party and the liberals) in July 2010. This new version limits CCS to research and demonstration projects and includes an evaluation and revision process of CCS for 2017.

Thus, at the moment, for building and operating CCS facilities, many different laws might apply.[1,2] Some experts assume that it would not be possible to integrate CCS technology into a commercial power plant due to legislative boundaries. Generally, experts agree that the current legislation does not allow a large-scale commercial storage site to be operated. [2]

Awareness of and knowledge on CCS are low in Germany. In a study from spring 2009 only 4 % of 1000 respondents stated to know the term CCS. [3] In a survey in winter 2009 over 60 % of respondents still indicated, that they had never heard of CCS, about 30 % said, they had heard ‘a little bit’. [4] Thus, in spite of local discussions around CCS-projects and communication efforts by the industry and lobby organizations, a lot of people still have never heard of CCS. Thus, it is difficult to estimate levels of public acceptance. Regarding power generation, similar to other European countries, people in Germany prefer renewable energy sources to fossil sources and nuclear energy. [5]

On a local level, awareness of CCS is certainly higher and local projects have been widely discussed. The two CCS-projects from Germany analyzed in this paper provide contrasting examples in terms of public acceptance. At Ketzin, the CCS-storage is accepted by the local public – or at least quietly tolerated. No public protests have been documented by the media so far and local politicians, e.g. including the mayor of Ketzin, openly welcomed the project. However, the planned storage sites by Vattenfall have met strong local resistance – in Beeskow as well as in the Oderbruch, the second area selected for exploration situated next to Beeskow. Politicians from all political parties have declared opposition, several of them in open dissent with the official position of their respective party (e.g. members of the conservative party CDU). The protest of local citizens emerged shortly after the announcement

of the project. Local action groups were founded who quickly developed internet sites, put up posters all over the area and organized protest events. These groups have been active until today. Opposition of these groups is fundamental – their aim is to block CCS in general, of course, especially in their home region. Local councils voted against the project and officially registered their opposition at the LBGR as the permitting authority; several other societal stakeholders have declared their opposition to the project as well, e.g. farmer associations. It is impossible to provide estimates about exact numbers about opponents, proponents and neutral / disinterested people living in the area; however, it is obvious that up to now carbon storage has not found public support in this area.

### 3. Methodology: Data collection

Information on the cases was collected through internet sources, e.g. project web sites, internet sites of opponents, and media archives, mainly from local newspaper. Furthermore relevant paper documents were accumulated as well, e.g. brochures issued by Vattenfall, material used by local action groups. Data collection was further complemented by visits to Beeskow and Ketzin, including e.g. the Vattenfall information center and touring the CO<sub>2</sub>Sink project site.

Additionally, 13 in-depth interviews were conducted with relevant stakeholders. Interview-partners thus include representatives of the respective project developer (GFZ, Vattenfall), the authority responsible for granting the project permit (in both cases LBGR Brandenburg), local authorities, local stakeholders, e.g. from citizen associations, and opponents. Interviews were semi-structured, following an interview guideline that was in each case adapted to the respective interview partner.

### 4. Project properties

Table 1 summarizes basic information about project properties. Both projects are located in the German state (*Bundesland*) of Brandenburg in Eastern Germany and within 100 km of Berlin – further information on Beeskow and Ketzin is provided in section 6.

Table 1 Overview over project properties.

<i>CO<sub>2</sub>Sink, Ketzin</i>	<i>Vattenfall, Beeskow</i>
<i>Aim of the project</i> The scientific research project focuses on observation and analysis of the effects of injecting CO <sub>2</sub> into a reservoir.	To explore whether the area underground around Beeskow is suitable to store CO <sub>2</sub> from power plants and industry on a commercial scale.
<i>Project developer and support</i> The project is coordinated by the GFZ, German Research Centre for Geosciences. The site is operated and owned by the <i>Verbundnetz Gas</i> (VNG). On the scientific side, numerous research institutions and universities from several countries are part of the consortium as well as the IEA and representatives from industry.	The exploration was initiated and is being led by Vattenfall; however, it is also being backed by the government of Brandenburg and is in line with the energy concept of the <i>Bundesland</i> . Vattenfall has successfully applied for subsidies by the European Union (see below).
<i>Status</i> The CO <sub>2</sub> Sink project started in April 2004. The injection of CO <sub>2</sub> started on June 30th 2008. Up to October 18th 2009, 23,411 tons of CO <sub>2</sub> had been injected into the underground aquifer. The GFZ is trying to extend the funding and duration of the project.	In March, 2009, Vattenfall submitted its application for a permit to explore for brine. However, it was openly stated from the beginning, that the aim is to examine whether the area is suitable for carbon storage. An outright refusal of the application would only have been possible if serious factual objections

were raised. After completion of the case study, the permit was provided and the necessary formal steps are now completed, i.e. Vattenfall could start the exploration work today.

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#### *Funding*

The CO<sub>2</sub>Sink project is funded by the EU Commission, the Federal Ministry of Economics and Technology (BMW<sub>i</sub>), the Federal Ministry of Education and Research (BMBF) and to a minor degree by industry.

The enterprise is funded by Vattenfall. After completion of the case study, it was announced that Vattenfall will receive 180 million € from the European Energy Programme for Recovery of the European Union for CCS-projects in Germany including storage around Beeskow.

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## **5. Communication to the public and public perception**

### *Communication strategy*

The Ketzin-project uses a site formerly used to operate a reservoir for natural gas. Thus, it was only necessary to apply for an official adaptation of the existing permit – held by VNG - for the research project. Public participation was not necessary but the community and the public were informed about the project during the planning stage.

Furthermore, at Ketzin, the mayor claims to have been actively looking for an energy-related utilization of the former gas reservoir site that is now used in the CO<sub>2</sub>Sink-project. Thus, from the first stages of planning the project, officials from the community were involved.

Once the CO<sub>2</sub>Sink-project at Ketzin obtained funding for the project, it was presented in detail to the town council and the public. This initial information event was followed by several other presentations regarding the progress of the project either in Ketzin or directly at the research site. Public interest in project presentations fluctuated over time. E.g. it was higher when it became clear that the CO<sub>2</sub> would have to be transported to the research site by truck. However, this issue has been able to be resolved due to the expected low number of trucks per day. On-site presentations usually enjoyed greater public interest and were partially conducted in cooperation with local clubs (e.g. catering provided by the local fire brigade). Information about the project is constantly available on a website provided by the GFZ. However, the site is not directed at the local general public (only in English, technical language, no regular updates). Tours of the site are offered by the GFZ by appointment and are often fully booked for weeks in advance by scientists, industry representatives, politicians, NGOs as well as local citizens even though they are not promoted very actively.

The Ketzin project is regularly covered by local as well as the national press. Press conferences were held, e.g. at the beginning of the injection. Due to the innovativeness of the project, some international media also reported about the project. Newspapers from other German regions that are also affected by CCS-projects contacted the GFZ as well and brought articles about the project. The general tone of the media coverage is neutral and factual, concentrating on project descriptions.

The exploration around Beeskow is to be performed under mining law, and builds on existing regulations for exploring brine as CCS and carbon storage are not regulated by German legislation. To explore saline aquifers for brine, public participation is not obligatory by law. It is sufficient to inform and hear the authorities affected by the enterprise, e.g. environmental authorities. Although it was not obligatory, all affected municipalities were invited to make statements as well. Project communication always stated that the aim of the project is to assess the suitability of the underground area for the storage of CO<sub>2</sub>.

The government of Brandenburg had been informed about the project in advance of the public announcement and had been involved in preparing the project together with Vattenfall for several months including the development of

a communication strategy. Community representatives, i.e. mayors, were informed in person by Vattenfall representatives one day prior to a press conference that announced Vattenfall's plans shortly before the application for the exploration permit was submitted at the end of March 2009.

At Beeskow, besides press conferences as mentioned above, all the households in the area concerned as well as relevant stakeholders, e.g. members of the parliament, church representatives, received information about the project via mail. While Vattenfall states that this was successfully managed, interview partners from the opponents disagree. After the official announcement, Vattenfall began a series of public events at which further information on the project was presented and questions could be asked. Additionally, Vattenfall actively contacted e.g. schools and clubs and offered to provide information. In July 2009, Vattenfall set up an information office at Beeskow, which opens twice a week. Visitors are given information about global warming, underground storage of CO<sub>2</sub>, a description of saline aquifers and general information on CO<sub>2</sub> (e.g. usage, occurrence) as well as a detailed map of the exploration area. Additionally, Vattenfall provides a comprehensive internet site on the topic, which includes general data on CCS, films and animations, as well as information about local projects. A regularly updated brochure can be downloaded featuring answers to questions raised by the public. A free telephone hotline to get information and ask questions is offered as well. As mentioned above, from the very beginning, the project was covered by the media. Opponents successfully voiced their resistance to Vattenfall's plans in the media as well. Media interest in the project has continuously been rising since March 2009. Locally and regionally, it was especially high during the election campaigns in summer 2009 when several groups declared their opposition. The project and resistance to it has occasionally been covered by nationwide media as well as internationally.

#### *Public perceptions*

Based on the interviews, it can be concluded that the inhabitants of Ketzin feel sufficiently informed about the CO<sub>2</sub>Sink-project. However, the perception is less positive for the Vattenfall project at Beeskow. Opponents claim to have learned about the project with some delay and that the information provided was not exhaustive. Generally, the arguments presented by Vattenfall regarding the technology are seen as being too positive, e.g. excluding knowledge gaps regarding the technology and downplaying safety issues.

For both projects, interview-partners report that members of the public have reservations about the technology, e.g. that CO<sub>2</sub> may be toxic or not being fully confident whether it is possible to handle the complexity of storing a substance deep underground. In both areas, people are aware that the technology is not fully developed and still implies several unknowns.

In Ketzin, the public feels safe due to the minor quantities injected and the fact that the project would have to be stopped in case of leakages. The researchers from GFZ are trusted by the public and by community representatives.

At Beeskow, the public discussion is strongly related to potential risks of CO<sub>2</sub> storage. These include concerns that leakages will occur, possibly causing fatal accidents, the problem of controlling or removing the carbon once storage has started and ground water contamination e.g. by salt from the saline aquifer. Furthermore, opponents are afraid of negative impacts on the real estate market as well as on tourism and also argue that investments in CCS reduce possible investment in renewables. Furthermore, opponents are afraid that Vattenfall will not openly share the results of the exploration work as Vattenfall benefits from a positive result.

## **6. Local context and history**

The storage site at Ketzin is situated about two km from Ketzin. Ketzin is about 20 km from Potsdam and about 70 km West of Berlin. The community includes the town of Ketzin as well as the villages of Etzin, Falkenrehde, Tremmen and Zachow and has overall about 6500 inhabitants. Ketzin has a long history connected to gas. 110 years ago a facility was built to produce town gas. [6] Later, when Ketzin was connected to a natural gas pipeline, an underground reservoir to stock natural gas was installed at the site now used by the CO<sub>2</sub>Sink-project. During installation of the gas reservoir some leakages occurred, probably at the drilling holes, and a small village,

Knoblauch, had to be relocated in 1965. The inhabitants were offered new houses and apartments in Ketzin. [7] The gas reservoir was closed in 2004. Near the CO<sub>2</sub>Sink site, the community has installed a biomass plant and is planning a photovoltaic field (“Reenergipark Ketzin”). The community is also equipped with wind turbines. Ketzin would like to encourage tourism in their region. Regarding the CCS-project, the community feels that they are benefitting from the project as the CO<sub>2</sub>Sink-project has attracted visitors from all over the country and the whole world and visitors often stay at Ketzin for the night or at least for a meal.

It was repeatedly stated during the interviews that acceptance for the CO<sub>2</sub>Sink-project is high because Ketzin has a history of storing gas and local people are therefore familiar with the technology. This seems to be a contradictory to the fact that the relocation of a village was necessary during the installation of the gas reservoir. With hindsight, even this fact is seen as a reason why acceptance is high: It is claimed that people from Ketzin have experienced the downside of gas storage and how to deal with it – and are therefore less afraid.

The storage site from the Vattenfall project lies around the town of Beeskow. About ten more villages are situated above the storage site and about 50 villages within the area for exploration work. Beeskow has roughly 8000 inhabitants is situated about 80 km south-east of Berlin. Industry does not play a significant role in the local infrastructure and bigger cities are several km away, i.e. it is a mainly rural area. The communities are trying to enhance tourism in the region, which has a beautiful landscape covered by forests and including several small lakes and rivers. Over the past few years, the local council of Beeskow has invested in renovating the historical town centre.

The region is described by several interview partners as special because it has been left undisturbed on a grand scale and is not densely populated. They claim that those who live there have strong ties to the area and that those with weaker ties have already moved to other regions – due to the better chances for employment elsewhere. At the same time, several individuals have moved into the area from Berlin and other parts of Germany in order to live closer to nature. There is a general perception that these people are especially engaged in resisting CCS

## **7. Discussion and conclusion**

The cases are similar in many aspects: Both projects are about storing CO<sub>2</sub> in an underground site. They are located in the same area of Germany, in the federal state of Brandenburg in a distance of 80 to 150 km from Berlin; the respective regions are rural and do not have local industries producing CO<sub>2</sub> on a large scale. In both cases, the project developers have tried to comprehensively inform the local public about the projects at an early stage using different channels, e.g. information meetings, web pages, informal contacts. However, there are slight, but maybe important differences: In the case of Vattenfall / Beeskow, the affected communities first learned about the project when it was already decided to go for an exploration permit in their area while in Ketzin community representatives have been involved before any activities had started. Regarding the communication strategy, it is Vattenfall who as the project developer at Beeskow has provided more and more professional information material about their plans than the GFZ at Ketzin.

Furthermore the two projects have different properties on dimensions that were seen as being related to public acceptance in the interviews: Project scale turned out to be an important factor – interview participants from Ketzin hypothesized that their might have been resistance to the project if it had been of commercial size. An additional difference arises from the local history: Citizens of Ketzin are used to underground storage as the site now used by the research project was formerly used for the storage of natural gas. However, no similar project has existed at Beeskow.

The role of the project developer is crucial for public perception: While the project in Ketzin is run by scientists, the exploration project at Beeskow is advanced by a member of the energy industry. Whereas GFZ as the research institution running CO<sub>2</sub>Sink is regarded as trustworthy as they do not benefit from the project on economic terms, Vattenfall is not trusted. Trust in large scale energy providers regarding societal and ecological responsibility is

generally limited in Germany. Recent affairs, e.g. around nuclear waste storage, have contributed to enhance distrust by the general public. Additionally, Vattenfall has the problematic double role of being the one benefitting from the project and at the same time being the main source of information for a public that has little prior knowledge on CCS. Accordingly, opponents stated that they perceive the information provided on the project as biased. In sum, this lowers the chances for Vattenfall to induce an open discussion of the topic which is needed as a basis for the development of local acceptance for carbon storage.

It can be concluded from this, that – if a society wants to include CCS as a part of its energy strategy – this also needs to be supported by several stakeholders in order to convince people on a local level that it is worthwhile to take the risk of living above / near a storage site. This societal support includes political support for industry activities, scientific research and transparent presentation of data and state of knowledge as well as compensation measures for storage regions.

Communication strategies on CCS should refer to risks and advantages as well as the current state of knowledge – openly and via trusted channels. At the same time, it is necessary that decision strategies about sites are transparent, e.g. through establishing boards that include members from the industry, from the competent authorities as well as the local public. It may be helpful, if local communities have the possibility to have an influence on the decision that is taken at the end – and are not only receivers of information. However, the local public may still develop negative attitudes towards CO<sub>2</sub>-storage as there is always uncertainty related to it.

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