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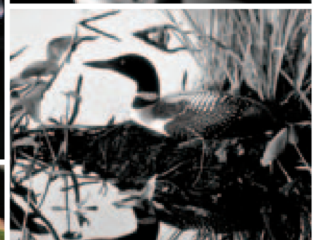
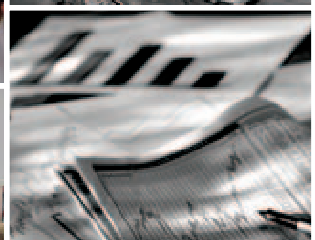
CCS AND COMMUNITY ENGAGEMENT










Guidelines for Community Engagement in Carbon Dioxide Capture, Transport, and Storage Projects

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Acknowledgments

This publication is the collective product of a carbon dioxide capture and storage (CCS) stakeholder process convened by the World Resources Institute (WRI) between April 2009 and October 2010. The unique perspectives and expertise that each participant brought to the process were invaluable to ensuring the development of a robust and broadly accepted set of community engagement guidelines for CCS. In addition to the insights provided by the stakeholders, additional perspectives were added through the peer review.

We would like to thank each of the stakeholders (listed on the inside front cover of this report) for generously contributing their time and expertise to this effort, as well as the WRI peer reviewers (Phil Angell, Stephanie Hanson, Kirk Herbertson, Lalanath de Silva, and Jake Werksman) and the external peer reviewers (Peta Ashworth, Albane Gaspard, Andrew Gilder, Krist Hetland, Kai Lima, Tezza Napitupulu, Willy Ritch, Ethan Schutt, Walter Simpson, Tony Surridge, and Catherine Trinh) for their thoughtful review of the document prior to publication.

This report would not have been produced without the leadership of WRI Climate and Energy Program Director Jennifer Morgan, and the authors and editors who demonstrated outstanding commitment and diligence throughout the process. This work and the stakeholder process also benefited substantially from the strategic insights and reviews of WRI staff members Ruth Greenspan Bell and Janet Ranganathan. We are thankful for the early contributions to this initiative by former WRI staff members Debbie Boger, Holly Elwell, Alex Grais, Jennie Hommel, Jennifer Layke, Yue Liu, Suejung Shin, and Preeti Verma. We are thankful to the many WRI staff who helped this process run smoothly in many ways, notably Hyacinth Billings, Stacy Kotorac, Kevin Lustig, Ashleigh Rich, and Oretta Tarkhani. We are also grateful to Polly Ghazi, Emily Krieger and Alston Taggart for their careful editing, copyediting, and design work.

Lastly, but importantly, WRI would like to thank Robertson Foundation, Energy Foundation, and United Kingdom Foreign and Commonwealth Office for their financial support.

Disclaimer

This report was designed to provide guidance to CCS project developers, regulators, and local communities as they engage in discussions regarding potential CCS projects. The report has been developed through a diverse multistakeholder consultative process involving representatives from business, nongovernmental organizations, government, academia, local economic development bodies, and other backgrounds. While WRI encourages the use of the information in this report, its application and the preparation and publication of documents based on it are the full responsibility of its users. Neither WRI nor the individuals who contributed to the report assume responsibility for any consequences or damages resulting directly or indirectly from their use and application.

The Guidelines reflect the collective agreement of the contributing stakeholders, who offered strategic insights, provided extensive comments on multiple iterations of draft guidelines and technical guidance, and participated in several workshops and conference calls. The authors and editors strived to incorporate these sometimes diverse views. In so doing, they weighed conflicting comments to develop guidelines that best reflect the views of the group as a whole, and acknowledged diverging opinions among stakeholders. Although the Guidelines reflect the collective input of the contributing stakeholders, individual stakeholders were not asked to endorse them. The identification of the individual stakeholders should not be interpreted as, and does not constitute, an endorsement of the Guidelines by any of the listed stakeholders or their organizations.

Guidelines for Community Engagement in Carbon Dioxide Capture, Transport, and Storage Projects

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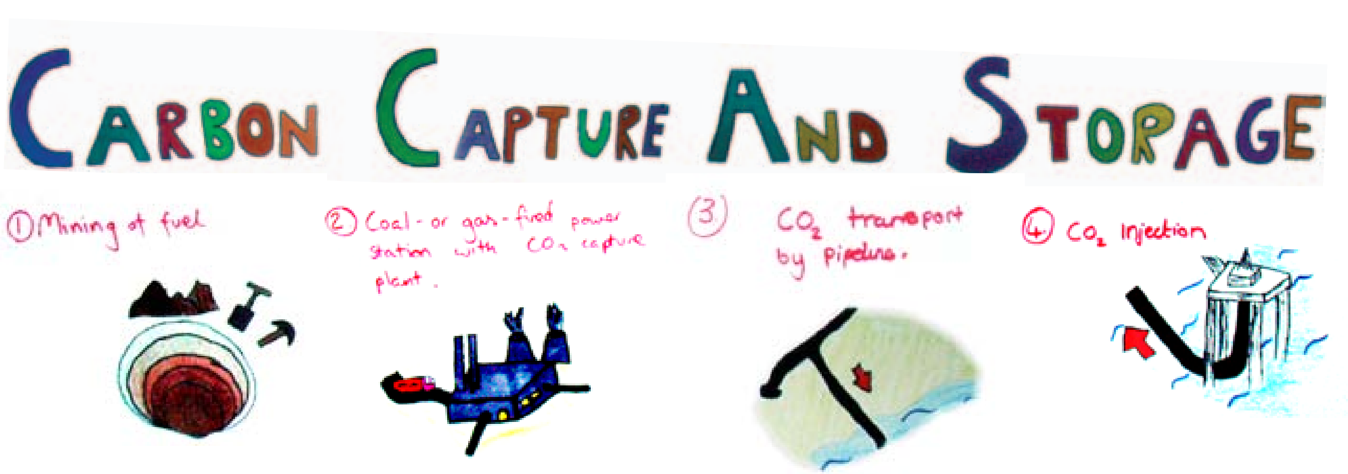
Chapter 5: Supplementary Information



Rendition of the CCS process chain by a student from Linlithgow Academy, Scotland (another student illustration is located on page 37).

Foreword

There is no single quick fix or technological silver bullet that will reduce the greenhouse gas emissions that are altering the Earth's climate. Rather, a range of technologies and strategies will need to be employed to keep global temperature rise below the 2.7 degrees Fahrenheit danger threshold identified by scientists.

Some of these solutions (think energy efficiency or wind and solar power) are tried and tested, but need scaling up; others are emerging and not yet commercially available, but offer great potential. Carbon dioxide capture and storage or CCS falls into the latter group. A suite of technologies that together can be used to sequester carbon dioxide greenhouse gas emissions from power stations and other major industrial sources, CCS is now moving from demonstration projects to commercial scale pilots.

Most credible analyses project a key role for CCS as a bridging technology between today's fossil fuel–based global economy and the low carbon societies of tomorrow. To be effective in helping contain global emissions, however, CCS deployment would need to accelerate dramatically over the next three decades, which is where community engagement, the subject of this report, comes in.

As an emerging technology which involves injecting carbon dioxide into geologic formations, CCS has drawn wary reactions from some communities around the world where demonstration projects have been sited or proposed. Too often, the reaction from regulators, project developers and local authorities has been to view public opinion and local communities as a barrier to technology deployment. This report takes the opposite tack: it starts from the position that project developers and regulators should treat host communities as partners whose questions and concerns can improve the project and who should be consulted in the design, development and operation of CCS projects on their doorstep.

To be clear, this report does not aim to make a case for or against CCS. Instead, it outlines how local communities can help shape decisionmaking around CCS projects, and in so doing build wider public support for the emerging technology.

The report builds on WRI's previous consensus-building stakeholder effort, which resulted in the publication of the *Guidelines for Carbon Dioxide Capture, Transport, and Storage*, a technical guide for CCS projects. This complementary publication is the product of the collective experience and best thinking of more than 90 experts and stakeholders involved in CCS across the world, including academics, project developers, regulators, nongovernmental organizations and community groups.

The resulting conclusions are intended to serve as international guidelines for regulators, local decisionmakers (including community leaders, citizens, local advocacy groups, and landowners) and project developers as they plan and seek to implement CCS projects. The guidelines will be road tested with CCS projects in the field, and the experience gained integrated into a revised edition of globally-applicable best practices.

Whether CCS will be viable at commercial scale is yet to be proven. Without public buy-in, however, the chances are slim that the technology will be deployed at meaningful scales for climate change mitigation. Transparency and consultation are prerequisites for this buy-in.

WRI hopes this report will provide a basis for best practice engagement on CCS projects worldwide, which will help enable the public to judge the technology on its own merits.

Jonathan Lash

Jonathan Lash
President, World Resources Institute

CCS COMMUNITY ENGAGEMENT GUIDELINES: OUR PROCESS

This World Resources Institute (WRI) report provides guidelines for local community engagement and public involvement in carbon dioxide capture and storage (CCS) projects. The report does not aim to make a case for or against CCS. Instead, it outlines how local communities, particularly those living or working near a potential carbon dioxide (CO_2) storage site, should be included alongside project developers and regulators as key parties in any proposed CCS project, and how such communities can proactively help shape engagement and decisionmaking processes.

The Guidelines is the product of a stakeholder process convened by WRI and is based on the participants' collective experience, as well as the latest developments in CCS research and deployment efforts. The Guidelines proposes how to effectively engage local communities during CCS project planning, development, operation, and long-term stewardship. The Guidelines will be road tested in real-life CCS projects, and the experience gained will be integrated into a revised edition of globally-applicable best practices for CCS projects.

Stakeholder Group: Contributors to the Guidelines have experience studying and practicing community engagement for CCS projects in different countries and provide a range of perspectives. The group includes academics, project developers, governance experts, representatives from utility and fossil energy companies, public servants involved in both policymaking and regulation, community representatives, scientists, and nongovernmental organization (NGO) representatives. Most contributors' names and organizational affiliations are listed on the inside front cover. Some stakeholders requested that their names be withheld, as they were not officially authorized to contribute by their respective organizations (notably regulators from governmental agencies involved with CCS). Such contributions were still fully considered and appreciated.

It is important to note, however, that it is challenging to create a perfectly balanced stakeholder group. In relation to CCS, particular difficulties included reflecting the voices of those so opposed to the technology that they would rather not join the discussion, and those who might only speak out if a CCS project were actually proposed in their specific communities. Finally, it is difficult to convene a geographically balanced set of stakeholders that would both enhance and inform the Guidelines. WRI's approach to dealing with these challenges was to introduce missing perspectives in a rigorous peer-review process that followed the stakeholder deliberations. The peer-review group included external experts both in support of and in opposition to CCS as a technology, leaders of local opposition to real CCS projects, and experts and public servants from countries currently considering CCS regulations and research endeavors.

Approach: The Guidelines avoids providing a step-by-step methodology for community engagement because each CCS project and community is unique and requires an engagement process tailored to suit site-specific needs.

The Guidelines primarily focuses on the aspects related to the CO_2 storage phase of CCS, such as very long time horizons, rights to subsurface usage, and the potential impacts on local communities from CO_2 injection, from both a technical and a socioeconomic perspective. This approach aims to shed light on some of the unique needs for public engagement on CCS, as the stakeholders found that engagement around capture and transport is generally similar to that which already occurs for other power, industrial, and infrastructure installations. However, all phases of a project will need to be taken into consideration as these principles are put into practice in communities. For example, the source of CO_2 for a proposed storage project may significantly influence the way the project is perceived by the host community: a project that intends to build a new coal-fired power plant as the source of CO_2 may be viewed very differently by a community than a project that intends to retrofit an existing plant.

The Guidelines builds on WRI's previous 2-year consensus-building stakeholder effort, which resulted in the publication of the *Guidelines for Carbon Dioxide Capture, Transport, and Storage,* a technical guide for how to responsibly proceed with CCS projects.[1] Although this report includes a brief overview of CCS, readers should consult the technical guidelines for detailed information on CCS technology and its use. The guidelines presented here also draw on and adapt WRI's research on community engagement related to extractive industries in developing countries, which identified seven principles for effective community engagement:[2]

1. Prepare communities before engaging.
2. Determine what level of engagement is needed.
3. Integrate community engagement into each phase of the project cycle.
4. Include traditionally excluded stakeholders.
5. Gain free, prior, and informed consent.
6. Resolve community grievances through dialogue.
7. Promote participatory monitoring by local communities.

The stakeholders have made an effort to focus on general, transferable principles for community engagement and participation as opposed to focusing on any specific existing regulatory scheme.

Audience and Objective: Groups and parties that may be engaged in the decision-making process for CCS projects encompass governments, national environmental groups, various project developers, CCS researchers, and other stakeholders. However, this report focuses on local community engagement, with the *local community* defined as the collection of citizens of one or more towns/cities/counties living near a project who may potentially be directly affected by one or more of its components. Engagement with nonlocal parties, while also important, lies outside the scope of this effort.

The Guidelines provides practical recommendations for integrating local input and involvement into potential CCS projects. Communities not only have a right to be included, but their engagement is also important to the successful deployment of CCS as a climate mitigation strategy at a large scale. Experience has shown that insufficient community involvement can hinder CCS deployment. Not all proposed CCS projects will move forward, and many will be opposed by local communities for valid reasons. Thus, realizing the public-good potential of CCS-generated climate mitigation will require establishing trusting, respectful, and stable relationships among project developers, regulators, and local communities.

Because of the evolving debate and experience surrounding CCS and the unique nature of each local community and CCS project, the Guidelines stops short of defining a decisionmaking process to determine whether specific CCS projects should proceed. Instead, the Guidelines aims to strengthen the underlying process so that the community, developers, and regulators are all effectively represented in the decisionmaking.

Likewise, while the guidelines support the seven WRI engagement principles outlined above, they do not explicitly prescribe any binding dispute settlement procedures or formally endorse Free, Prior, and Informed Consent (FPIC) in a CCS context (see box on page 39). These decisions stem from the stakeholder process, and do not reflect a change in WRI's stance on governance issues.

EXECUTIVE SUMMARY

CCS and Climate Change Mitigation

Carbon dioxide capture and storage (CCS) encompasses a suite of existing and emerging technologies for capture, transport, and storage of carbon dioxide (CO_2) that together can be used to reduce the greenhouse gas emissions from fossil fuel power generation and other industrial sources. Achieving cuts in energy-related CO_2 emissions is critical to avoiding more than a 1.5 degree Celsius (°C) (2.7 degree Fahrenheit [° F]) rise in global temperatures by 2050 and the irreversible and damaging impacts such a temperature rise would have on people and ecosystems.[3] The scale of the climate change challenge requires a portfolio of clean energy technologies and energy efficiency efforts, and most credible analyses project that CCS will have to play a substantial role in achieving the necessary emissions reductions (see Appendix 3).

CCS has been tested at a small scale, and there are a few industrial operations around the world, including in North America and Europe, which already capture and store small quantities of CO_2 emissions underground. However, the technology has not yet been demonstrated at the scale required for application to commercial power and industrial plants. To address this gap, governments of many major economies have announced plans to support commercial-scale CCS demonstration projects that store more than 1 million metric tons of CO_2 annually.[4] Several are currently being built in Europe, China, Australia, and Canada, and many more are in the planning stages, including in the United States. Leading industrial nations, through the G8, have called for 20 such demonstration plants to be launched by 2010, with a view toward broad deployment by 2020.[5]

Actions taken to demonstrate transformational clean energy technology over the next decade will define the solutions available to help solve the climate problem.[6] Commercial-scale CCS demonstration projects are required to demonstrate whether or not the technology should play a major role in bridging today's fossil fuel–driven world and tomorrow's low- or zero-carbon economy. Yet, as with the introduction of many new technologies, proposed CCS projects have been met with mixed reactions from the public, and in particular from the local communities asked to host them.

Community Engagement in the CCS Context

Project developers and technical experts in CCS often cite the public as a "barrier" to CCS deployment, because decisions on whether individual projects move forward often significantly depend on the local community's acceptance or opposition. The case studies from the United States, the Netherlands, and Australia featured in this report suggest that communities often have more concerns and questions about CCS than about more established industries and technologies. The guidelines for community engagement, however, were written with the belief that decisions on individual demonstration projects ultimately hinge on site-specific factors, including the needs of the local community. While much social science research around CCS to date has focused on gauging public attitudes toward the technology or on education and outreach best-practices for project developers (see Appendix 2), we focus instead on providing recommendations for creating a culture of effective, two-way community engagement around CCS projects.

In addition to project developers and host communities, there is a third partner essential to effective community engagement around CCS: regulators. In some countries, regulatory frameworks governing CCS development and deployment, including rules for community engagement, are already in place (see Appendix 1). In others, an environmental regulatory framework for CCS does not yet exist, and the advent of demonstration plants is forcing regulatory policymakers to make real-time decisions about how to ensure projects move forward safely, and what level of public participation should be required in the decisionmaking processes.

The engagement around any one project, therefore, is contingent on the interactions of three primary groups: local decisionmakers (typically on behalf of those in the community), regulators, and project developers. All three groups are addressed in this report. It is important to underscore upfront, however, that effective community engagement is measured by the success of the *engagement process,* and is not contingent upon agreement between the project developer, regulator, and community on the outcome or the design of the CCS project. Nevertheless, effectively engaging communities can help move CCS projects forward and foster continuing constructive relationships between project developers and communities. Such relationships can help ensure that commercial-scale CCS demonstrations and any subsequent commercial projects progress in such a way that local economies, values, ecosystems, and people are respected, and the potential of the technology in helping to mitigate climate change is fully realized.

About the Guidelines

The Guidelines was drafted by authors at WRI in close consultation with an international group of stakeholders (see inside front cover) with specific expertise and experience in engaging local communities regarding deployment of CCS technology. This effort builds on WRI's previous 2-year consensus-building stakeholder effort that resulted in the *Guidelines for Carbon Dioxide Capture, Transport, and Storage,* a set of technical guidelines for how to responsibly proceed with safe CCS projects.[7] The community engagement guidelines for CCS are intended to serve as international guidelines for **regulators** (including those in both regulatory policy design and implementation capacities); **local decisionmakers** (including community leaders, citizens, local advocacy groups, and landowners); and **project developers** to consider as they plan and seek to implement CCS projects.

The Guidelines begins with an introduction that describes their intent, a working definition of community engagement, and why effective engagement is an essential element of CCS deployment. It then provides an overview of relevant CCS technology issues, including the status of CCS technology, regulatory and permitting processes, and the timeline and various stages of a representative CCS project. The report then reviews existing relevant experience in community engagement, presented in six case studies from CCS projects. These studies were drafted by stakeholders engaged in the development of the Guidelines who had a hands-on role either in engaging the local community or in decisionmaking around the featured project. Chapter 4 of the report presents the guidelines for community engagement on CCS.

Key Principles in CCS Community Engagement and Roles for Each Party in the Process

	Understand Local Community Context	Exchange Information about the Project	Identify Appropriate Level of Engagement	Discuss Risks and Benefits of Project	Continue Engagement through Time
REGULATORS	Learn community concerns. Determine, meet, and possibly improve public participation requirements.	Educate, respond to, and provide information to the public.	Establish a multistakeholder engagement process.	Require communication and contingency measures and regular updates during life cycle. Evaluate environmental and other impacts.	Require public participation at key stages and increase engagement in the process.
LOCAL DECISIONMAKERS	Understand community interests, identify leaders, and establish a dialogue early.	Contact developers early. Ask questions. Identify, seek, and publicize pertinent information about the project.	Determine engagement level and establish a transparent process.	Ask questions. Identify and communicate concerns and clarify follow-up process. Insist on full disclosure.	Establish institutional memory, possibly a taskforce. Consider participating in monitoring and reporting. Regularly update the community.
PROJECT DEVELOPERS	Assess community dynamics and your historical presence. Weigh participatory engagement.	Engage early and develop a relationship with the community. Answer questions. Seek input, and provide information openly and transparently.	Foster two-way engagement; consult and negotiate with communities. Address concerns. Convey feasible level of engagement.	Answer questions. Discuss with community risks, benefits, uncertainties, and mitigation and contingency plans. Consider benefit sharing.	Engage community at each step of project schedule. Consider informal, long-term relationship to ease stewardship transition.

This effort was initiated with a hope of providing a set of best practices to guide the engagement of future commercial CCS projects, if the demonstration projects prove successful. The guidelines for regulators are designed to guide regulatory authorities responsible for overseeing CCS projects but also offer recommendations for improving the public participation rules as new regulations are drafted. The guidelines for local decisionmakers highlight how, in some cases, communities can take a proactive role in shaping the engagement around a potential CCS project, rather than a passive role as purely receiver of information. Finally, the guidelines for project developers highlight principles and activities that can be employed to promote effective community engagement and involve the local community in the CCS project.

The guidelines are separated into five categories as summarized in the table above. The full text of the guidelines follows, presented by audience. In Chapter 4, the guidelines are presented by engagement principle, with an introductory overview of each issue.

GUIDELINES GROUPED BY AUDIENCE: REGULATORS

Understand Local Community Context

- Request that the developer assess and report the needs and concerns of each local community as part of the required engagement plan. (regulatory authority and regulatory policy designers)
- Consider commissioning local opinion polls or meeting with local stakeholders to gain insight into the situation and specific context, in addition to any requirements that project developers may have to do the same. (regulatory authority)
- Evaluate the effectiveness of current or prospective requirements in reaching community members who will be affected by the project. If these requirements are considered insufficient, policy designers may include new requirements (for either developers or themselves), such as conducting follow-up assessments to determine if specific stakeholder groups were adequately represented in decisions about the project and commissioning opinion polls to gauge the reaction of individual subgroups within the host community. (regulatory policy designers, and sometimes regulatory authorities when evaluating engagement efforts' effectiveness)

Exchange Information about the Project

- Consider developing a program to provide accurate informational materials to the local community regarding CCS technology and its role as a climate change mitigation strategy and economic driver. Adapt the materials to meet the needs and interests of specific segments of the public. If providing information of this nature falls outside the regulator's mandate in a given jurisdiction, consider engaging the appropriate government agency to provide this information. (regulatory authority and regulatory policy designers)
- Establish national or regional standards for public databases of information on CCS injection wells and CO_2 in geological storage, or liaise with regulators across other jurisdictions to establish as much harmonization as possible between public databases and to ensure appropriate public accessibility. (regulatory policy designers and sometimes regulatory authorities)
- Ensure that project developers provide all available nonproprietary and nonsensitive data that can be made publicly accessible and interpretable as part of their required engagement plans, and take steps to ensure the public—especially local community members—have easy access to such information. Examples may include a searchable web page open to the public, periodic announcements in the local print media outlets, and/or monthly newsletters to interested parties. Project developers should also be required to provide additional resources and support to local communities when necessary, such as translators, cultural facilitators, or independent technical liaisons to explain any required technical information to local citizens in easily understandable terms. (regulatory authority, and sometimes regulatory policy designers in regards to requirements for project developers).
- Ensure there is a plan for providing access to information regarding the project during the post-closure stewardship phase (if stewardship is transferred to the government), or require developers to provide such information (if they are still responsible to do so under the relevant regulations after site closure). (regulatory authority and regulatory policy designers)
- Consider the effective limits of a formal hearing as a venue for information exchange in the local community context, and explore alternative information exchange channels, where warranted. (regulatory authority)
- Require developers to report the most frequent questions being asked by the community during the permitting process, in order to inform subsequent steps in the community engagement process plan. (regulatory authority and regulatory policy designers)
- Analyze the evolving inventory of questions and their respective answers over time, in order to flag local issues that can inform future regulatory requirements. (regulatory authority and regulatory policy designers)
- Use media and social media to communicate information about the regulatory process to the community. (regulatory authority and sometimes regulatory policy designers)
- Provide answers to community questions in real time when possible, as opposed to logging questions and providing answers at a later date. (regulatory authority)
- Designate an agency representative—preferably someone familiar with the community or linked to others who can provide the necessary guidance on local context—whose explicit responsibility is to communicate information clearly and concisely and designate time to listen and respond to questions from the community directed to regulators. (regulatory authority)

GUIDELINES GROUPED BY AUDIENCE: REGULATORS

Identify the Appropriate Level of Engagement

- Establish processes for multistakeholder engagement with the community as part of the rule making process. (regulatory policy designers and sometimes the regulatory authority)

Discuss Potential Impacts of the Project

- Include regulatory requirements for a risk-communications plan that includes descriptions of contingency measures. (regulatory policy designers)
- Require regular updates from the project developers throughout the project life cycle. (regulatory policy designers)
- Regularly compile a list of concerns from the community, and require project developers to constructively address these concerns with the relevant stakeholders, even if the real risk around such issues is negligible. (regulatory authority)
- Evaluate the environmental impacts of a project, including ensuring the preservation of endangered and threatened species and the protection of drinking water resources, and make the findings publicly available and easily accessible. (regulatory authority and sometimes regulatory policy designers)
- Require thorough assessment and full disclosure of all costs and impacts to different parties, comparing—where appropriate—the cost and impacts of the proposed project with potential alternatives. (regulatory authority and sometimes regulatory policy designers)
- Accept or reject permit applications based on a comprehensive review process. If accepted, require risk communications, contingency measures, and regular updates during the project life cycle. (regulatory authority and sometimes regulatory policy designers)

Continue Engagement Throughout the Project Life Cycle

- Require public participation at key stages throughout the project as part of the permitting, operating, and site-closure certification processes, and consider engaging and ideally involving the community in post-closure stewardship activities, such as maintenance at the site when possible and periodically discussing monitoring and updates of the site's stability during long-term stewardship. (regulatory policy designers and regulatory authority)
- Consider avenues for increased and updated local community engagement in the regulatory development process. (regulatory policy designers)
- Ensure that necessary resources are allocated toward and made available for appropriate engagement initiatives by the regulatory authority during the post-closure phase of the project. (regulatory authority)

GUIDELINES GROUPED BY AUDIENCE: LOCAL DECISIONMAKERS

Understand Local Community Context

- Local government representatives should understand the community and its interests, recognize the diversity of views, and ensure that all groups are given equal opportunities to be involved in the engagement process.
- Consider the possibility of conflicting interests among local community members, especially those of elected officials, business owners, or influential parties that could benefit from or be damaged by the proposed project, regardless of its impact to the rest of the community.
- Create a map of potential interests outside the community and how these influence local decisionmaking. Alongside economic and political considerations, map nonlocal channels of influence, such as NGOs, social media, and the Internet. Consider how these can influence local decisionmaking and how they might also combine with local or other interests to directly or indirectly influence the project and the engagement plan.
- Identify who will represent the community in interactions with the project developer. Ensure that such leadership is clearly communicated to the project developer and regulator and is considered a trustworthy source by the community. In case a single representative cannot be established because of competing or diverse local interests, this should be clearly communicated to regulators and developers as early as possible, in order to accommodate engagement initiatives and exchanges accordingly.
- Establish an early dialogue with the project developer about the imperative for an open, transparent, and inclusive process for engagement around the project.

Exchange Information about the Project

- Make early contact with project developers and regulators, potentially establishing a working committee or task force to understand implications of CCS on the local community. Ensure that such committee adequately represents the diversity of views embodied in the community. Be proactive as soon as the community learns about the project; do not wait for developers to come to you.
- Ask questions about the project and the technology. When answers are not available, identify a plan and a process for follow-up with the regulator and/or project developer.
- Identify which data the community would like to access, and work with the regulator and project developer to ensure an effective process for making that data accessible and comprehensible to interested citizens.
- Establish clear roles and expectations for communication processes in order to avoid misunderstandings.
- Inform the project developer of the community's desired venues for communication. Seek opportunities to exchange information that will best suit the needs of the community. If needed, request from the developer additional support or resources, such as translators or mobile communication enablers.
- Participate in public meetings and other venues for information exchange organized by the project developer, or consider hosting such an exchange.
- Use social and traditional media channels to communicate information about the project to community members unable to attend public meetings.
- Seek out information from sources independent of the regulator and project developer, such as academic institutions and NGOs (see also potential additional sources of information in Appendix 3).
- Consider the benefit of connecting with other communities that have been through similar processes (successfully or not), and establish a dialogue to take advantage of any lessons learned that could be applied to your community—keeping in mind that every CCS project and local context combination is unique.

Identify the Appropriate Level of Engagement

- Determine whether the community will be engaged in a consultation or negotiation, and on which issues, and work with the project developer to define a transparent and effective process for engagement.

GUIDELINES GROUPED BY AUDIENCE: LOCAL DECISIONMAKERS

Discuss Potential Impacts of the Project

- Identify risks that pose concerns over the life cycle of the project, and then ask the regulator and/or project developer questions about these risks and the planned contingency measures.
- Identify and clarify processes for follow-up, when answers to risk- and benefit-related questions are not immediately available.
- Acknowledge differences between perceived risk and quantifiable risk, being as objective as possible when considering the impact of newly available information on the original perception of risk.
- Discuss potential benefits from the project, including benefit-sharing or other improvements to the community's well being.
- Insist on full disclosure and considerations of costs and potential impacts of the project, ensuring that locally important natural and cultural resources are protected.

Continue Engagement Throughout the Project Life Cycle

- Consider forming a community task force to work with the project developer and regulator, and ensure they provide periodically updated information about the project to the general community on an established timetable.
- Consider the potential role of the community in monitoring and reporting the project's impacts over time, and work with the project developer and regulator to formalize these activities.
- Encourage key community members who understand the project to uphold institutional memory by building and maintaining long-term relationships with regulators and project developers. Encourage youth to participate in the process, in order to pass the community's experience to subsequent generations and ensure effective engagement continues throughout the project's lifetime.

GUIDELINES GROUPED BY AUDIENCE: PROJECT DEVELOPERS

Understand Local Community Context

- Conduct a thorough social-characterization assessment of the community, aiming to understand community leadership dynamics, decisionmaking processes, and general local context. Complete this before establishing and initiating an engagement effort.
- Consider your historical presence in the community and the community's history with other industrial projects, and the effect each will have on your CCS project proposal.
- Conduct a stakeholder analysis, mapping each identified local group and focusing on power issues, excluded stakeholders, and any specific problems within the community that might be solved or exacerbated by the project. Map potential concerns of each identified stakeholder.
- Based on the above, establish the most effective level of engagement for the local context and phase of the project. When pursuing participatory engagement, commit to the consequences of that participation, taking the opportunity to establish a relationship with the community.

Exchange Information about the Project

- Designate an experienced and trained representative to act as the community's link to the project. This representative's responsibility is to build relationships, communicate information clearly and concisely, and take the time to listen and respond to questions, relaying community inputs and concerns back to the rest of the project team. Consider making funds available for the community to hire its own independent expert to aid the engagement process, if needed.
- Be prepared to provide information, and to do so in an open and transparent process. Transparency includes providing information about project alternatives that are (or could be) under consideration, explaining project timelines, and addressing questions on how the project may positively or negatively impact individuals and the wider community.
- Engage community leaders as early as possible in the planning process, and begin community engagement well before any decisions are finalized. Seek community input on alternative project characteristics, where possible.
- Establish engagement opportunities before formal meetings required by regulations occur, and use formal meetings as only one in a series of vehicles for engagement opportunities. Avoid using a formal public hearing or town hall meeting as the first engagement with a community, lest being perceived (either correctly or incorrectly) as "only doing what is required by law."
- Consider a wide variety of methods for communicating and answering questions. These can range from one-on-one dialogues with individual community members to a series of regular town hall meetings. Ensure that proper transparency principles are fully employed in all interactions with community members.
- Recognize opportunities to use both traditional and social media, and employ best practices when doing so.
- Be prepared to answer in a factual manner very detailed questions about the project proposal or the technology.
- Keep track of questions asked over time in an inventory, and address these openly and in a timely fashion. This includes admitting when you do not have an answer to a question and agreeing to a process for providing additional information in response.
- Use the inventory of questions from the community to gain insight into the local context, refine the community engagement plan, and identify potential issues that need to be proactively addressed.
- Take into account that the information you provide may not be fully trusted and interpreted as neutral. Whenever possible, encourage community involvement in the monitoring and reporting of information. Consider having third parties contribute to the monitoring and/or verification processes.

Identify the Appropriate Level of Engagement

- Assess options for engagement in specific issues, and seek opportunities to foster two-way engagement by consulting and negotiating with communities, subgroups, and individuals, rather than simply informing them.
- Recognize that different groups among the local community stakeholders will sometimes require different levels of engagement to satisfy their needs, in addition to different engagement strategies to address their specific characteristics.
- Assess and convey the level of engagement that is feasible based on your ability to alter elements of the project design.

GUIDELINES GROUPED BY AUDIENCE: PROJECT DEVELOPERS

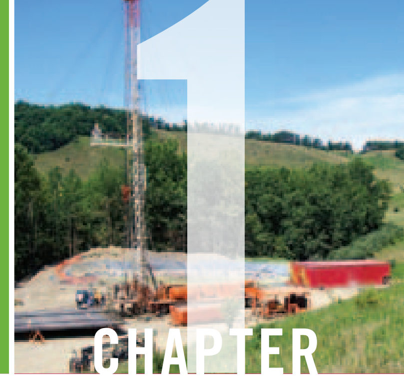
Discuss Potential Impacts of the Project

- Discuss the potentially positive and negative aspects of the project as a key part of the two-way community engagement process, following best practices for risk communication when needed.
- Respect an individual's or community's concern about a particular risk—even if the real risk is perceived by the developer to be extremely low or nonexistent—and provide data in a transparent manner to the community, in order to inform and potentially reduce discomfort from risk perceptions among local citizens.
- Acknowledge uncertainties and assumptions in risk assessments, and explain contingency plans that will be put in place to mitigate any realized risks.
- Be open to community ideas on benefit-sharing schemes and ways to improve the project, and ideally take the initiative to propose benefit-sharing or project-improvement procedures to address specific needs or concerns from the community.

Continue Engagement Throughout the Project Life Cycle

- Include community engagement activities in each step of the project's schedule, beginning with feasibility studies and ending after site closure or when the responsibility for the site transfers to the competent authority.
- Consider maintaining an informal relationship with the local community, even after responsibility for the site is transferred to other parties, and take steps to ensure a smooth transition to the new site stewards by leveraging the long-established relationship with the community.

INTRODUCTION



Globally, nearly 70 percent of anthropogenic (human-caused) carbon dioxide (CO_2) emissions are related to energy consumption.[8] The International Energy Agency (IEA) projects these energy-related CO_2 emissions will nearly double between 2007 and 2050 if the world follows a business-as-usual path.[9] Therefore, achieving significant cuts in these energy-related emissions is critical to avoiding more than a 1.5° C (2.7° F) rise in global temperatures by 2050 and the irreversible and damaging impacts such a temperature rise would have on people and ecosystems.[10]

A realistic assessment of the world's current energy mix suggests the difficulty of foregoing fossil fuels in the immediate future, and most recent analyses include a substantial share of carbon dioxide capture and storage (CCS) in efforts to assess how climate change goals will be met (see Appendix 3).

Governments in many major economies, including Australia, Brazil, Canada, China, the European Union (EU), France, Italy, Norway, South Africa, the United Arab Emirates, the United Kingdom, and the United States have announced plans to construct commercial-scale CCS projects.[11] The IEA's CCS Roadmap, designed to determine the potential role for CCS in achieving a 50 percent reduction in global CO_2 emissions, states that 3,000 CCS projects would need to be online by 2050.[12] Although commercial-scale projects using CO_2 for enhanced oil recovery (EOR) are plentiful, there are at present only four operating commercial-scale projects focused on the geological storage of anthropogenic CO_2.

In July 2008, the G8 set a goal of launching 20 CCS demonstration projects globally by 2010, with wide-scale deployment beginning in 2020.[13] However, this goal is far from being met, and local opposition is often cited as one of the reasons for CCS project delays and cancellations.[14,15] Past experience suggests that CCS will not be widely deployed at the pace needed without local community support. Such support can evolve from active participation in an engagement process by regulatory policy designers and regulatory authorities, project developers, local opinion leaders, national and local policy-makers, and community members.

CCS Explained

Carbon dioxide capture and storage (CCS) is a broad term that encompasses a suite of technologies that together can be used to reduce the carbon dioxide (CO_2) emissions from industrial sources such as power plants; steel, cement and chemical production plants; and oil and gas processing facilities. These technologies include the capture or separation of CO_2 from point sources of emissions; compression and transportation of the CO_2; and, finally, injection of the CO_2 into deep subsurface geological formations, permanently preventing its entry into the atmosphere (storage). CCS technology has been the subject of extensive research and demonstration over the past decade. The first CCS project of significant scale was the Sleipner project in Norway, which has been injecting 1 million metric tons of CO_2 per year since 1996. Current efforts are focused on scaling-up the technology and integrating it with commercial power plants and other industrial facilities, primarily through government-sponsored demonstration projects. Policies for environmental regulation of CCS, requirements for CCS at new industrial facilities, and incentives for first-of-a-kind projects have been established in some countries to enable this first wave of demonstrations. Although research to date has been promising, more will be learned about the technology with larger-scale experience gained through demonstrations.

Critical Role of Host-Community Support for CCS

Public participation in decisionmaking is a widely-accepted principle and is emphasized in international declarations signed by most of the world's governments, such as in Principle 10 of the United Nations Rio Declaration on Environment and Development.[16] Moreover, community participation and engagement are critical both to the long-term success of most proposed industrial projects worldwide and to achieving environmental sustainability and social equity. Effective community engagement may be especially important for relatively new technologies, where communities are likely to have even more questions and concerns than they normally would for established industries. Therefore, as an application of both new and existing technologies, CCS projects will likely require paying special attention to thorough and effective community engagement, so that the voices of all those potentially affected by proposed projects may be taken into account in planning and development.

From a project developer's economic risk-management perspective, careful attention to community engagement on CCS is a key element for a project's success. Like other large infrastructure endeavors, future CCS deployment will be at least partially contingent on local community acceptance of individual projects, as strong opposition could potentially hinder or raise the costs of planned projects beyond economic feasibility.[17] The added technological novelty, the questions particular to CCS as a climate mitigation tool, and its perceived links to fossil fuels provide further complications warranting additional engagement effort, as compared to more established industries. Effective community engagement (detailed further on page 25) can help identify project risks, improve project design, and establish ways to resolve communities' concerns about the project.[18] In turn, these benefits may contribute not only to the individual project's outcome, but also to the longer-term perception of CCS and the project developer. This is why anticipating community concerns and providing clear guidelines on community engagement for CCS projects are critical components in project development and large-scale deployment.

Community Opposition and Project Risks

WRI's 2007 report, *Development Without Conflict: The Business Case for Community Consent*, describes types of risks that can arise from strong community opposition to infrastructure projects, which effective community engagement can help identify, prevent, mitigate, and manage.

- **Financing Risk**—Financial institutions and investors may delay their financing, require more conditions, or decide not to participate.
- **Construction Risk**—The project developer may not be able to complete the project on time or on budget.
- **Operational Risk**—The project developer may not be able to access property, necessary inputs, produce sufficient output, or sell at a sufficient price, which can disrupt operations.
- **Reputational Risk**—The project may harm the project developer's or financial institutions' brand identity, which can translate into loss of market value.
- **Credit/Corporate Risk**—Delays or interruptions to a project may reduce the project developer's profitability and asset values, decreasing the project developer's stock value, lowering its credit rating, and raising the cost of borrowing.
- **Host-Government Risk**—The host government may withdraw permits and licenses, commence enforcement actions, impose civil or criminal penalties on the project developer, or tighten requirements.
- **Host-Country Political Risk**—Political forces in the host country may threaten the project.

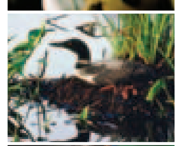
Most of the above risks reflect mainly on the project developer. However, regulators, politicians, and host-government agencies on national, state, or local levels may also suffer from political backlash due to strong opposition on CCS projects; the case studies in chapter 3 provide insight into how this can occur in a CCS context.

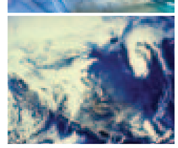
Adapted from Sohn, J. et. al., 2007. *Development Without Conflict: The Business Case for Community Consent* (Washington, DC: World Resources Institute, 2007). Available at: http://www.wri.org/publication/development-without-conflict.

Regulatory policymakers and local communities will also benefit from establishing the pathways toward effective community engagement processes in CCS projects. As part of their responsibility to the public, regulatory policymakers should emphasize public participation requirements in decisionmaking processes; by doing so they will likely also reduce the chance of negative political repercussions due to inadequate engagement processes (see box above). Local communities will also benefit from proactively engaging with developers and regulators, not only to ensure their voices are heard, but also to maximize their ability to capture potential benefits and resolve any concerns they might have about the project (see page 69 for further details).

In short, if nations embark on the siting of large CCS projects, it is important both in principle and in practical terms that local community concerns and sensitivities are respected and that projects are planned, designed, sited, operated, and maintained in a sound manner that adequately takes local voices into account.

WRI'S CCS Principles

WRI's carbon dioxide capture and storage (CCS) project was initiated in 2006 and is predicated on the following principles for CCS demonstration and deployment:

1. Protect human health and safety.
2. Protect ecosystems.
3. Protect underground sources of drinking water and other natural resources.
4. Ensure market confidence in emissions reductions through proper greenhouse gas accounting.
5. Facilitate cost-effective, timely deployment.

"Community engagement can help identify project risks, improve project design, and establish ways to resolve community concerns."

About this Report

The aim of this report is to present the conclusions of an extensive stakeholder-driven effort (described on page 8) that discussed how community engagement principles should be best applied to the CCS context. These conclusions are presented as guidelines in Chapter 4 of the report. To put them in context, we first provide an overview of community engagement principles in relation to CCS and of specific CCS issues relevant to community engagement. We also present case studies authored by stakeholders involved firsthand in community engagement efforts for actual CCS projects. These case studies collectively informed the Guidelines and are designed to present readers with insights that put the guidelines into context. The report also contains appendices that provide additional references and resources for readers who wish to delve deeper into specific subjects discussed herein.

Audience

These Community Engagement Guidelines for CCS are intended to serve as a source of international guidelines for regulators (including both those in regulatory policy design and implementation capacities), local decisionmakers (e.g., community leaders, citizens, local advocacy groups, landowners, etc.), and project developers to consider as they plan and deploy CCS projects.

The Guidelines differs from previous efforts, such as the U.S. Department of Energy's (DOE) *Best Practices for Public Outreach and Education for Carbon Storage Projects,* which is targeted primarily at U.S.-based project developers.[19] The Guidelines benefited from stakeholder participation by the authors of the DOE best-practices document, as well as numerous other international experts in the public dimensions of CCS deployment, from regulatory, academic, industry, and NGO perspectives.

The Guidelines presented in this report consider regulators, local decisionmakers, and project developers as the three key and equally important parties in a unified engagement effort. While each of these audience groups has distinct roles and responsibilities as they engage each other over the life cycle of a CCS project, the stakeholder group decided to create a set of cohesive principles that emphasized the interaction and commonalities between all three. Each target audience can use the Guidelines as follows:

Regulators: to design, establish, and implement participatory processes that ensure transparent and effective community engagement and feedback, from a project's planning to its conclusion. The Guidelines aims to be universally-applicable and can be used by regulatory policymakers and compliance and enforcement officers, ranging from national to local levels of government.

Local decisionmakers: to understand what types of questions to ask project developers and regulators about a proposed CCS project in order to better understand the project proposal and its potential impacts on the community, opening the opportunity for participation in the development process. Examples of local decisionmakers include:

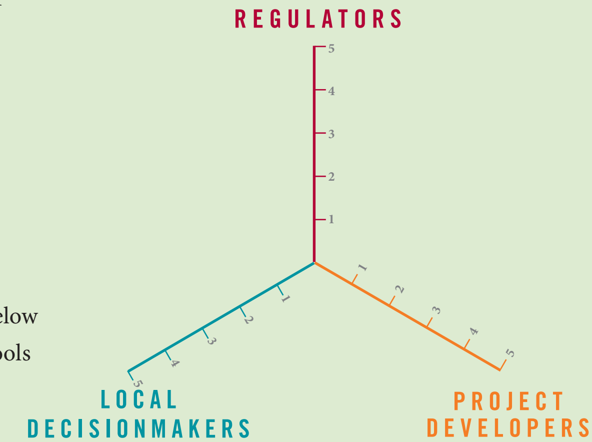
- Local government representatives and community leaders, to suggest improvements in methods and types of community engagement that will best meet local needs
- Individual citizens and landowners, to determine opportunities for engagement with the project developer and regulators
- Environmental groups, to ensure, where possible, they understand the potential environmental impacts of a project and are prepared to be effectively involved in how these are addressed

Project developers: in their strategic planning and decisionmaking about the community engagement strategy chosen for potential CCS projects. The Guidelines is designed to provide guidance for developers working in different countries and project configurations, allowing for flexibility in the development of community engagement strategies that are tailored to specific project contexts.

What is My Role in a CCS Community Engagement Process?

This tool is intended to elucidate the roles played by different parties in the engagement process. Although these may be clear for well-defined positions, such as employees of the project developer's organization or public servants acting in a regulatory role, in other cases roles may be less defined, and potential stakeholders may span different categories altogether. In such cases, individuals or groups who straddle more than one category may have a conflict of interest that needs to be acknowledged and addressed.

In addition to their individual motivations and responsibilities, it is essential that all parties understand where others generally stand and what their interests may be in the project. While the self-assessment below presents a basic structure in which to think about these issues, other tools and suggestions for a more complete appraisal of relevant intergroup dynamics are presented with the guidelines later in this report.



Step 1: Self-Identification Questions

Question	NO		MAYBE		YES
Am I involved in designing and/or writing regulatory policy on CCS?	1	2	3	4	5
Do I implement and/or ensure compliance with regulations on CCS?	1	2	3	4	5
Am I a local government official or a non-elected community leader?	1	2	3	4	5
Am I a citizen or landowner in the local community?	1	2	3	4	5
Will my local business be directly affected (good or bad) by the CCS project?	1	2	3	4	5
Am I otherwise directly able and willing to influence opinions in the community?	1	2	3	4	5
Will my company directly develop (build, manage, own) the CCS project?	1	2	3	4	5
Am I part of a non-local business that will directly profit from the CCS project?	1	2	3	4	5

Step 2: Mapping your role

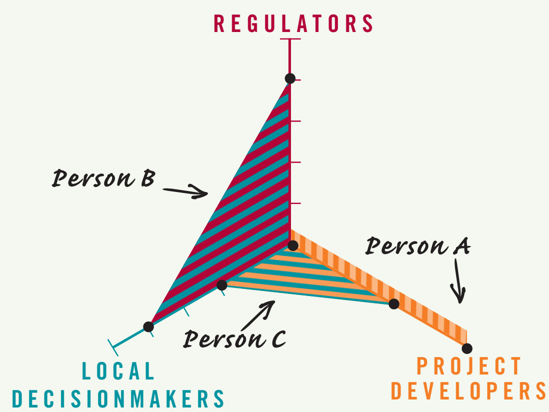
a. Take the highest score and plot the result along the 'Regulators' axis.

b. Take the highest score and plot the result along the 'Local Decision-Makers' axis.

c. Take the highest score and plot the result along the 'Project Developers' axis.

Step 3: Connect the dots

Most stakeholders' shapes will be straight lines, indicating that they fall into just one of the categories. For example, the map of a project developer's manager might look like Person A's on the example to the right. However, some stakeholders will straddle more than one group, meaning they should consider following the guidelines recommended for both. For example, a city's mayor (Person B) might have control over how local regulations are written and can also influence a community's opinion. Meanwhile, a local business owner (Person C) might help build the project and could also influence local public perception of the project.



Finer Detail for "Regulators"

Often regulations are legislated, written, and implemented by different agencies. If your answer to the first question above was significantly higher than your answer to the second question, you are likely to be a regulatory policymaker or designer. If your answer to the second question was higher than your answer to the first, you are likely to be a regulatory authority or a regulation implementer.

Some of the guidelines presented in this report apply to both groups while others are specific to one or the other and will be denoted as such. For example, recommendations to include certain regulatory requirements are generally directed toward regulatory policymakers, while the guidelines on better informing or involving the community will better apply to regulatory authorities.

Community Engagement in the CCS Context

Community engagement is the process through which a project developer or a regulator builds and maintains constructive relationships with communities by involving them in a timely and transparent manner over the life of a project.[20] Local decisionmakers usually respond to the engagement, which in most cases is initiated by either project developers and/or regulators. In the case of CCS, this facet of community engagement is even stronger, as project developers have been in the vast majority of cases the ones leading the characterization of potential project sites, thus determining which communities are eventually engaged as project locations are selected. Although it is possible to have local communities taking the initiative to host CCS projects and contacting potential developers, this report will focus on the more common case where the opposite happens.

Engagement can take various forms, from more passive processes, where the community can formulate its questions and receive answers, to more active processes, where communities can express concerns and see these concerns translated into an alternative design—or even the rejection—of the project.[21] In some of the most active forms of engagement, communities may codevelop the project and sometimes even own it financially—as sometimes is the case in wind farm projects, where members of the community own wind towers and/or windmills and enjoy economic returns from them. Section 3 of the Guidelines, "Identify the Right Level of Engagement," explores this topic in more detail (see page 65).

As stated earlier, a broader engagement process that includes parties beyond local communities is both necessary and expected for CCS projects, but lies outside the scope of this report. Our guidelines focus more narrowly on the engagement between the host community, the regulator, and the project developer. Issues of interest in this context may range from the impacts a CO_2 storage site might have in local real estate prices, job creation, and the local economy, to broader questions regarding energy choices and climate change mitigation.

It must be noted that any given local community is not monolithic or a single entity, but rather a diverse collection of interests and parties who may view a proposed CCS project very differently. All those involved in a community engagement process—including developers and regulators, but also the various individuals that comprise the local community—should expect and be ready to manage and work with dissenting voices coming not only from the other groups, but also from within their own ranks.

In order for a community engagement process to qualify as a *transparent process,* it should entail timely, open, and candid engagement with communities during the different stages of the project life cycle. Transparency includes being proactive in the disclosure of relevant information, even when not directly requested, admitting when answers to the questions posed by a community are not currently

The Critical Public and Private Dimensions of CCS Deployment

There is a recognized, global public benefit from a carbon dioxide capture and storage (CCS) project—a benefit that is often not well connected to the local communities' rights, risks, and rewards for hosting the project. The cost of CCS demonstrations has in some cases been borne by society (a public cost for a public good). On other occasions, the local community is expected to pay for an increased cost of electricity resulting from the project (an example of a local cost for a public good). Balancing the public good with the local impacts is a challenge not easily overcome.

Community members often oppose local projects and take a Not In My Back Yard (NIMBY) stance. For CCS, this attitude is sometimes referred to as NUMBY, or Not Under My Back Yard. The position of any local citizen who will be impacted directly by a project will be shaped in part by their engagement with other local decisionmakers, regulators, and the project developer. Local citizens or groups may adopt a NUMBY attitude due to a perceived imbalance between 1) the local risks and/or negative impacts of the project, 2) the value of the public good of reducing CO_2 emissions, and 3) any local socioeconomic benefits arising from the project. In addition to supporting constructive relationships between host communities and project developers, effective community engagement serves the crucial purpose of elucidating and potentially rebalancing these three factors, which often lead to local opposition when not clearly discussed and adequately addressed during a project's design phase.

Individual and community decisions to support or oppose a CCS project will also occur in the context of a broader societal debate about energy choices and climate change. The impacts of the project may also affect a larger region from economic (e.g., ratepayers who pay more for electricity) and environmental (e.g., impacts to air and water emissions) perspectives. Engagement with this broader group is also important, and together with the local community experience will influence decisions on public investment in CCS projects.

available, and providing such answers as relevant information becomes available. For their part, in relation to CCS, communities need to appreciate the iterative process of geologic investigation through different phases of the project (see Timeline of a Representative Geologic CO_2 Storage Project, on page 33) and acknowledge that answers to every question will not exist at the outset. In addition, 'transparency' includes the principle that it should be clear to all parties how and when decisions are being made in a process, and who or what authority is *accountable* for decisionmaking.

Effective CCS Community Engagement

The stakeholder group that contributed to this report has defined *effective community engagement* as a transparent process that goes beyond purely an information exchange between communities affected by a project and project developers and/or regulators. In addition to exchanging information, effective community engagement also includes the following:

- Easy access to complete and reliable information
- Opportunity for a community to raise concerns

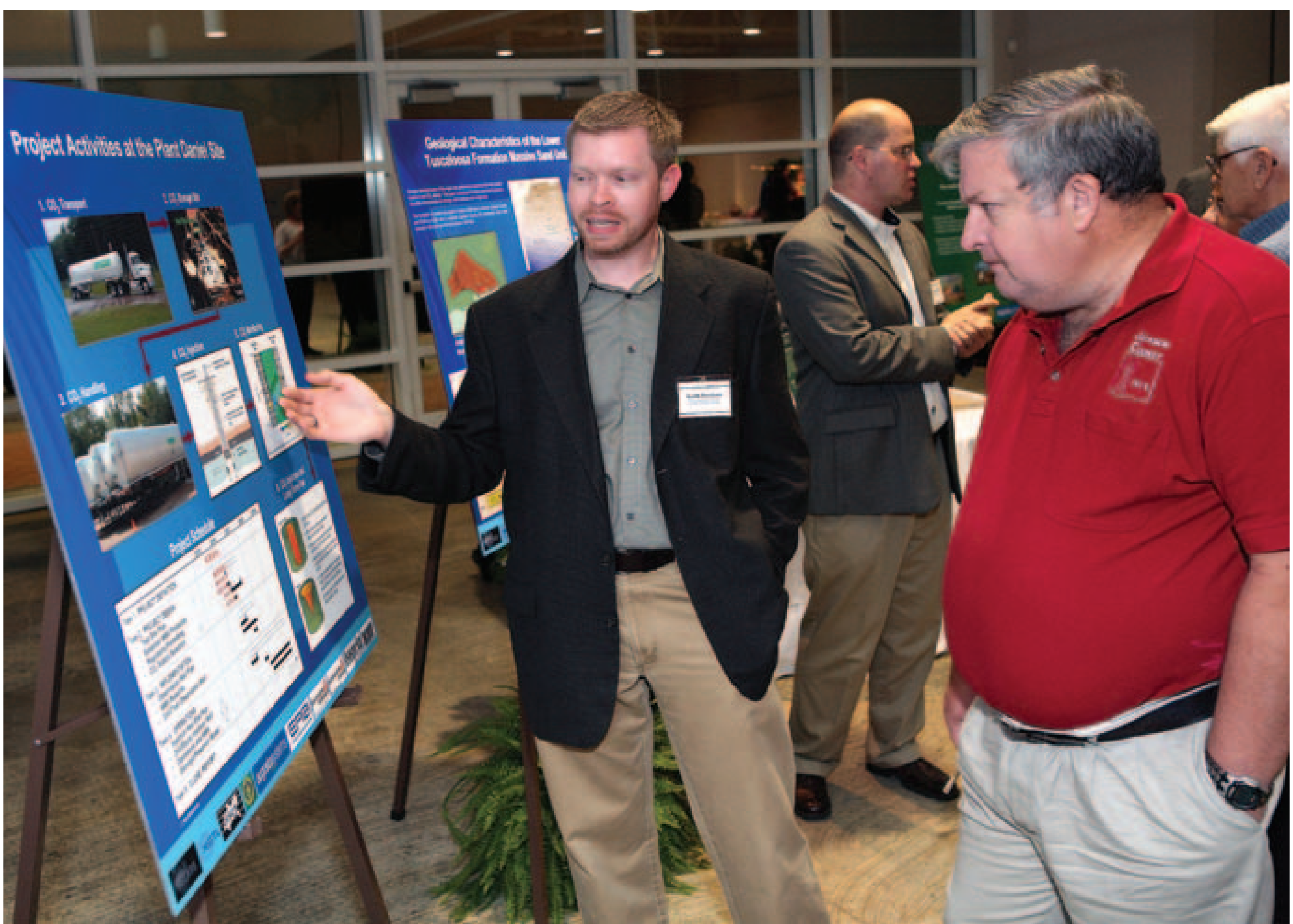
"Transparency includes being proactive in the disclosure of relevant information, even when not directly requested, admitting when answers to the questions posed by a community are not currently available, and providing such answers as relevant information becomes available."

"The effectiveness of a community engagement process is a function of its ability to uphold engagement principles, and is not contingent upon agreement between the project developer or regulator and the community on the outcome or the design of any specific CCS project."

- Opportunity for a community to receive a response to those concerns, both in terms of answers and the alteration of project characteristics as a response to their concerns—including the potential relocation of the project to another site if the interests and concerns of project developers and the host community cannot be reconciled.
- Agreement between project developers, local communities, and regulators on decisionmaking procedures, roles, and responsibilities, with opportunity for community input before final decisions are made
- Joint decisionmaking on project characteristics affecting the community directly, where warranted
- A priority for all parties to reach mutually agreeable outcomes on key issues
- Where applicable, proper development of mechanisms for benefits-sharing, as well as equitable distribution of risks and costs

The Guidelines seeks to foster *constructive relationships*, defined in this context as a working relationship between project developers, communities, and regulators, facilitated through effective engagement, which may lead to mutual benefits to both parties if a planned CCS project goes forward. It is important to underscore that the effectiveness of a community engagement process is a function of its ability to uphold the characteristics described above and is not contingent upon agreement between the project developer or regulator and the community on the outcome or the design of any specific CCS project.

Defined like this, successful community engagement can lead to construction or cancellation of a planned project, or it



might yield community input on a proposed project plan that leads to changes in the project design (e.g., location, technical characteristics, and implementation). In the best outcomes, community engagement can help shape the project in ways that better fit the needs of the community, while at the same time retaining the project's climate change mitigation benefits and its economic viability to developers. In turn, such positive outcomes may pave the way—together with reinforced trust and understanding fostered by effective engagement—toward a long-term collaborative relationship between the project developer, regulator, and the community.

This process-oriented definition of success in community engagement for CCS projects may be at odds with the more common perception—especially among project developers—that successful engagement means that a specific project goes forward. However, deeper involvement in the community engagement process itself may lead to a number of benefits that may not be immediately clear if one considers a CCS project as a stand-alone endeavor, rather than part of a wider and longer-term CCS deployment process. Seen in this light, the decisions project developers and regulators make today in respect to a specific CCS project may be considered less as one-off processes, and more as steps that may impact both future public perceptions of CCS and their reputation. In turn, all these are likely to affect not only the dynamics with the community hosting the current project over time, but also the feasibility and design requirements of future projects in other locations.

Direct Decisionmaking Roles for Community Members

Communities and their members exert direct and indirect decisionmaking roles affecting most local industrial or infrastructure projects. Examples of community members engaging in direct decisionmaking in relation to CCS may include:

- Landowners, or other individuals without title to the land who nevertheless control its access and use, who need to be engaged as developers negotiate right-of-way access for CO_2 pipelines, injection or characterization wells, and monitoring access.
- Individuals or companies who may own the subsurface pore space (depending on the specific country's laws) and will negotiate a lease agreement with the project developer.
- Community members with legal rights to vote or otherwise weigh in on the proposed project, particularly if it conflicts with an existing local ordinance or land use, including those without legal title but with recognized ancient claims over land, such as indigenous communities.
- Community members who attend public hearings and have a formal opportunity to comment directly to the regulator or project developer prior to the final permit approval.

Indirect Decisionmaking Roles for Community Members

Local community members may also significantly influence a project through actions beyond direct negotiation with the project developer and participation in formal procedures established by the regulator or the developer. Examples of such activities include:

- Expressing opposition or support through protests, media campaigns, and other means
- Advocating for or against a project with key decisionmakers
- Filing lawsuits at any step in the process, including those that seek review of the regulatory approval or public participation process
- Walking away from the process or stalling it by delaying required feedback or actions

For the community engagement effort to be most effective, both direct and indirect community involvement, as well as formal and informal engagement activities, should be employed.

Community Engagement Timeline

Community engagement for a CCS project does not end with project construction or operation, but rather extends over the project life cycle (see page 33 for the timeline of a representative project, as well as section 5 of the guidelines, on page 77, for a more detailed discussion). For CCS, the post-closure stewardship phase of CO_2 storage sites—the period after geological injection of carbon dioxide is complete, but periodic monitoring and maintenance are still required—may span many generations. This highlights the need for community engagement not only during planning and operational phases of the project, but also for the long-term engagement—usually conducted by the regulator or responsible governmental agency—that may continue indefinitely through the post-closure stewardship phase.

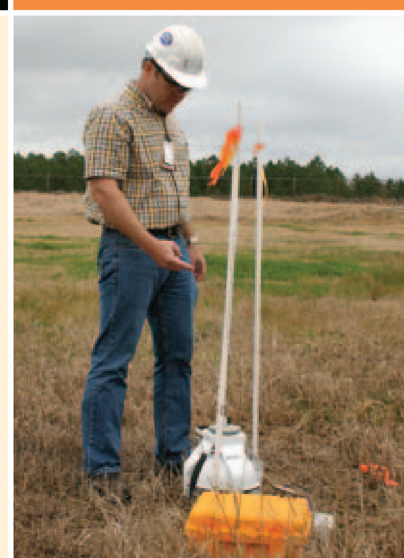
This long-term engagement may take different forms depending on the country, state, or province where the storage site is located. For example, the EU's CCS Directive (see Appendix 4) states that long-term stewardship will be the responsibility of the state or another competent authority after a minimum 20-year closure period; in other regions of the world this proposed shift in responsibility is still being discussed by policymakers.

> *"A CCS project is not a stand-alone endeavor, but rather part of a wider and longer-term CCS deployment process. Decisions taken today in respect to a specific project are not isolated. These decisions are likely to affect not only the dynamics with the community hosting the current project over time, but also the feasibility and design requirements of future projects in other locations."*

CHAPTER 2

CCS-SPECIFIC ISSUES FOR COMMUNITY ENGAGEMENT

This chapter provides a brief overview of some current technical and regulatory issues around CCS relevant to different parties involved in a community engagement process for a CCS project. It includes (1) an introduction to the status of CCS technology, aimed as a first step to bridge the potential information gap between different parties, (2) an explanation of CCS regulation and permitting processes, and (3) a representative timeline for the development of a generic CCS storage project.



Status of CCS Technology

The discussions around CCS technology have progressed quickly from their origins among highly technical circles to the current inclusion of CCS in climate change mitigation plans (such as the IEA BLUE map scenario[22]) and high-level government dialogues. This progression is driven by a growing recognition for the need to find climate change solutions that can apply to growing recognition of the need and planned carbon intensive industries and is also the result of the early successes in pilot capture and storage demonstrations and field validation tests, where significant volumes of CO_2 have been injected for geological storage.

While there are currently no large-scale, traditional coal-fired power plants fully operating with CCS applications, a small number of commercial-scale projects are operating successfully today. Examples include the storage of CO_2 separated from natural gas, the capture of natural CO_2 for commercial use, and the injection of CO_2 into oil formations to improve production, referred to as "enhanced oil recovery" (EOR). Furthermore, all the technical components required by a CCS project have been utilized in the past by industry at commercial scale.

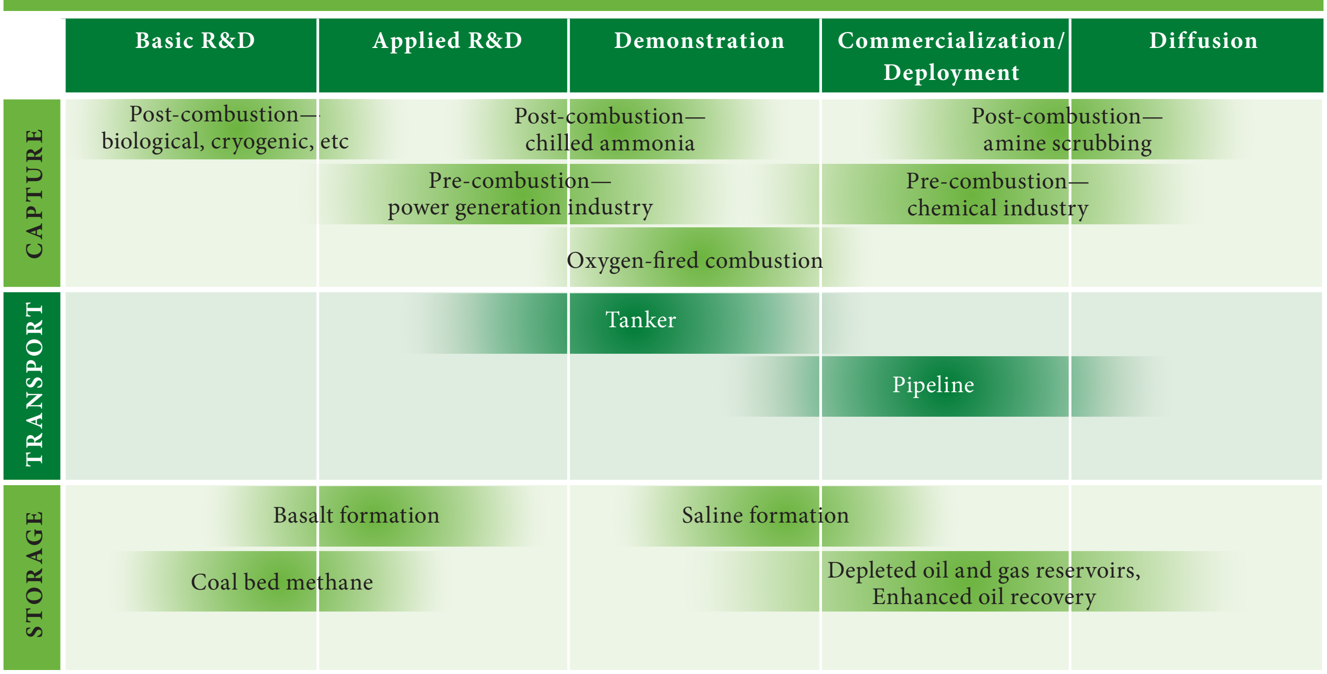
In its simplest form, the suite of CCS technologies comprises three main steps aimed to achieve permanent sequestration of CO_2 emissions generated at industrial locations:

- the capture and/or separation of CO_2 from emissions from point-sources;
- the compression and transportation of the CO_2; and
- the injection of the CO_2 into deep subsurface geological formations (storage).

CAPTURE: CO_2 capture technologies have been employed at scale on industrial processes for various purposes, including the processing of natural gas to meet pipeline specifications, industrial chemical manufacturing (such as the production of ammonia or methanol from coal gasification), treatment of refinery and chemical plant streams, and separation of CO_2 for use in EOR and the food industry. However, current capture technologies have not been demonstrated economically for large-volume, low-CO_2 content flue gas streams—a development which would be needed for application to many commercial-scale industrial and fossil fuel power plants. In addition to further research and development, demonstration and potential widespread deployment of novel capture technologies will require operators of facilities to learn and optimize processes, as well as adopt appropriate health, environmental, and safety precautions. Many of these methods, best practices, and regulations are already in use in other industries, such as those that follow the range of the International Organization for Standardization's (ISO) guidelines for environment, health protection, and safety.[23]

The three major, current CO_2 capture approaches are post-combustion, pre-combustion, and oxygen-fired combustion (a.k.a., Oxy-fuel).[24] Post-combustion systems separate CO_2 from flue gases produced when the primary fuel (e.g., natural

Figure 1: Innovation Chain and CCS Components



See also Haszeldine, R.S., 2009. "Carbon Capture and Storage: How Green Can Black Be?" Science 325: 1647. and F.M. Orr, Jr., 2009. "Onshore Geologic Storage of CO_2." *Science.* 325: 1656.

gas, oil, coal, etc.) is combusted in air. The low concentration of CO_2 and the presence of oxygen gas in the flue gas mixture make this approach challenging. Pre-combustion approaches are typically proposed for plants that gasify and react fuels to produce a mixture of hydrogen gas and CO_2 (e.g., integrated gasification combined cycle [IGCC] power plants).[25] The pre-combustion process produces CO_2 at higher concentrations, making capture more efficient. Such technologies are already used to remove CO_2 from produced gas to meet product specifications or to separate CO_2 from hydrogen gas produced from gasification or reforming. Finally, the oxygen-fired approach requires using relatively pure oxygen, as opposed to air, for fuel combustion. The resulting flue gas has higher CO_2 concentrations, and the CO_2 can then be more easily separated after the removal of pollutants and water vapor.

Currently, the most common post-combustion capture technology, amine scrubbing, is used commercially to remove CO_2 from natural gas, hydrogen gas, and other mixtures with low oxygen concentrations. The technology is operational on small coal-fired power plants but is still being scaled up.[26,27,28,29] Pre-combustion systems are also still developing. Currently, there are relatively few full-scale, operational IGCC power plants; and they lack CCS.[30,31] Effective separation of CO_2 from a pre-combustion system has been proven in plants producing synthetic fuels, hydrogen gas, and other chemicals, but has not yet been applied to an operational power plant.[32] Oxygen-fired combustion exists at pilot scale and could become commercially available given more research and development.[33,34,35]

In many capture processes, a primary challenge is the cost of separating CO_2 from the flue gas. Capturing the CO_2 costs money and decreases plant efficiency, imposing a 6 to 30 percent energy penalty, which results in further costs.[36] The energy penalty means that power plants must consume more fuel for the same amount of electricity provided to their customers. From an environmental perspective, this increased energy use also comes with a commensurate increase in the need for cooling water. One of the main aims in carrying out capture demonstrations is to learn from the implementation of such new technologies in real life, and thus develop ways to reduce the costs and related energy penalty.

Prior to transportation and injection, the captured CO_2 is compressed to reduce the volume and allow storage deep underground, in what is considered today a routine process. The need for compression varies to some extent on the specific capture technology used, but in all cases compression requires significant energy consumption. There are several existing technologies for CO_2 compression, and research is also underway to reduce their energy use and costs.[37]

TRANSPORT: Once captured and compressed, CO_2 often needs to be transported to a separate storage site. The most developed mode is pipeline transportation; there are currently over 6,270 kilometers (km) (3,900 miles) of CO_2 pipelines in operation in the United States, used mainly for EOR and industrial processes.[38] Industrial experience in transporting CO_2 by ship, rail, and truck is also well established, but not on the scale required.

Although the majority of the CO_2 currently transported worldwide comes from natural underground deposits rather than human activities, this operational experience provides a solid base for the development of a CO_2 transportation infrastructure for CCS. Carbon dioxide transportation by pipeline is already considered a mature technology.[39] Transport through urban or ecologically sensitive areas usually requires additional due diligence to minimize risks associated with leaks to human health and environmental integrity, depending on the existing laws in different countries and jurisdictions. Governments are already evaluating the potential to use existing pipelines and rights of way for CO_2 transportation and drafting regulations to facilitate the CO_2 pipeline transport for CCS uses.[40]

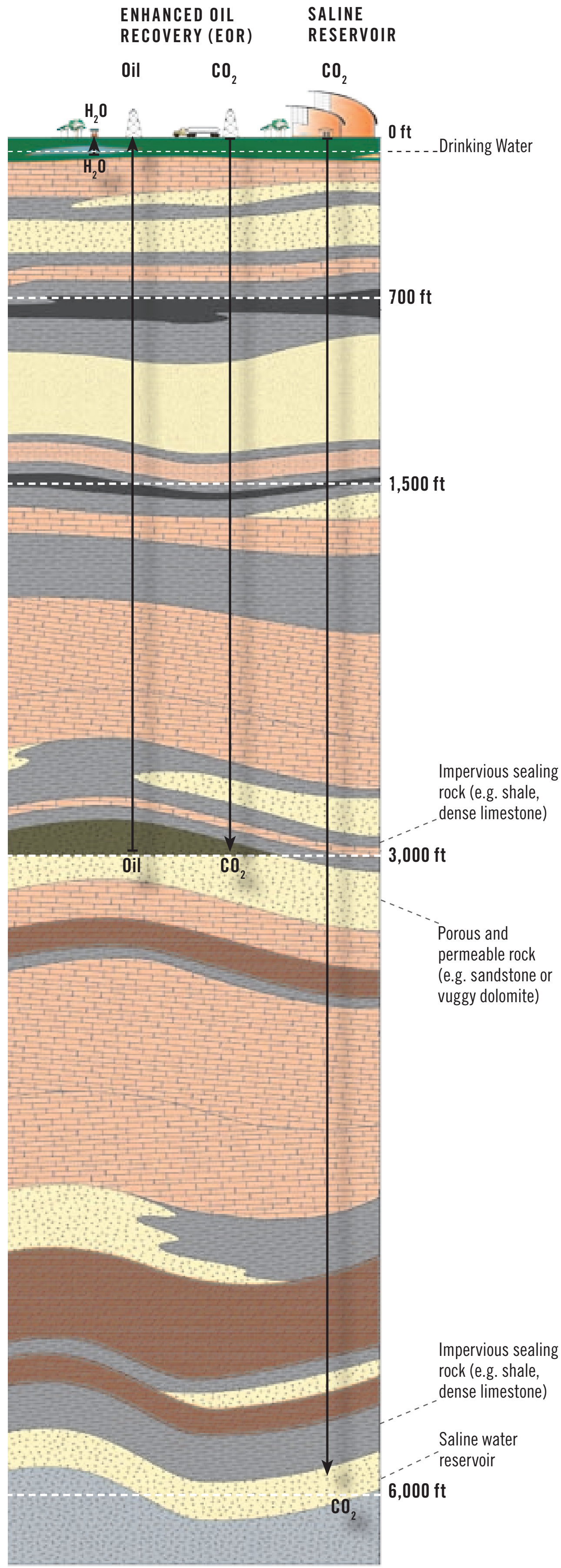
> *"The storage component is the most novel and generally misunderstood in the CCS chain, and presents most of the potential new impacts and issues around community engagement associated with CCS."*

INJECTION AND STORAGE: Once at an appropriate storage site, CO_2 can be injected into deep subsurface geological formations for isolation from the atmosphere. Ideal sites are at least 800 to 1000 meters deep, have a geological formation that prevents the CO_2 from escaping, are large enough to store CO_2 over a facility's lifetime, and are permeable enough to allow CO_2 to be injected at reasonable rates.[41] Underground geologic formations that are suitable for CCS projects may or may not already contain naturally occurring CO_2, and can be found both under the ocean ("offshore formations") and under various types of terrain on firm ground ("onshore"). In addition, many prospective subsurface sites have saltwater (i.e., saline formations), which theoretically increase storage security with time.

Injected CO_2 can also be reused beneficially, notably for EOR.[42,43] EOR operations provide technological and process experience with CO_2 injection, as the industry has been injecting CO_2 underground for 40 years. For example, in the United States, EOR projects have injected over 600 million metric tons of CO_2 over several decades.[44]

Dedicated global research and development programs for CO_2 storage have been underway since the 1990s, and a substantial amount of knowledge has been gained through research-scale projects.[45] There are currently four operational, industrial-scale projects that have focused on understanding and verifying

Figure 2: CO_2 Storage



CO_2 storage, as opposed to simply injection, of quantities approaching and above 1 million metric tons of CO_2 per year. These projects include three natural gas processing operations (Sleipner and Snøvhit in Norway and In Salah in Algeria) and one EOR operation utilizing anthropogenic sources of CO_2 (Weyburn-Midale in Canada).[46]

Comprehensive site characterization, selection, and operation are critical to successful geological storage efforts. In addition, developing an adequate measurement, monitoring, and verification (MMV) plan with sound reporting procedures and conducting a comprehensive risk analysis are also integral to safe and effective geological storage. Ultimately, the storage plan for an individual site must reflect variations in the local geological conditions, be informed by knowledge gained during project operation, allow flexibility to respond to the knowledge gained in the course of the operation, and be based on site-specific data. Finally, a long-term stewardship plan, which likely extends beyond the project developer's involvement in the project, is also an essential component to CO_2 storage.

CCS Regulations and Permitting Process

Regulations governing CCS are not yet in place in many parts of the world.[47] An environmental regulatory framework is needed to manage CCS projects and ensure that environmental and public health and safety are protected. Ideally, regulations for CO_2 injection and storage should be developed by national and/or provincial or state governments before they are deployed within their jurisdictions. From a community perspective, these frameworks must address safety and environmental protection, promote storage security, include provisions for public notification, establish rules for long-term monitoring, protect landowner rights, and ensure that liability is covered.

Under CCS-specific regulatory regimes, at various points during a CCS project's life cycle, a project developer will typically need to apply to a regulatory authority for a permit. This same regulatory authority is often also tasked with enforcing the permit.

The process of developing and applying for a permit provides a crucial opportunity for early community engagement. In some countries, such as the United States, a regulatory authority can require public notice of permit applications, solicit comments, and hold public hearings. Ideally, regulatory policy designers could also include in new regulations minimum requirements for developers to engage communities and stipulate that project developers engage the community, with periodic reviews or consultations, throughout a permit's duration.

The timing of permit applications for CCS projects varies by country and region; in some instances, permits already granted can be reviewed in light of new requirements or circumstances. For example, in the EU, an operator applies separately for a site characterization permit and an injection permit. Other countries, such as the United States, are evaluating the feasibility of a single permit for characterization and injection, with regulatory evaluation of plans at key points in the process, such as prior to injection or upon site closure.

Because regulatory frameworks are still emerging, there are open questions regarding post-closure stewardship of CCS project sites in most countries. Local decisionmakers, regulators, and project developers should ensure from the outset of the project that the local community is actively engaged in determining clear, long-term stewardship responsibilities and rules.

CCS Storage Project Stages

- Prefeasibility studies, with site preselection, site characterization, and exploration permitting
- Detailed site characterization, including site-specific geological tests for storage integrity and capacity
- Site confirmation and injection permitting
- Site construction or refurbishment of existing infrastructure
- Operations and monitoring
- Site closure: the cessation of injection, with post-injection monitoring and well plugging
- Post-closure stewardship: monitoring until demonstration of non-endangerment and closure certification, with the site responsibility transfer (in some jurisdictions)

Timeline of a Representative Geological CO_2 Storage Project

To elucidate understanding of the detailed guidelines that follow, this section provides a common overview of the types of activities that will commonly occur over the lifetime of a CO_2 storage project.[48] This description focuses on the geological storage aspects of a CCS project rather than the capture or transport phases, for two reasons. First, the storage component is the most novel and generally misunderstood in the CCS chain, as there is already extensive experience on the construction of industrial facilities (used in the CO_2 capture) and pipelines (used to transport the CO_2). Second, storage presents most of the potential new impacts and issues around community engagement associated with CCS.

Figure 3 lays out the timeline for a representative geological CO_2 storage project. It is important to note that the exact sequence of events may vary among projects. In addition, a number of potential sites will likely be evaluated and characterized at the start of a CCS scoping process, with only a few proving viable for hosting projects. One factor is that for some locations, such as areas of active oil and gas exploration and production, the regional geology is likely well understood and characterized, while other regions, such as those above deep saline formations, will need substantial initial assessment efforts. All sites require detailed characterization specialized for CCS purposes.

1. Site selection

Several steps need to be completed as an operator chooses an appropriate site for a CO_2 injection and storage project. These steps may span months or years, depending on candidate-site characteristics and other evolving variables affecting the project's feasibility, such as legislation, financing opportunities, and technological developments. As an operator progresses through the three site selection steps below, the uncertainty in the viability of a site to function as an effective geological CO_2 storage site diminishes, until the final site selection has been reached. Implicit in this description is the notion that several sites may be simultaneously assessed and evaluated by the developer, as well as the possibility that any or all sites may be discarded for commercial reasons unrelated to any specific local factors.

PRELIMINARY FEASIBILITY AND SITE SCREENING

A preliminary feasibility study is often conducted with available data that describe regional geology. Such information is available from governmental agencies worldwide, such as geological surveys or oil and gas permitting authorities, and private firms may hold additional information. Types of basic information include the location of sedimentary basins and other general characteristics that will serve as a preliminary screening tool. More details about a site may be available for areas where there has been past exploration for oil, minerals, or geothermal power.

Regional data can provide insights into the presence or absence of key geological criteria needed for safe and secure CO_2 storage, such as the presence of a cap rock that will serve as a geologic seal and help ensure that the CO_2 is safely contained in the target formation. At this point in the process, the operator develops a conceptual model of the regional geology, which serves as the basis for a computational reservoir model. Based on readily available data, this conceptual model includes the general location and classification of rock types in a selected area, known wells, faults, basic characteristics of fluids contained in the reservoir's rocks, and the likelihood of future seismic activity. This model is then continuously updated and refined throughout the storage process.

There are many other factors that will affect the viability of a storage project at the preliminary feasibility stage. These may be associated with the cost or procurement of lease/license applications, general funding (e.g., any government-set carbon price at the time of the project, public grants, and/or private financing arrangements), or costs of negotiating with users of areas adjacent to the proposed storage site. A preliminary feasibility study will also consider factors such as the ability to purchase or lease land needed for operations and monitoring, or the ease of delivering CO_2 and other materials needed for the proposed storage facility. At this time in the project-planning phase, there is significant uncertainty over whether the project concept can be realized; and the project developer may not have answers to questions regarding the specifics of the project design or location.

Figure 3: Generic Timeline for a CCS CO_2 Storage Project

1. Site Selection	2. Project Plans and Construction	3. Operation	4. Closure and Post-injection Monitoring	5. Post-closure Stewardship
■ Preliminary feasibility and site screening ■ Preliminary and detailed geological characterization ■ Simulate injection in models	■ Site-specific Project Plan ■ Risk Assessment and Contingency Plans ■ Construction ■ Well Integrity Tests	■ CO_2 Injection ■ Ongoing Validation and Updating of Underground Model	■ Cease of Operations ■ Closure of Most Wells ■ Post-Injection Monitoring ■ Application for Site Closure	■ Potential Transfer of Responsibility ■ Routine Maintenance ■ Long-Term Monitoring
1–10 YEARS		1–50 YEARS	20–50 YEARS	INDEFINITE

PRELIMINARY GEOLOGICAL CHARACTERIZATION

For sites that look promising based on preliminary feasibility studies, further investigation of available geological information will be necessary. This will include a comprehensive assessment of all available geological information, such as data from nearby wells, existing core samples, accessible seismic surveys, records and descriptions of existing, plugged or abandoned wells, and other resources. The project developer may also conduct some preliminary seismic surveys to provide site-specific details on the geological strata, though sometimes this step is postponed until choices have narrowed to a primary candidate site. This information is used to develop site-specific reservoir models and make a final site selection.

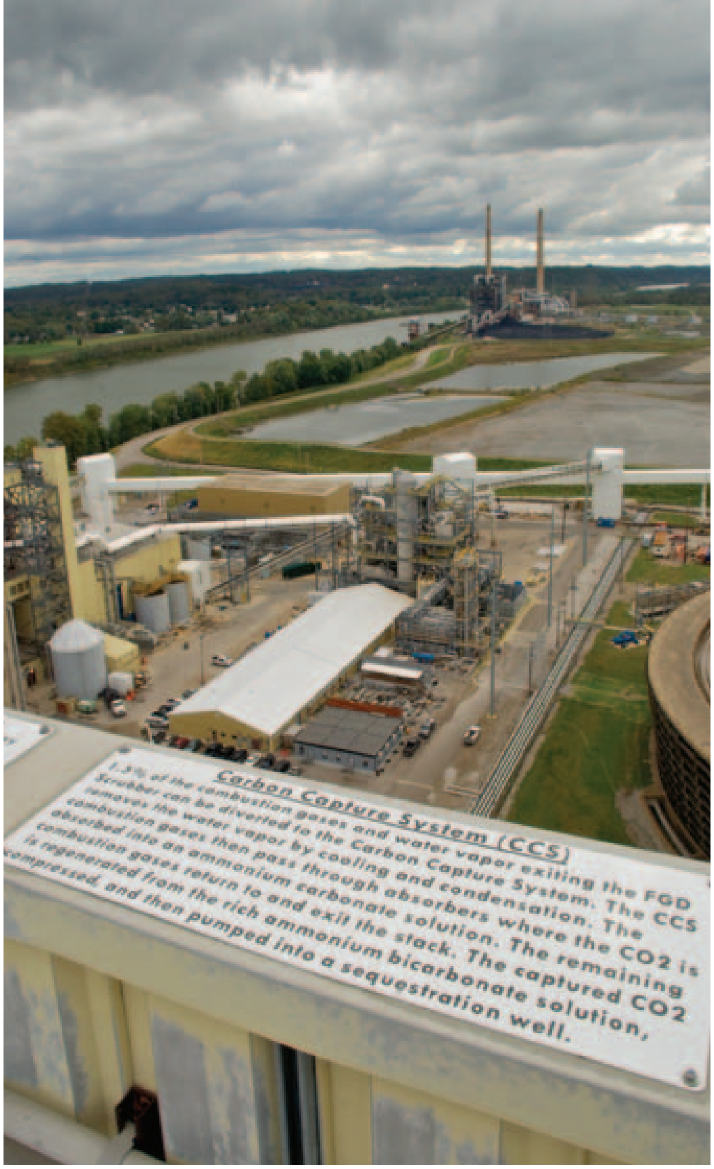
DETAILED GEOLOGICAL CHARACTERIZATION

If preliminary, site-specific geological characterization proves successful, in most cases the next steps are to acquire a local seismic survey, and then to drill one or more site characterization wells to collect site-specific geological information, and to perform injection tests if needed. Such data is needed to accurately predict the ability of the geology at the site to accommodate the planned volume and injection rates of CO_2. In some cases, this information is already available, usually when the site under consideration is a depleted oil or gas field. The data is entered into the site-specific reservoir model and used to simulate the planned CO_2 injection, including the expected behavior and extent of the CO_2 plume and of the generated overpressure, after injection is complete.

2. Project plans and construction

After the final site has been selected, and before actual construction takes place, the developer creates a fully detailed, site-specific project plan. This plan includes a comprehensive risk assessment, as well as contingency plans to guide upcoming operations. On top of this, the developer produces monitoring plans, decommissioning plans, and post-closure site plans.

The decision to develop the storage facility by drilling wells for CO_2 injection and/or monitoring is made based on the information gathered during site characterization. However, prior to the actual drilling of such wells, additional geological details are gathered. Project-specific considerations will determine the exact well and facility design, but in general these will resemble practices for well construction used by the oil and gas industry. Water- and CO_2 injection tests may be conducted to provide new detail that will then be incorporated into the subsurface model and further the understanding of the local geology.



Construction takes place after these steps are completed, and plans may be revised to incorporate any new geological knowledge emerging from drilling the injection well(s). Such revisions are usually minor, but may require changes to monitoring plans or even building additional wells beyond those initially planned. After construction is concluded, the integrity of the well(s) is tested prior to operational injections.[49]

3. Operation

Injection operations can conceivably last up to 50 years or more, depending on the volume of the sources and the effective geological storage capacity at the site. Throughout operation, data will be collected and used to periodically validate and, if necessary, update the site-specific reservoir model and CO_2 injection simulation. Through this process, over time the models will evolve to more closely represent subsurface conditions and predict with increasing accuracy the behavior of injected CO_2. Ongoing site characterization, monitoring, and simulation models will inform operational decisions, and regulatory bodies will periodically analyze whether actual injection is adequately monitored and managed.

4. Closure and post-injection monitoring

During site closure, injection will cease, and the majority of injection wells will be closed (often referred to as "plugged" or "abandoned"), except for those used in monitoring. During this period, operators will conduct a final assessment of all wells, and ideally the data from each site will be reported in a publicly accessible registry. Operators will be required to undertake post-injection monitoring to demonstrate that the storage project does not present CO_2 leaks or endanger human health or the environment. In many countries, operators will submit relevant information to the regulator to receive a certification of site closure, so that responsibility for the site can transfer to the designated authority at this point.

5. Post-closure stewardship

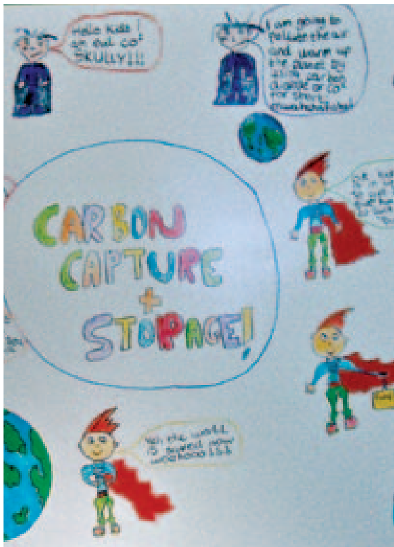
Under some proposed regulatory frameworks, such as the current EU directive on CCS, once a project is certified as closed, the responsibility for the site is transferred from the operator and managed by the government, or by an institution created specifically for post-closure stewardship of CCS sites. At this stage, the operator should have proven that the CO_2 is securely stored; activities at the site should be limited to routine maintenance and monitoring tasks, as needed.

Because of the current lack of specific regulation in some countries (see CCS Regulations and Permitting Process, on page 33) for closure and post-closure stewardship issues and because the existing commercial-scale CCS projects have not reached this stage yet, there is still some uncertainty concerning steps 4 and 5 above.[50] Therefore, steps taken after operations cease may differ according to the context of individual countries, and possibly that of individual sites (depending on site-specific post-closure plans). For example, in some countries, regulators may demand the presence of an independent third-party to carry out monitoring, reporting or auditing activities, or even require that responsibility for the site remain with the operator indefinitely.

> *"Because of the current lack of specific regulation in some countries for closure and post-closure stewardship issues and because the existing commercial-scale CCS projects have not yet reached this stage, there is still some uncertainty concerning the requirements in these steps; these may differ according to the context of individual countries and sites."*

CHAPTER 3

LEVERAGING EXPERIENCE FROM OTHER INDUSTRIES AND CCS PROJECTS



The Guidelines builds not only upon literature and hands-on experience with CCS demonstration projects, but also upon the extensive experience and research in community engagement in similar industries. In fact, many of the questions communities have about CCS projects resemble those pertaining to environmental issues for which best practices for community engagement have been long established and implemented.

Examples of relevant, existing best practices for each audience group include:

- **REGULATORS:** The Aarhus Convention provides a framework for public participation and access to information that can be useful as regulators consider public participation and data access requirements for CCS.[51] Individual country rules for public participation, such as those described in Appendix 1, and public databases for oil and gas wells will also provide useful reference points.

Example: CO_2 Flooding in Seminole, Texas

Communities surrounding the Permian Basin of west Texas, USA, have had a long relationship with oil exploration. For almost a century, oil has been prospected through wells drilled both inside and outside city limits in the area. After decades of exploration near the town of Seminole, primary oil production started to decline, and in 1969, operators introduced a water-flooding technique to enhance the oil production of old wells. In 1983, operators started converting their flooding medium to carbon dioxide (CO_2), which allowed even more oil recovery from the nearly exhausted wells. Experiments with the new CO_2 flooding technology started outside the city limits, as it had happened with the earlier water-flooding technique.

Oil operators had a long working relationship with the local population, and many of the original oil wells were located within Seminole town limits, yielding economic benefits through jobs, tax income, and additional economic activity. The operator consulted extensively with the town council while developing expansion plans for CO_2 injection across the local oil field. Because of the novel nature of the technology at the time, the town council decided not to allow CO_2 injection wells within the city until more was known about the long-term impacts. The operators respected their request, the CO_2 flooding plan was altered, and injection has been restricted to wells outside the town limits for almost three decades. By choosing not to oppose the town's decision and taking its concerns into consideration, the operators strengthened their relationship with the local population, keeping an "open door" to revisit the issue when the technology matured over the years.

Recently, with the accumulating experience in CO_2 flooding and the enduring atmosphere of mutual benefit and trust between the town and the operators, talks between the two parties have resumed on friendly terms, and CO_2 injection wells may be allowed within city limits in the near future.

- **LOCAL DECISIONMAKERS:** Previous WRI reports outline considerations for community leaders relevant to CCS, including the importance of an inclusive, accountable, and transparent process and of collaborating with project developers in project design and implementation, in order to shape it to meet local needs and generate community benefits.[52,53]

- **PROJECT DEVELOPERS:** The standards outlined in ISO 14063 provide guidance for internal and external environmental communication that could apply to CCS projects. Another tool under development is ESTEEM, an Internet-based tool specifically developed to support project managers in creating more societal acceptance for energy projects by engaging stakeholders (see box on page 66-67). In addition, the DOE's *Best Practices for Public Outreach and Education for Carbon Storage Projects* specifically assists project developers in understanding and applying best outreach practices for siting and operating CO_2 storage projects.[54]

Although experience with community engagement around CCS projects worldwide is still somewhat limited, the stakeholder group quickly identified a list of what can go wrong. The group's collective experience indicates that local community engagement can become ineffective in the following circumstances, whether they are real or perceived:

Ten Ways Community Engagement Can Fail

- When there is minimal or no community involvement or efforts to engage the community
- When information providers are not considered neutral when they should be, or are not trusted
- When information is only exchanged in the form of project advocacy or opposition
- When the local community perceives itself as a "guinea pig," or the subject of experimental research against its own will
- When insufficient resources are applied to engagement
- When engagement is attempted too late in the development process
- When communication is not open and factual, and processes are not transparent
- When the media or a government entity announces the project before the community is engaged
- When potential benefits and risks for the community are not clearly defined, communicated, or fairly distributed
- When those accountable and those making decisions are not present or participating in the process

The Business Case for Free, Prior, and Informed Consent (FPIC)

The principles of "free, prior, and informed consent" (FPIC) are one of the main building blocks leading to this report's set of guidelines for community engagement on carbon dioxide capture and storage (although the stakeholder group did not formally endorse FPIC). FPIC is widely regarded by nongovernmental organizations and community advocates as the gold standard of community engagement. A voluntary process between project developers and local communities, it does not equate *consent* to *veto-power* by communities, but it does give local people a significant voice in shaping projects on their doorstep.

In a 2007 Report, WRI presented several case studies that illustrate the business case for obtaining a host community's FPIC regarding a potential project.[1] The report proposed the following principles to assist ***project developers:***

- **Information.** Affected communities should be provided with sufficient information in local languages regarding the proposed project. Project developers should work with communities to understand the types of information the communities need to make informed decisions and must allow sufficient time for communities to review and discuss information provided to them.
- **Inclusiveness.** All interested community members should be allowed and encouraged to take part in the FPIC process, including stakeholders affected by indirect or cumulative impacts.
- **Dialogue.** Dialogue within an FPIC process should be formalized, continue throughout the lifetime of a project, and include government and local stakeholder representatives.
- **Legal recognition.** FPIC should be formally recognized through binding, negotiated agreements. There should be a sufficient period of time for community decisionmaking prior to project commencement.
- **Monitoring and evaluation**. Opportunities for appropriate and independent community monitoring should be put in place. Monitoring and evaluation should be supported by independent grievance processes to ensure that community concerns are addressed throughout a project's lifetime.
- **Corporate buy-in.** Project developers should view FPIC as an inherent and necessary cost of project development. Where appropriate, developers should find constructive ways to channel funds to communities to maintain the integrity of the process and the independence of the community's role.

The report also offers guidelines for ***local decisionmakers.***

Community involvement and consent work best in a setting where the host-country government recognizes these concerns as a matter of law or policy. Project developers should work with governments to gain their endorsement and involvement in the FPIC process.

[1] Sohn, J. et al., 2007. *Development without Conflict: The Business Case for Informed Consent* (Washington, DC: World Resources Institute, 2007). Available at: http://www.wri.org/publication/development-without-conflict

Case Study Experience from CCS Research and Demonstrations

Although CCS is a new technology, there is a growing body of literature and experience in engaging communities around potential CCS projects. The following case studies are examples of the various strategies that have been employed and the different outcomes that have occurred by the time of publication in late 2010, unless otherwise noted. Each is written by one or more members of the stakeholder group convened to produce the Guidelines. The case studies are preceded by a synthesis (Figure 4 below) summarizing for each case the author's perspective, key engagement tools, and the project outcome, and are followed by a brief analysis of some potential lessons to be drawn.

In addition to the six experiences detailed below—four from the United States and one each from the Netherlands and Australia—there are scores of other communities currently considering CCS project proposals and working in support or opposition of the proposed activity. This number will tend to grow as the deployment rate of CCS projects increases over time. The lessons from early engagement experiences, such as the ones presented below, should be instrumental in determining the interaction environment in which future CCS community engagement processes will take place.

Figure 4: Synthesis of Case Studies

CASE STUDY	AUTHOR PERSPECTIVE	PROJECT TYPE	ENGAGEMENT TOOLS USED	PROJECT OUTCOME
Barendrecht	Independent observer	CCS at an oil refinery (0.3 million tCO_2/year)	■ Formal hearings as part of impact assessments ■ Information center at shopping mall ■ Websites and informational flyers ■ Personal visits by national ministers	Project cancelled by the Government due to extensive delays and complete lack of local support
Wallula	Project developer	CCS research at a paper mill	■ Interviews and focus groups ■ Communications about project made publicly available ■ Site tours for public	Initial community resistance; project was reconfigured and moved to a new site where local community supports project
FutureGen	National project developer, local project team, and community representative	Research-oriented IGCC with CCS (1 million tCO_2/year)	■ Economic development perspective emphasized ■ Educational demonstrations and meetings with local residents ■ Public hearings	Strong community support for hosting the original project; later rejection due to project's redesign
Otway	Project developer	Research-scale injection	■ Formal social science assessment and two-way consultation plan ■ Formed a community reference group ■ Project has a community liaison	Project supported by local community
Jamestown	Community opposition	50 MW new coal plant with CCS research	■ Scoping meetings ■ Informational community meetings ■ Workshops on CCS ■ Media attention	Strong opposition to project remains while developers continue to seek full financing
Carson	Project developer	500 MW IGCC with CCS (2 million tCO_2/yr)	■ Briefings with state and local officials ■ Briefings for key community groups ■ Emphasis on project benefits	Project developer did not proceed with this project, and is instead looking at a similar project in another location

CASE STUDY #1

Barendrecht CCS Project—Barendrecht (The Netherlands)

BY H. C. DE CONINCK AND C.F.J. (YNKE) FEENSTRA, ENERGY RESEARCH CENTRE OF THE NETHERLANDS

The Dutch Barendrecht CCS project planned to capture CO_2 from a pure CO_2 point source in a large Shell refinery in the port of Rotterdam and store the CO_2 in two recently depleted onshore gas fields under the town of Barendrecht. The capture-ready CO_2 source, existing pipelines, and well infrastructure, as well as the short distances between capture and storage, made the project an economically attractive demonstration of CCS. The CO_2 stored would amount to some 300,000 metric tons per year, and the total storage capacity in the reservoir is around 10.3 million metric tons of CO_2. The project was subsidized by the Dutch Government. In addition, Shell, as the owner of the refinery, covered part of the costs. Other project participants included NAM, the corporation that owns the depleted gas fields; OCAP, the distributor of CO_2; and TNO, an independent research institute, for the underground monitoring.

Regulations required Shell and NAM to perform an environmental impact assessment (EIA) of the proposed project. The impact assessment process included providing information to the community members of the area where the CO_2 would be stored. Information was provided in two informational meetings in Barendrecht in the spring of 2008. The meetings showed that both inhabitants and local politicians had many questions about the project that could not be answered sufficiently at the time. The project developers performed additional research and communication on the items that were raised in the following months. Additionally, an administrative discussion platform and communication working group were set up, in which the project developers, the national government, and the local government (at municipal and provincial levels) were represented. Despite these outreach efforts, the city council unanimously voted against the project because of the concerns of local politicians and inhabitants.

In November 2008, the national government decided to allocate EUR 30 million to the project. This decision was followed by two additional informational events for local communities in the spring of 2009, organized by local parties in the city council, where both opponents and advocates (project developers) presented their views. Surprisingly, no NGOs joined the meetings, which attracted over 1,000 people, who demonstrated emotion and concern about the CCS plans for Barendrecht. The meeting was reported on Dutch national and international news, which gave the project wide media exposure and recognition.

In April 2009, the environmental impact assessment was officially approved by the independent EIA commission, which paved the way for the project to be licensed. The independence of the EIA commission was immediately questioned by local politicians and community members in Barendrecht. The Dutch Government delayed any decision on the project until December 2009, to allow the local situation to calm down and better inform local stakeholders. It set up an information centre on CCS in a shopping mall, arranged visits by two government ministers to Barendrecht to talk face-to-face with community members about CCS and the project, performed additional research on other possible locations for CO_2 storage, and hired additional external experts to answer specific questions. Meanwhile, a group of citizens set up a foundation to organize resistance to the project.

The drivers for this strong resistance against the project have not yet been investigated in depth, as the events are quite recent. However, official documents and reports of city council discussions show a variety of concerns, including possible devaluation of properties, and the existing environmental pressures on the town, due to its location close to the industrial harbour of Rotterdam and the recent construction of a new neighborhood, a major goods train track, and a highway extension. Other arguments included the lack of a "100 percent safety guarantee," the fact that the project is a "demonstration," and that technologies should not be "tested" in a densely populated area. Arguably, the style of the project's communication—mainly created by the industrial developer and focused on providing information rather than consultation and engagement—led to the community, including local politicians, feeling disengaged and even ignored. The implementation of a national law that makes it easier for the national government to overrule local decisions concerning projects of national interest (including CCS) in March 2009 may have also increased these feelings.

In December 2009, the national government decided to continue with the Barendrecht project, despite local opposition and negative votes in the city and provincial councils. The ministers came to Barendrecht to explain their decision at a public meeting, which was very emotional, and received significant media coverage. This raised some questions in the national parliament. However, a subsequent debate in January 2010 concluded that the government would continue with the project, creating a fund to cover possible devaluation of local property due to the project.

In November 2010, the national government reverted its decision and cancelled the Barendrecht project. In an official letter to the parliament, the Government explained that the project was no longer essential to CCS development because there were other CCS initiatives elsewhere in the country. In this context, the Government decided to stop pursuing CO_2 storage in Barendrecht due to the extensive delays faced by the project, and the "complete lack of local support".

CASE STUDY #2

Wallula Project—Wallula, Washington (USA)

BY G. HUND, BATTELLE

With support from the Big Sky Carbon Sequestration Partnership, funded by the DOE's National Energy Technology Laboratory and several private partners, Battelle, a contractor to the DOE, has led efforts to design and conduct a pilot CCS project in an expansive, deep basalt formation in eastern Washington state, in the United States. The project would purchase small quantities of food-grade CO_2 from a third party to be injected and monitored in the basalt formation, in order to learn more about CO_2 storage in this kind of geology.

Initially, the technical team hoped to site the pilot on the Hanford site—a remote site used in support of the Manhattan Project to develop a nuclear weapons capability. The site was significantly contaminated, and an extensive cleanup effort has resulted in numerous well-characterized deep wells. However, a decision was made by the lead DOE office managing the site that the pilot could be seen as competing with the primary cleanup mission. Shortly thereafter, an invitation was received to move the pilot site to land owned by the Port of Walla Walla, in Washington. However, another company consortium—in an unrelated move parallel with the pilot CCS test—demonstrated its interest in developing an innovative coal plant on the site, with hopes of storing its eventual CO_2 emissions in the basalt formation. Because of the small-scale scientific and technical focus of the pilot Battelle study, limited community engagement had occurred up to this point. When the community realized that there was separate interest in building a coal plant, a group of citizens convened to oppose the proposal. The Port felt that they could not move forward with the CCS pilot project among such public outcry.

The CCS pilot was reconfigured a third time to be sited on private land, at a nearby paper mill in Wallula, Washington. In coordination with the new partners, a communications and community engagement plan was developed. A fact sheet and question and answer sheet were drafted. Interviews were conducted with community leaders to describe the new partnership and emphasize that no coal plant was part of the plan. The outreach team also met with the media before the partnership between Battelle and the paper mill was announced, in order to answer questions and clarify misconceptions. After the announcement, the team met with dozens of stakeholders and several community groups representing a broad range of interests to describe the project and answer questions. This included meetings with the previously vocal group against the project. Outreach coordinators from both Battelle and the paper mill attended, as well as senior management from the paper mill and a technical CCS lead from Battelle. These discussions were frank, and a commitment to share correspondence was made between Battelle/paper mill staff and the state regulator with this group, to demonstrate the team's interest in being transparent. In addition to interviews and small meetings/focus groups with stakeholders, an open house and tours of the proposed site were provided for stakeholders and members of the media. Geology classes from a local college toured CCS laboratories and the drilling site. This engagement resulted in hiring summer interns and increased the community's awareness and understanding of CCS.

The outreach team emphasized the win-win attributes of the project—the community would gain from the removal of CO_2 (and other associated compounds that cause odors) from a nearby plant, the paper mill was receiving support from DOE and Battelle to conduct the pilot project, and Battelle was gaining important scientific knowledge to further evaluate CCS occurring in basalts. The team further stressed that the paper mill was not required to investigate the feasibility of capturing and storing its CO_2 onsite, but did so proactively. As a result of the various community engagement approaches and associated accurate media coverage, there was a much better understanding of the pilot's objective and that promoting the siting of a coal plant was not the focus of the research. This community engagement has resulted in little to no public opposition, positive press articles, and improved public trust. The community engagement around this project is still ongoing in late 2010, with the results from the characterization well shared with community members.

CASE STUDY #3

FutureGen—Mattoon, Illinois (USA)

BY S. GREENBERG, ILLINOIS STATE GEOLOGICAL SURVEY, AND G. HUND, BATTELLE

FutureGen is a public-private partnership between the DOE and the FutureGen Alliance (the Alliance), a consortium of national and international coal companies and power utilities. The Alliance is a not-for-profit organization created with the mission of disseminating information and lessons learned in the process of creating and operating an integrated gasification combined cycle (IGCC) power plant with CCS, somewhere in the United States. Knowledge sharing, worldwide, is a fundamental goal of the project and is integral to the communications strategy. A competitive process was conducted between 2001 and 2007 to choose the eventual site for FutureGen. A dozen communities from seven American states responded, generally motivated by job potential, economic development, and the opportunity to host a world-class research facility. Based on extensive siting criteria, four sites were selected as semifinal candidates to host the facility: two in Texas and two in Illinois.

Site selection was based on several technical and social components, with community engagement a major focus. Due in part to the competitive nature of the FutureGen project, the community engagement process was conducted on multiple levels. The Alliance, as the project developer, focused on the selection of a suitable site and conducted social characterization of sites as one of their criteria. For example, newspaper articles were reviewed daily from all of the candidate sites to gauge community support. Additionally, stakeholders in the four semifinalist communities were identified and interviewed. The states and communities competing to host the project conducted community engagement on a more local level, building project-developer teams. Public engagement on the local level included hosting meetings, giving presentations, providing demonstrations explaining the project and CCS, and providing opportunities for stakeholders to ask questions of project developers, economic developers, and state officials.

In Illinois, the FutureGen for Illinois project team (the Illinois Project Team) was driven by the Illinois Department of Commerce and Economic Opportunity, along with the Illinois State Geological Survey, the competing cities of Mattoon and Tuscola, community economic development teams, industry partners, consultants, and state and local politicians. The Illinois Project Team focused first on bringing FutureGen to Illinois and then on individual communities. Mattoon and Tuscola are 40 km (25 miles) apart and share similar geological sequestration site characteristics, as well as social characteristics. Both are rural farming communities interested in job opportunities and located near major universities and community colleges.

Community engagement served different purposes for the Alliance and for local project developers. The Alliance engaged community stakeholders to determine issues, concerns, and overall perceptions of a potential host community, and to answer any questions about the technology and project in general. The Illinois Project Team focused on educating stakeholders about FutureGen, CCS, and the potential opportunities the project brought to the region, which has considerable coal resources, suitable CCS geology, an active interest in reducing pollution from coal, and preexisting experience with analogous industries, such as oil production and natural gas storage. The community engagement process was successful from both the Alliance and the Illinois Project Team perspective.

Members of the Illinois Project Team, especially local business development specialists, were crucial contacts for the Alliance stakeholder involvement team. The Illinois Project Team identified interested local parties and then arranged numerous meetings with a diverse range of stakeholders, so that the Alliance team could describe the project, but more importantly, so that the Alliance team could hear local issues and concerns. The Alliance team visited all four sites and met with over 200 stakeholders. The vast majority of citizens from all sites were interested in having the facility sited in their community. Examples of groups with whom the Alliance team met included residents who live within a 16-km (10-mile) radius of the proposed site, community leaders, farming association members, educators, nearby industrial business representatives, state regulators, environmental interest groups, and the media.

The Alliance team shared a fact sheet describing the project and walked through a technology flow diagram, illustrating how the integrated system would work. If the Alliance team did not know the answer to a particular question, it committed to finding the answer and getting back to the stakeholder. Questions asked during these interviews greatly influenced the content of a "frequently asked questions" section developed for the Alliance's website. The Illinois Project Team was helpful in getting specific responses back to the appropriate stakeholder. The major topics of interest were:

- Job opportunities
- Use of local coal
- Potential disturbances (e.g., light, noise)
- Water requirements
- Groundwater contamination risk

CASE STUDY #3 (CONTINUED)

- CCS and monitoring process
- Maintaining land use rights
- Impact on power costs
- Decommissioning plans
- Potential for research user facility

The Illinois Project Team began community engagement during the proposal writing stage with a series of four public meetings at proposed project sites. Once the two Illinois semifinal sites were chosen, the Illinois Project Team created a task force to broaden the scope of outreach and communication. A task force briefing for major community leaders, university presidents, trade groups, business developers, farming groups, industry, media, legislators, utilities, and many others provided briefing material, FAQs, and materials to use when discussing the project with constituents and stakeholders. A series of meetings was held with stakeholders to educate the community about FutureGen and CCS, using hands-on, physical demonstrations—such as rock samples and a three-dimensional sequestration model that shows how CO_2 behaves in the subsurface—and had a great impact on creating understanding. Major questions and topics of interest included:

- What happens to stored CO_2 in the event of an earthquake?
- Where does formation water go when CO_2 is injected?
- Will the siting of a pipeline impact my property value?
- How does CO_2 stay in the rock formation?

A formal component to community engagement occurred when the DOE held its public hearings as required under the National Environmental Policy Act. This is an official opportunity for stakeholders to testify and raise issues about the proposed project. For 2 hours prior to each meeting, the Illinois Project Team and the Alliance participated in an open house, where technical experts were stationed at public displays related to aspects of the project. One station included representatives from the Illinois State Geological Survey demonstrating the sequestration model. Other stations held FutureGen engineer experts, state officials, and other project developers there to answer questions. Members of the public took this opportunity to ask questions in an informal setting, so during the official hearing, testimony focused on positive aspects of bringing FutureGen to Illinois, and very few negative comments were received. The benefits of jobs, added economic opportunity for the community, and the prestige of hosting the innovative facility were perceived as much greater than the possible risks associated with the project.

Changes in FutureGen and the Reaction from Local Communities

The U.S. Department of Energy (DOE) initiated the FutureGen project in 2003. In December 2007, the DOE put the project on hold and developed a plan for restructuring, which was not implemented. In 2009, Congress allocated US$1 billion in stimulus funding for the stalled project. In August 2010, 7 years after the initial announcement, the DOE announced another restructuring, to FutureGen 2.0.[1] The redesigned project would not include the construction of a state-of-the art IGCC plant and research laboratory, but would instead repower an existing power plant in Meridosia, Illinois, to be the largest oxygen-combustion carbon dioxide capture and storage (CCS) retrofit in the world, and transport the captured carbon dioxide (CO_2) through pipeline to Mattoon, where it would be injected underground for permanent storage.

The following letter was submitted to WRI for use in this report in the weeks immediately following the announcement and reflects the position of the local economic development lead in Mattoon, Illinois, on the restructured project, as of October 2010.

[1] U.S. Department of Energy. 2010. "Secretary Chu Announces FutureGen 2.0". Fossil Energy Techline, Department of Energy Office of Public Affairs, August 5, 2010.

An open letter from a local community leader in Mattoon, IL

I think it is entirely appropriate for my piece to continue where the case study above ends. The authors provide a framework for community engagement that clearly worked and a backdrop for why our community felt it needed to back out after the recent changes.

The last sentence of the case study is particularly poignant given the latest, and perhaps final, twist in the FutureGen project. Clearly, WRI is developing guidelines for community engagement to address misconceptions about CCS and community resistance to CCS. The irony of the FutureGen case study is that a community, actually a region, was willing to be the first to test, demonstrate, and host—all those words that can make other communities afraid—a prototype, large-scale integrated coal plant with CCS. Mattoon supported this project. Our citizens embraced it. They were proud to play a role in proving this forward-thinking technology works, that it is safe, and that it has the potential to help address climate change and the impact of CO_2 emissions. While many communities across the globe have rejected CCS projects because there is a belief it is unproven and may jeopardize public health and safety, our community of more than 50,000 people was willing to stake its future on the emerging science of CCS and the probability that there are no immediate or long-term dangers associated with it. We spent a great deal of time with members of the FutureGen Alliance. We trusted them and their motives. They were sincere in their quest to develop, share, and deploy technology that could make a meaningful impact on the environment we are leaving future generations. Those were the kind of partners we wanted. As a result, we didn't merely open our minds and our community to the project. Our citizens, community leaders, and business leaders enthusiastically dedicated more than 4 years of work and substantial financial resources to support the siting, development, and construction of the project. This community was vested intellectually, financially, and emotionally in the FutureGen project. We believed our role to be vital and fundamental to the project's success. At the end of the testing, research, and vetting period, we knew our site would be highly regarded for CCS projects, perhaps even for projects where permanent employment would be higher, yet we were still eager for our partners to use it in this important endeavor.

The community engagement and education process was critical in generating the support the original FutureGen project enjoyed in Mattoon. That process was

CASE STUDY #3 (CONTINUED)

the solution to any unfounded, unsubstantiated, or provocative reactions to the project. Eventually most of the local stakeholders, special interest groups, and concerned citizens across the county supported the project. While a few remained skeptical of the science or of industrial development in general, ultimately even they were willing to trade their skepticism for the promise of job creation and a project that would change the local economy for their children and the global environment for their grandchildren.

That all changed when FutureGen 2.0 was announced. The reason I've gone into such great detail to convey the depth of support and sentiment for the original FutureGen project and for the private sector partners at the Alliance is to be clear about the reasons we pulled out of FutureGen 2.0. They had nothing to do with apprehension or opposition to CCS in our community. Rather, it was because of the enormously diminished role our federal partners envisioned for this community. Our citizens, business leaders, and elected officials had a sophisticated understanding of the FutureGen project. The tangible (job creation) and intangible benefits (focal point for development of technologies that address greenhouse gas emissions) of participating in FutureGen were immeasurable. Unfortunately, in the revised FutureGen 2.0 there would have been very few jobs created, few opportunities for spin-off economic development, and a trivial role in advancing solutions to climate change. During the community engagement process, this community came to view our ability to participate in cutting-edge technologies that could provide solutions to climate change or provide a platform for continued development of technologies that push the envelope in research and scientific study as an enormous reward. Given everything the community sacrificed, the opportunities lost as we pursued FutureGen, and the years we continued to support the project—even when federal partners at various times did not—we were unwilling to be a partner in FutureGen 2.0, wherein our role would simply have been to store the CO_2 generated and piped from a prototype power plant on the other side of the state. Doing so would have effectively eliminated the role of our community in the pursuit of technologies that may offer dramatic and prolonged solutions to environmental challenges.

As the economic developer who took the lead for the community in the recruitment of this project and the education and engagement of the citizens, and who was the standard bearer in the movement to create public acceptance and support for this project, I could not ask the citizens one more time to accept less than they worked for or deserved. They responded vehemently, clearly, and in large numbers that FutureGen 2.0 was not welcome in our community. Their verbal, written, and online comments overwhelmingly reflected their beliefs in the merit of the original project, and anything short of that would have to find another home. They continue to believe our community and our site have a higher and better purpose than FutureGen 2.0; one that hopefully resembles the original FutureGen project. My obligation is to work to bring something back that is as close to the original project as possible, and that unquestionably includes CCS.

Angela Griffin

—Angela Griffin, COLES TOGETHER

CASE STUDY #4

CO2CRC Otway Project—Nirranda, Victoria (Australia)

BY T. STEEPER, THE COOPERATIVE RESEARCH CENTRE FOR GREENHOUSE GAS TECHNOLOGIES (CO2CRC)

The Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC) is an international joint venture CCS research organization based in Australia. CO2CRC partners include industry, government, universities, and research organizations. The CO2CRC Otway Project in rural southwestern Victoria, currently Australia's only geosequestration project, is researching and demonstrating CO_2 storage, monitoring, and verification at an industrially significant scale.

In 2004, after considerable research, a site was identified in the Otway Basin near Nirranda, a dairy farming area of about 300 people with a growing tourism industry. The site is highly suitable for geosequestration research, as the geology contains suitable storage reservoirs, and there is a source of naturally occurring CO_2 nearby (from an existing natural gas production facility), which minimizes the additional costs of CO_2 capture and transportation by limiting the necessary new construction.

Because the site is within a close network of established farms, a community consultation program was a priority and critical to success. The aim of the program was to establish a relationship of trust with the Nirranda community, because the project—including construction of three wellheads, regular monitoring visits and surveys, ongoing tours, and media attention—would have a considerable effect on peoples' daily lives and farming operations. Indeed, one useful outcome has been finding out just how much of an impact monitoring, especially seismic monitoring, can have on agricultural land, and the best ways to manage it.

Early in the project, CO2CRC engaged an independent social research company that used focus groups and individual interviews to assess the local and regional community's attitudes toward CCS and identify concerns with the project. Research results showed that the community believed climate change was an important issue but had little knowledge of geosequestration or CCS.

Therefore, the initial focus was on provision of information. Promoting understanding of CCS and the aims of the project required that the community be informed about complex science and technological concepts, including global warming, the production of greenhouse gas emissions, geophysics, geochemistry, and risk analysis. The community had considerable experience with the oil and gas and natural gas storage

CASE STUDY #4 (CONTINUED)

industry, which from a project developer's perspective was both an advantage (familiarity with operations such as drilling of wells and seismic surveys) and a disadvantage (overconsultation on resource projects, high expectations of remuneration). One farmer noted there had been 12 seismic surveys on his land in the past 15 years.

CO2CRC used public meetings, publications such as newsletters and fact sheets, briefings, face-to-face meetings, and the media to inform the community about climate change, CCS and the project aims. Other tools used were CO2CRC's comprehensive and regularly updated website on CCS and CO2CRC research and a project update newsletter that is regularly mailed to the local community. The results of the social research were used to develop a two-way consultation plan, using the best-practice recommendations of the International Association of Public Participation.

An important element of the plan was the establishment of a community reference group comprising landowners, regulators, local NGOs, and project management. This provided an avenue for two-way communication, acting as a conduit between the community and project developer and assisting with early identification of emerging issues. The group has credibility in the community and met frequently in the early days of the project. It currently meets twice yearly, or as needed. Through the group, CO2CRC undertakes to listen and provide feedback and/or action on community issues and concerns.

Also a vital part to continuing consultation is the Community Liaison Officer, who provides a focal point for landholders, researchers, visitors, and the local community. The Community Liaison Officer is a local resident with excellent community links, as well as a background in education. With other project staff, the officer runs regular tours of the project for industry, researchers, and community groups and has found this an excellent way of communicating the project aims and the science of CCS. A crucial part of the officer's role is working with landholders and researchers to ensure good relations regarding access to local farms for monitoring and sampling surveys.

The Otway Project has been highly successful, with minimal public opposition, generally positive media coverage, and a considerable body of knowledge of geological storage and monitoring achieved. While the community consultation program was effective overall, it should be noted that some access issues were unable to be resolved without resorting to legislative avenues. This highlights the fact that despite a developer's best efforts, community consultation cannot guarantee a trouble-free project.

CASE STUDY #5

Jamestown Oxycoal Project—Jamestown, New York (USA)

BY W. SIMPSON, CLEAN ENERGY FOR JAMESTOWN

In 2004, the Jamestown, New York, Board of Public Utilities (JBPU), a municipal utility, announced plans to build a US$145 million, new, 50-megawatt (MW) coal-fired power plant to replace its existing Carlson coal plant. The project was billed as "clean coal" and would have used circulating fluidized bed (CFB) technology with no CO_2 emissions controls. The project proceeded through state-mandated draft and final environmental impact analyses, but as a result of criticism, in 2007 was discontinued in its initial form and redefined as a CCS demonstration project. The JBPU announced that it would seek federal funding for the CCS portion of the project, which was variously estimated to cost from US$250 million to $350 million, from the DOE Clean Coal Power Initiative (CCPI).

In June of 2008, New York Governor David Paterson announced his support for the modified project. Like the 2007 JBPU's CCS announcement, Governor Paterson's announcement occurred without any prior discussion with opponents of the project—who, not surprisingly, felt blindsided and reacted critically. While the JBPU and governor viewed the CCS redefinition of the project as reflective of fundamentally new "pro-environment" goals and aspirations, opponents were unconvinced.

Early JBPU community engagement efforts consisted of a series of "scoping" meetings for the initial CFB project, as required by New York's State Environmental Quality Review Act. After the project was redefined as a CCS demonstration, JBPU community engagement primarily consisted of informational community meetings that were sponsored and staffed by the JBPU, its Oxycoal Alliance corporate partners, and occasionally Governor Paterson's office. A series of workshops was also conducted by the New York State Department of Environmental Conservation. These were intended to discuss only CCS, though it was difficult for some participants to separate CCS from the controversial proposed new coal plant through which the CO_2 capture technology would be demonstrated.

Some community members perceived community engagement meetings conducted by all of the above as promotional and one-way in nature in order to minimize public criticism and controversy. From the beginning, it was perceived that the JBPU was intent on building a new coal plant of one kind or another, irrespective of community concerns or the validity of opposing arguments. This view was reinforced by the fact that the JBPU never commissioned a study of alternatives to a new coal plant with CCS, and an early JBPU study of power supply options glossed over energy efficiency and renewable energy sources. Critics of the project viewed this omission as unacceptable, especially since 80 to 90 percent of the electricity consumed by JBPU ratepayers is very low-cost hydropower from the New York Power Authority, leaving just a small load to be met by some other means.

The project's developer, the JBPU, is a branch of city government. Thus, the developer and local government are more or less the same—with the effect of removing local government as an independent agency to challenge the developer and represent community concerns and criticism.

Even though the JBPU is part of local government and describes itself as transparent, local activists and those representing a larger coalition of project critics found it increasingly difficult to obtain information about the proposed project. For example, the JBPU never publicly released its study on the cost of building and generating power from a new coal plant, its application for funding to the DOE, or a NYPA-funded study that concluded that the JBPU could reduce its ratepayer electric load by nearly 20 percent within 5 years with a properly designed energy efficiency program. In most cases, the New York State Freedom of Information Law was required to produce disclosure, and even then requested information was difficult or impossible to obtain. The lack of disclosure extended to the drilling of test wells to determine whether local geology is suitable for CO_2 sequestration. While the JBPU maintains that the drilling was done legally with proper state government oversight, the community was not informed of the drilling, which worried some residents and infuriated at least one county legislator in whose district the drilling occurred.

Community engagement for this project was further complicated and compromised by the nature of small-town politics. While a small core of local activists criticized the project (with support from a large coalition of environmental groups outside of Jamestown), other local residents steered clear of the controversy either out of apathy or fear of alienating the local "powers that be." Local news media aired some of the controversy, but coverage of opposing points of view was slim in the local daily newspaper, which was perceived by activists as a house organ for the JBPU. No regulatory agency provided guidelines for or enforced a public engagement process of any kind, let alone one that would have required full disclosure on the part of the

CASE STUDY #5 (CONTINUED)

project developer or imposed a process for bringing the community together to air issues and work constructively and openly on the project. Activists contend that basic issues were never addressed by the JBPU or through a community engagement process, including:

- Whether the new coal plant is needed by ratepayers
- How much electricity from the plant would cost and how it would impact electric rates
- Who would pay for the high costs of CCS after the 3-year DOE CCPI grant expired
- How the project would impact the local economy after construction, when the bills would be due and electric rates would rise
- Whether the JBPU's payments-in-lieu-of-taxes formula could be changed to ensure that the city and school district could receive the revenue they needed without building a new power plant
- What the alternatives were to building a new coal plant with CCS and how much these alternatives would have cost and impacted the environment compared to the JBPU's "clean coal" project

For the last 5 years, Clean Energy for Jamestown, a coalition of 20 regional, statewide, and national environmental groups, has joined local activists—who gathered under the banner of Concerned Citizens of the Jamestown Area—in opposing the JBPU project. This coalition, through a team of volunteers with energy and legal expertise in the nearby Buffalo area, has provided local activists with expert support. The Natural Resources Defense Council, which nationally supports the development of CCS, joined the critics of this project. Together they argued that the project was not suited for a CCS demonstration because neither the JBPU's existing Carlson coal-fired power plant nor its proposed new coal plant are needed to meet the electrical needs of the JBPU ratepayers and because alternatives—principally energy efficiency—would be much cleaner and cheaper. Interestingly enough, in the 6-year history of this project, no polls have ever been conducted to learn what fraction of Jamestown residents or JBPU ratepayers support or oppose the project. While a few local community members have been intensely engaged, most have been seemingly disinterested bystanders.

As of late 2010, the JBPU continues to pursue this project, having already spent—by its critics' estimate, based on JBPU data—US$10 million, or $500 per ratepayer, in development and promotions. However, in 2009, the JBPU's project was turned down for funding twice by the DOE CCPI, and the JBPU lost support from key Oxycoal Alliance partners, Praxair Inc., and the University at Buffalo. The JBPU's test drilling did not identify rock formations suitable for CO_2 injection. Also, CCS-enabling state legislation proposed in New York did not address liability issues and has not been passed by the New York State Legislature. And project critics were successful in a recent JBPU rate case before the New York State Public Service Commission (PSC) in convincing the commission to require that the JBPU stop spending ratepayer funds to develop and promote the new coal plant project with CCS. Also, in response to project critics, the PSC established a process to evaluate whether continued power generation and coal burning in Jamestown is in the best economic interests of JBPU ratepayers.

To improve community engagement on this project, the JBPU should have:

- Fairly considered alternatives to building a conventional coal-fired power plant or one demonstrating CCS; and
- Established a community engagement process that invited dialogue and criticism and was fully open to the possibility that not building a new coal-fired power plant, with or without CCS, was in the best interests of JBPU ratepayers, the city, and the environment.

An open, public process would include full disclosure of all project reports and documents, open town meetings that invited and encouraged honest exploration and the expression of divergent views, and a request to the local daily newspaper to function independently and cover and explore all views. Such a process would also have included the selection or appointment of a JBPU board of directors that held a diversity of opinion on how best to serve the future needs of electric ratepayers, the city, and the local economy.

Finally, the JBPU should have been willing to meet with and engage the organized opposition to its proposed project, the Clean Energy for Jamestown coalition. This never occurred, at least in part because of JBPU legal counsel opinion that a contact should be avoided because the opponents "have threatened a lawsuit." This "threat" was at best hypothetical (i.e., anyone can sue as a last resort if they disagree with the outcome of the state-mandated environmental review process), but it was used to prevent dialogue—though, admittedly, dialogue is difficult once battle lines have been drawn, and would have been fruitless if the JBPU remained committed to its project and unwilling to consider alternatives.

CASE STUDY #6

Carson Hydrogen Power (CHP) Project—Carson, California (USA)

BY G. MINTER, HYDROGEN ENERGY REPRESENTATIVE

Carson Hydrogen Power (CHP) was a proposed 500 MW integrated gasification combined cycle (IGCC) power plant with 90 percent capture, which would have sequestered over 2 million metric tons of CO_2 annually. The project, announced by a partnership of BP Alternative Energy and Mission Energy in 2006, was to be sited in Carson, California, in the United States. The town is adjacent to several oil refineries and to the Wilmington oil field, a sufficiently depleted oil reservoir that could serve as a geologic storage reservoir. Carbon dioxide was also to be used to support EOR operations, thus offsetting project costs. The project team began considering alternative site locations in the fall of 2007, because of its inability to obtain a commercial agreement with the operator of the Wilmington field on the purchase of CO_2 for EOR operations.

Project sponsors reached out to the community after the announcement of the project, during the period when preliminary studies were being prepared to submit a permit application to the state's energy regulatory authority. Initial outreach was conducted with state and local government officials, informing jurisdictional representatives of the project and its benefits. Additional outreach provided briefings for leaders of local community-based organizations, homeowners associations, environmental and air quality organizations, environmental justice organizations, business associations, and local labor.

Early outreach activities indicated that there would be support from business, labor, select state and local elected officials, several neighborhood organizations, and local community leaders. There also was indication of local opposition, primarily from local environmental justice groups.

Although the project never reached the point of submitting a permit application, and thus never entered a public approval process, CHP had briefed most of the local stakeholders likely to be involved in the public review. Special emphasis was focused upon key stakeholders, including adjacent Latino communities, environmental organizations, labor, and the city in which the facility was to be sited. CHP also formed a Latino outreach team and an environmental affairs outreach team, to focus efforts on these respective constituencies.

The project's location was an area of significant industrial activity and adjacent to predominantly minority and lower-income residential neighborhoods. While the project sponsors had focused on the benefits of existing infrastructure minimizing the need for new infrastructure, the addition of another industrial facility in an overburdened area developed into a community concern. Additionally, the local atmosphere was also significantly affected by other sources of emissions, making project-related criteria emissions an air quality concern, despite the benefit of CO_2 emissions reductions.

One unique aspect of the project that received both favorable and negative responses was the use of petroleum coke (pet coke), a by-product of oil refining, as the feedstock fuel. On one hand, processing of pet coke on-site was praised by some, because it would have resulted in reduced port truck traffic, and also would have eliminated the CO_2 emissions from the combustion of pet coke abroad. However, others did not approve of the use of pet coke, or any fossil fuel, in an area already home to several other petrochemical operations, because it was perceived as an overburdening of the local area.

In 2008, the lack of agreement with the operator of the Wilmington oil field resulted in a commercial decision by project sponsors to halt the CHP project. A new partnership was formed to pursue another project, to be sited adjacent to an oil reservoir located in Kern County, California, where there was a stronger interest in the use of CO_2 for EOR operations. This new Hydrogen Energy California (HECA) project is planned to be a 250 MW (net) base load IGCC power plant, also with 90 percent CCS. HECA is currently under public review by the California Energy Commission.

Case Study Experience: Common Themes and Lessons

Although each of the cases presented reflects a unique situation with respect to local community dynamics and site-specific project design, some common themes can be observed. A summary of the key characteristics in each case study is presented in Figure 4, on page 40.

It is evident that effective community engagement cannot happen where the community has the impression—correct or incorrect—that the decision to move forward with a project has already been made without engagement and consultation. A community's real or perceived lack of ability to influence the decisionmaking process is exacerbated when engagement focuses only on one-way information exchanges.

Gaining the trust of the community is key to successful engagement. In the Otway example, trust was gained by emphasizing two-way engagement and establishing a community liaison. In the Wallula case, the project was at first rejected by the local community—probably fruit of the misplaced association of the pilot project with a completely unrelated coal plant, due to an initial lack of information provision—but later reconfigured with more engagement and outreach, and the community supported the revised proposal.

However, if Wallula provides an example of engagement and community involvement in decisionmaking that generates trust and eventual community support, FutureGen 2.0 represents the opposite. Community support for the project was initially strong, but evaporated quickly when key benefits the local community anticipated were unilaterally stripped from the project design.

The Jamestown example highlights the complexities in local relationships. In this case the project developer is the local government, and the lack of trust between some community members and the developer is underscored. Opposition in Jamestown is centered not on CCS technology, but rather on the negative local economic impact for ratepayers, who arguably do not need what is viewed as surplus electricity, and on local opposition to coal.

Communities that already have a substantial industrial presence were once thought to be places where public support for CCS would be easier to gain, compared to sites without existing industry presence. However, in both Barendrecht and Carson, the communities involved respectively felt that having additional environmental risk or one more big industrial plant in the area was not acceptable. Several research projects, including FutureGen and Otway, have benefited from being the first-of-a-kind, but it is worth noting that some communities have opposed research-oriented projects for that very reason. Community engagement is affected not only by the local political and social dynamics, but also by the structure of the engagement process itself.

"Effective community engagement cannot happen where the community has the impression—correct or incorrect—that the decision to move forward has already been made without engagement and consultation."

GUIDELINES FOR CCS COMMUNITY ENGAGEMENT

CHAPTER 4

This section presents the results of the stakeholder-driven process to reach a set of guidelines for community engagement on CCS projects, as follows: identifying five key principles of effective community engagement, as applied to CCS; exploring concepts relevant to each of the five principles individually; and presenting a set of principle-specific guidelines, separated by audience — regulators, local decisionmakers, and project developers.

By grouping the guidelines according to engagement principle, readers can identify the common and complementary roles each audience—regulators, local decisionmakers, and project developers—can play in the engagement process. While some of these principles will be more important than others in different phases of the project, they are not meant to be sequential; in fact, some elements in each of the five principles will require attention at every point during a CCS project's life cycle.

The Guidelines was developed by the stakeholders participating in the process (and named inside the front cover of this report) to serve as a benchmark for future CCS projects. The stakeholder group represented the viewpoints of a wide range of interested parties, and the Guidelines was designed to be as universal as possible in their potential application and use around the world. They represent a set of recommendations for engaging communities around CCS projects and should be considered in light of existing regulations on public outreach and participation and permit process requirements in different countries, states, and local jurisdictions.

Readers who wish to quickly review all the guidelines relevant to them may also refer to the Executive Summary, which groups the same guidelines by audience rather than by engagement principle.

FIVE KEY PRINCIPLES OF EFFECTIVE COMMUNITY ENGAGEMENT FOR CCS

1. Understand Local Community Context

The Guidelines has been developed for application to CCS projects in any country or community. However, it is essential to understand that the local community context and the existing legal requirements for public participation will influence the best form of, and timing for, engagement with any given community. Every local context will be unique, and any community is likely to contain a range of opinions. One way to understand the local context is to conduct a thorough social site-characterization.[55] Existing legal requirements for public participation vary substantially worldwide, and examples are provided for select countries in Appendix 1. A business case can be made for going beyond the one or two public hearings that are usually required by law (see FPIC box on page 39).[56]

A community's previous experiences with a given project developer, investors, and regulatory authorities are likely to influence local opinions regarding a new industrial project. The same is true for a community's previous experience with other large but unrelated industrial projects. A community that is familiar

Figure 5: Key Principles in CCS Community Engagement and Roles for Each Party in the Process

	Understand Local Community Context	Exchange Information about the Project	Identify Appropriate Level of Engagement	Discuss Risks and Benefits of Project	Continue Engagement through Time
REGULATORS	Learn community concerns. Determine, meet, and possibly improve public participation requirements.	Educate, respond to, and provide information to the public.	Establish a multistakeholder engagement process.	Require communication and contingency measures and regular updates during life cycle. Evaluate environmental and other impacts.	Require public participation at key stages and increase engagement in the process.
LOCAL DECISIONMAKERS	Understand community interests, identify leaders, and establish a dialogue early.	Contact developers early. Ask questions. Identify, seek, and publicize pertinent information about the project.	Determine engagement level and establish a transparent process.	Ask questions. Identify and communicate concerns and clarify follow-up process. Insist on full disclosure.	Establish institutional memory, possibly a taskforce. Consider participating in monitoring and reporting. Regularly update the community.
PROJECT DEVELOPERS	Assess community dynamics and your historical presence. Weigh participatory engagement.	Engage early and develop a relationship with the community. Answer questions. Seek input, and provide information openly and transparently.	Foster two-way engagement; consult and negotiate with communities. Address concerns. Convey feasible level of engagement.	Answer questions. Discuss with community risks, benefits, uncertainties, and mitigation and contingency plans. Consider benefit sharing.	Engage community at each step of project schedule. Consider informal, long-term relationship to ease stewardship transition.

"Every local context will be unique, and any community is likely to contain a range of opinions. Effective local community engagement should seek to include all relevant community stakeholders, not only those that proactively step forward."

with and supported by fossil fuel–based industries and has experience with injection wells or other facilities that would be employed in a CCS project will have a different perspective than a community without such experiences. Any previous positive or negative interactions between the community and the project developer will ultimately set the initial tone for interaction regarding a new project.

Two other issues influencing the attitude of the community are its level of homogeneity and how decisions affecting the local community are usually made. For example, in some communities there is active community participation, while in others, decisions are essentially made by a small group of individuals in varying capacities, with the majority (voluntarily or involuntarily) kept apart from the decisionmaking processes. Within any community there will likely be a small group of citizens interested in in-depth engagement with the project developer, while others may choose to only observe or show no interest in the engagement process. The group of interested individuals may include influential community leaders (e.g., local governmental officials, teachers, business leaders, elders, members of community groups such as Rotary and Farm Bureaus, resident associations, locally active environmental organizations, etc.), as well as landowners, business owners, and other citizens who will likely be directly affected by the project. Some countries,

Figure 6: Factors to Consider for Local Community Context

Some of the many local community context factors that need to be taken into account to gain a basic level of understanding of any given community include the following:

ECONOMIC	ENVIRONMENTAL	LEGAL
■ Economic trends ■ Taxation issues ■ Job growth and unemployment ■ Interest, inflation and exchange rate ■ Cost of inputs locally (energy, water, etc) ■ Cost burden to ratepayers/taxpayers	■ Local geology ■ Water and land use/issues ■ Environmental regulations ■ Recreational interests and tourism ■ Impacts on flora and fauna ■ Comparative environmental impacts of alternatives	■ Current legislation , including subsurface rights, eminent domain, and grievance mechanisms in place ■ Likely future legislation ■ Regulatory bodies and processes ■ Consumer and environmental regulations
POLITICAL	**SOCIAL**	**TECHNOLOGICAL**
■ Governmental leadership/structures ■ Local and international lobbying/ advocacy groups ■ Political trends and elections	■ Media views ■ Ethnic/religious factors ■ Demographics and population shifts ■ Education, health and living standards ■ History between community and developers/regulators ■ Local experience with other industries ■ Social make up of society ■ Formal/informal authority structures	■ Research funding ■ Technology access and patents ■ Intellectual properties issues ■ Overall technological environment (competition, synergies maturity, new developments, etc.)

The above list is not exhaustive; any other local factors that shape life in the community should also be carefully considered by local decisionmakers, project developers and regulators, as community engagement plans are created, executed, and overseen.

Adapted and expanded from Pestle Analysis

states, provinces, and local communities nurture a culture of civic engagement, while others do not.

A community's previous experience with public participation is essential to consider, but in some contexts its lack of experience may be even more important. For example, in South Africa, the environmental law reform process in the 1990s had to account for the fact that, prior to 1994, decisions on projects that might negatively impact the environment were made, by and large, in the absence of any public participation. Since approximately 1998, however, an increasingly complex body of law has arisen and regulates the public participation process.

In addition, any engagement process on CCS will be influenced by a community's general level of awareness of climate change issues. It may be important to establish a baseline level of knowledge on climate change and related issues when seeking to engage with a local community on CCS. Understanding the community's perspective and background knowledge will be essential to an effective effort. Where needed, project developers, and even regulators, may choose to implement capacity-building initiatives to provide the understanding required to appropriately consider a proposed CCS project—noting that capacity building and education are not community engagement per se, but can provide the basis for a deeper and more involved process.

Effective local community engagement should seek to include all relevant community stakeholders, not only those that proactively step forward. It is essential to ensure that the community engagement process reaches the various subgroups within a community and all members are given a meaningful opportunity to voice their opinion and participate in the process. It is also important that the costs and impacts of the project—both positive and negative—are proportionately distributed between different segments of the community.

To maximize its reach, the engagement process must be designed with the stakeholders' local context in mind, even when simply planning logistics. For example, in farming communities, meetings and other engagement activities are best scheduled to avoid harvest periods. In societies with strict social rules and norms, meetings and other engagement activities must be organized accordingly in order to guarantee representation of all those who desire it, without compromising the developer's relationship with the overall community.[57]

Guidelines for Understanding Local Community Context

REGULATORS:

- Request that the developer assess and report the needs and concerns of each local community as part of the required engagement plan. (regulatory authority and regulatory policy designer)
- Consider commissioning local opinion polls or meeting with local stakeholders to gain insight into the situation and specific context, in addition to any requirements that project developers may already have to perform similar actions. (regulatory authority)
- Evaluate the effectiveness of current or prospective requirements in reaching community members who will be affected by the project. If these requirements are considered insufficient, policy designers may include new requirements (for either developers or themselves), such as conducting follow-up assessments to determine if specific stakeholder groups were adequately represented in decisions about the project and commissioning opinion polls to gauge the reaction of individual subgroups within the host community. (regulatory policy designers, and sometimes regulatory authorities when evaluating engagement efforts' effectiveness)

LOCAL DECISIONMAKERS:

- Local government representatives should understand the community and its interests, recognize the diversity of views, and ensure that all groups are given equal opportunities to be involved in the engagement process.
- Consider the possibility of conflicting interests among local community members, especially those of elected officials, business owners, or influential parties that could benefit from or be damaged by the proposed project, regardless of its impact to the rest of the community.

- Create a map of potential interests outside the community and how these influence local decisionmaking. Alongside economic and political considerations, map nonlocal channels of influence, such as NGOs, social media, and the Internet. Consider how these can influence local decisionmaking and how they might also combine with local or other interests to directly or indirectly influence the project and the engagement plan.
- Identify who will represent the community in interactions with the project developer. Ensure that such leadership is clearly communicated to the project developer and regulator and is considered a trustworthy source by the community. In case a single representative cannot be established because of competing or diverse local interests, this should be clearly communicated to regulators and developers as early as possible, in order to accommodate engagement initiatives and exchanges accordingly.
- Establish an early dialogue with the project developer about the imperative for an open, transparent, and inclusive process for engagement around the project.

PROJECT DEVELOPERS:

- Conduct a thorough social-characterization assessment of the community, aiming to understand community leadership dynamics, decisionmaking processes, and general local context. Complete this before establishing and initiating an engagement effort.
- Consider your historical presence in the community and the community's history with other industrial projects, and the effect each will have on your CCS project proposal.
- Conduct a stakeholder analysis, mapping each identified local group and focusing on power issues, excluded stakeholders, and any specific problems within the community that might be solved or exacerbated by the project. Map potential concerns of each identified stakeholder.
- Based on the above, establish the most effective level of engagement for the local context and phase of the project. When pursuing participatory engagement, commit to the consequences of that participation, taking the opportunity to establish a relationship with the community.

2. Exchange Information about the Project

One of the first steps in effective community engagement, and a crucial action throughout the whole engagement process, is exchanging information about the CCS project. As previously mentioned, a transparent and inclusive process should include a proactive dialogue between all stakeholders, exchanging information in a timely and open fashion during the various stages of the project life cycle. For those generally providing information, transparency also includes disclosing when information is not available, disclosing information as it becomes available, and ensuring that all information provided is unbiased, conveying a truthful, undistorted picture to those receiving and relying upon it.

Questions also serve as an important source of information and tool for local decisionmakers to learn about and influence the project. Inquiries can provide guidance to the engagement process and should not be feared by regulators, local decisionmakers, or project developers. From a community perspective, the ability to ask questions and receive answers is inherent to understanding and engaging with a project.

One of the challenges to an early information exchange is that a community may have questions about the project that cannot yet be answered. For example, a community may be interested in understanding features of the local geology, even before detailed characterization has been completed. The challenges posed by unanswered questions can be overcome by defining a process early on for open and transparent engagement. Likewise, during a project's operational stage and post-closure, there may not be much interest in exchanging information, and it may not be clear who has the responsibility to undertake this effort.

This section includes an overview of the types of information that need to be exchanged, as well as the means and processes available for exchanging that information.

Types of Information

For CCS projects, the types of information that need to be exchanged typically fall into at least three general categories. First, there are questions about CCS technology. Second, there are general questions about the project itself. Third, there are questions regarding the impacts—positive and negative—the project might have on the individual and the community.

1. WHAT IS CCS? WHY CCS?

CCS can be explained as a technological approach to mitigating climate change, by capturing the emissions from a CO_2 point source and storing them underground. There are a number of available resources that describe the role of

CCS as one technology in a portfolio of options for climate change mitigation (see Appendix 3). In addition to understanding how CCS fits into a broader climate change strategy, the community may also be interested in discussing other clean energy/emissions mitigation technology options and understanding why the site is a candidate for CCS specifically. This is especially true where the CCS project is related to a coal facility, as CCS is often tied to the larger societal debate around coal and climate change.

2. WHAT IS THIS PROJECT?

Communicating details regarding the location (and options for alternate locations), the planned timeline for the project, and a description of what the project will look like is extremely important when presenting to the community what the project entails. The public is also likely to move beyond desiring facts about CCS and the specific project and into issues of trust and accountability. For example, they may want to know how they can trust the information provided, how they can verify that the project will be conducted safely, and who will be responsible if something goes wrong.

3. HOW CAN IT AFFECT THE COMMUNITY? WHAT ARE THE POTENTIAL BENEFITS AND RISKS?

The largest set of questions about a potential CCS project will probably relate to its potential impacts on individuals and their community. Communities who have hosted the first wave of CCS demonstration projects have been most interested in the following issues:

- risks and emergency response
- the potential for groundwater contamination
- liability (what happens if or when the operator leaves town)
- the potential for electricity rate increases to citizens
- impact on property values
- the stability of the ground and the effects of underground movements on privately owned buildings or houses
- long-term security of storage

The community is also likely to be interested in how and whether they may obtain any benefits arising from the project. The range of potential benefits from a CCS project is wide and highly context specific, but some often explored include the following:

- landowner compensation, especially in areas where landowners are compensated for natural gas storage
- requests for royalty payments to the community
- educational benefits to local students through school and university programs linked to the project, along with availability of internships and/or research grants to local citizens
- community development initiatives, such as building libraries or recreational centers
- media coverage and increased tourism potential
- increase in local economic activity
- job creation potential
- the local contribution to addressing global climate change

Access to Information

Providing access to information builds trust and enables all parties to be well informed, making community engagement and potential joint decisionmaking more effective and balanced.

In many locales, existing databases of publicly available information on oil and gas wells may provide an initial framework for sharing data on CCS injection wells and CO_2 stored in geological formations. This initial structure may be further refined for CCS information purposes, both for the needs specific to local communities and for the general public. However, the data input, structure, and format for access to these existing databases vary by nation and province/state and are usually technical in nature. The nature of the data itself may pose challenges to successful information dissemination to the public. It is important for all stakeholders to distinguish between lay-audience information, such as reports, and raw technical data, which are used to generate reports. Stakeholders should, with the help of academics and experts, develop a clear understanding of who gathers and interprets the technical raw data and who oversees and approves reports, followed by how the community will have regular access to those reports.

In addition to targeted reports and information provision initiatives tailored to the local community, project developers may choose to also standardize and present in lay terms the publicly available information about the project, in order to expand its usability beyond technical audiences and enhance knowledge sharing on a wider perspective. An example of such an initiative is the European CCS Demonstration Project Network, which has been established to share information between European CCS demonstration projects and the public at large.[58]

There are both opportunities and challenges associated with making data for a CCS project accessible throughout its life cycle. In the early phases, much of the data regarding the geological characteristics of a site can be disclosed to the public, although some of it may include proprietary information regarding hydrocarbon reserves, which could make some project developers reluctant to release it. During operation, monitoring and sharing information on the status of ongoing CO_2 injection and storage is crucial to keep the public well informed and able to effectively engage with project developers and regulators. At the end of a project life cycle, processes must be put in place to allow for access to data regarding CO_2 stored in geological formations over extended time periods. Moreover, this information must be available institutionally, so it continues to inform the community even as local decisionmakers change. Ultimately, the responsibility for ensuring public access to data falls on the regulator, but the project developer also has the responsibility to provide the information as needed.

On their part, local communities should identify the kinds of information they seek in order to make informed decisions about the project over time and engage with both regulators and project developers to access this information. Where the information is not available or cannot be immediately disclosed, communities will benefit from keeping the dialogue open, determining from developers the reasons for its unavailability, and together developing a disclosure plan for when such information becomes available.

The process of collecting, preparing, and disseminating information takes time and resources. It is important that project developers put aside enough of both to carry it out well. This means not only providing adequate information to the local community but also providing the tools and resources to allow the community to interact with and comprehend the given information. Access to neutral third-party experts who can provide technical guidance to lay audiences may increase a community's trust and capacity to participate in a meaningful process.[59] Some communities may also face language, cultural, or technological barriers that hinder their ability to access or comprehend some types of information or engage other parties in the process. Providing translators, facilitators, or communication tools may greatly enhance the information exchange process in these cases.[60] A project outreach team can also be a good way to make community involvement a tangible commitment, with potentially positive spin-offs to relationship building as well.

Aarhus Convention

The Aarhus Convention provides a framework for public participation and access to information that can be a useful starting point as regulators consider public participation and data access requirements for carbon dioxide capture and storage (CCS).[1] However, implementation of these frameworks has not been universally successful, and CCS poses some unique challenges because of the long timeframes involved in geological storage.

In 1998, the European Commission signed the *Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters*. The Convention contained three aspects that grant the public different rights:

1. The right of access to environmental information
2. The right to participate in decisionmaking processes
3. Access to justice for the public

Although the Convention has been signed by 40 countries in Europe and Central Asia and is not meant to be binding on developing countries, it nonetheless presents a potentially valuable framework for regulators to consider as they craft language for public participation in a CCS context.[2]

For more information, please refer to http://www.unece.org/env/pp/

[1] Bell, R. G. et al., 2002. "Fostering a Culture of Environmental Compliance through Greater Public Participation." *Environment* 44(8): 34–44.

[2] Toth, B. 2010. "Public Participation and Democracy in Practice—Aarhus Convention Principles as Democratic Institution Building in the Developing World." *Journal of Land Resource and Environmental Law* 30(2): 295–329.

Processes for Exchanging Information

Successful community engagement extends beyond the content of the information exchanged and includes the processes through which it is distributed. The timing of information release is particularly important. Community engagement should begin well in advance of any project decisions. Ideally, the local community should be engaged during the preliminary phases of a project, before the final site is selected. Meaningful input from community leaders will be contingent on their access to information and on time and capacity to discuss this information with the project developers, regulators, and the community at large.

In the modern world of multimedia communication, there are numerous methods for exchanging information, and for any one project many of them will be employed. A few of the potential venues for engagement around CCS projects are summarized below. The effectiveness of each venue will depend on the local community context. It is important to recognize the limits of new digital communication channels and ensure that information exchange is enhanced by their usage, rather than curbed. For example, in areas with unstable or fragmented Internet access, the use of social media or email to disseminate information may exclude certain groups from access.

> *"Meaningful input from community leaders will be contingent on access to information and on their time and capacity to discuss this information with the project developers, regulators, and the community at large."*

Public Hearings: One or more formal public hearings are often required by the regulator as part of the permitting process or by the government as part of an environmental impact assessment. Some hearings are formatted such that the community members ask questions, which are then logged and responded to by the government at a later date. The role of the project

developer in public hearings varies by country and state. In some, the developer may participate and provide information upon the regulator's request during the hearing, while in others the project developer may supply the necessary information outside the hearing, or may even be prevented from participating in the hearing process entirely. The formality of the public hearing can be a disadvantage, in that it often does not allow for easy communication and information exchange. However, it does provide an official public record of a community's reaction to a proposed project.

Town Hall Meetings: A town hall meeting is an open meeting, usually held in a public facility, or town hall. The format differs from the public hearing in that it typically includes an open forum for questions and answers. Town hall meetings may be convened by the local government, the project developer, or the regulator and are often held in advance of formal hearings. The advantage of a town hall meeting is that it is often less intimidating and more open compared to a formal hearing.

Open House: An open house may be held to discuss issues around a project, usually prior to a public hearing or a town hall meeting. During an open house, the project developer often posts information or conducts educational demonstrations about the project and is available for one-on-one discussions with interested community members.

Working/Focus Groups: A group can be formed that is designed to meet repeatedly over time and explore a discrete set of issues in more depth. Such working groups can be organized by the community, the project developer, or the regulator. As an additional option, focus groups may also be used to capture impressions and reactions to different ideas before these are proposed to a larger audience, especially if these have the potential for strong or dissenting opinions. The composition of working groups is important—including diverse interests and parties in a working group may better inform it of pertinent issues and give its findings credibility.

Mediated Discussion: An external party—usually an independent consultant—may be used as a neutral mediator for discussions between different stakeholders in a local community and the project developer or regulator. A facilitated dialogue can help explore issues that hold natural sensitivities to one or more parties or can help in cases where lack of trust and/or openness prevents a productive dialogue.

Informal "Chats", or Community Group Presentations: A project developer may host an informal discussion where a short presentation is given followed by a question and answer period. The group of invitees for such a "chat" is usually more targeted and limited to a smaller number compared to an open house or a town hall meeting. A series of such meetings may be held with key groups of individuals within a community, at the request of the project developer or the community.

One-on-One Meetings: Sometimes the project developer will meet individually with interested or affected members of the community, either at their homes or at a local public meeting place. These meetings or home visits allow for individually tailored answers to specific questions and also provide an opportunity for community members to build relationships with the project developer. The exclusive nature of one-on-one meetings can be both a strength and a potential weakness. It is imperative that the parties involved in such exchanges uphold high transparency standards in relation to the rest of the community.

Experience shows that if the community learns that some meetings have been taking place without their knowledge, it might undermine perceptions of how transparent the process is and have a negative impact on the status of community members that took part in the meetings.

Media: A significant amount of information is distributed via newspapers, radio, local television, and websites. The media provide an outlet for information from the community, the regulator, or the government to a broader audience, although this is a one-way form of communication. In addition, local public perception of the available media outlets will shape how it perceives the information gathered from such channels. If the media are viewed as aligned with the project developer, their potentially helpful role may be undermined. The same is true for areas where media are censored or otherwise deprived of independence.

Social Media: Social media are increasingly important in daily communication for much of the world. Such media include social networking tools (Facebook and Twitter, among others), Internet blogs, and text messaging with mobile phones. Social media are often used by community members to communicate with each other but are increasingly also used by governments and commercial interests, such as project developers. The effectiveness of social media and other online forms of communication is limited to those communities and individuals with reliable and convenient Internet or mobile phone access, but they can provide deep insight into the sentiment of individuals and communities when used adequately. Those using social media must understand their unique nature—unlike traditional media, they involve two-way communication. If used like traditional media, in which a developer or other organization talks *at* people instead of holding a conversation, social media efforts may be ineffective and could backfire. Social media can also be used to quickly disseminate time-sensitive information, such as using a mobile phone network to alert local citizens of an emergency through system-generated text messages.

Knowledge Sharing: Knowledge sharing has been common practice between project developers for years; however, as experience with CCS projects accumulates worldwide, this powerful tool is usually overlooked by local communities. In many instances, there is much insight to be gained from connecting with other communities who have experience with similar projects or with the same project developer. The role of the Internet can be greatly leveraged in these cases, as it allows for easy communication between communities, even if they are located across the globe from each other. Mobile Internet access is now a reality in many remote locations, and local communities should not overlook reaching out to counterparts for insight as they consider a CCS project proposal, even if they need to rely on external parties (like NGOs with local presence, independent consultants, or service providers) to facilitate such connections.[61]

Impact of the Messenger

Another important aspect of information exchange is that some sources of information are more trusted than others. Engaged individuals within a community will likely seek information from academic and nongovernmental organizations and institutions unaffiliated with the project that can provide credible and unbiased information about the technology. These parties may be perceived as "neutral" by both sides and help relay information from the community back to project developers and/or regulators. Research has also demonstrated that a mix of messengers normally perceived by the community as mutually antagonistic (e.g., ExxonMobil and Greenpeace) working together to convey a message increases the resulting trust in that message. The role of universities should be emphasized, especially of those located in or near the local communities. In many cases, universities may provide the link between parties by pairing technical and local expertise with experience in communicating to nontechnical audiences. In addition, academic researchers are usually perceived to be neutral on a project-specific level (as opposed to their views on carbon dioxide capture and storage as a climate mitigation technology and other issues) and are accustomed to both objectively scrutinizing information and having their own ideas subjected to scrutiny.

Terwel, B. W. et al., 2009. "How Organizational Motives and Communications Affect Public Trust in Organizations: The Case of Carbon Dioxide Capture and Storage." *Journal of Environmental Psychology* 29(2): 290–299.

Quality and Level of Detail of Information

Different segments of the community may have different needs and be more responsive to various levels of detail and information exchange procedures. Therefore, parties conveying information will benefit from tailoring the content, form, and format of the information they convey to meet the desired target audience within the community. However, this kind of custom-messaging should not spin or distort the project for the purpose of manipulating public opinion, but rather be designed to make the information more accessible and better understood by different audiences. In addition, while information should be provided in clear and easy-to-understand terms, technical details should also be available upon request in response to specific questions raised by the community or those who simply want more information.

Guidelines for Exchanging Information about the Project

REGULATORS:

- Consider developing a program to provide accurate informational materials to the local community regarding CCS technology and its role as a climate change mitigation strategy and economic driver. Adapt the materials to meet the needs and interests of specific segments of the public. If providing information of this nature falls outside the regulator's mandate in a given jurisdiction, consider engaging the appropriate government agency to provide this information. (regulatory authority and regulatory policy designers)

- Establish national or regional standards for public databases of information on CCS injection wells and CO_2 in geological storage, or liaise with regulators across other jurisdictions to establish as much harmonization as possible between public databases and to ensure appropriate public accessibility. (regulatory policy designers and sometimes regulatory authorities)

- Ensure that project developers provide all available nonproprietary and nonsensitive data that can be made publicly accessible and interpretable as part of their required engagement plans, and take steps to ensure the public—especially local community members—have easy access to such information. Examples may include a searchable web page open to the public, periodic announcements in the local print media outlets, and/or monthly newsletters to interested parties. Project developers should also be required to provide additional resources and support to local communities when necessary, such as translators, cultural facilitators, or independent technical liaisons to explain any required technical information to local citizens in easily understandable terms. (regulatory authority, and sometimes regulatory policy designers in regards to requirements for project developers)

- Ensure that there is a plan for providing access to information regarding the project during the post-closure stewardship phase (if stewardship is transferred to the government), or require developers to provide such information (if they are still responsible to do so under the relevant regulations after site closure). (regulatory authority and regulatory policy designers)

- Consider the effective limits of a formal hearing as a venue for information exchange in the local community context, and explore alternative information exchange channels, where warranted. (regulatory authority)

- Require developers to report the most frequent questions being asked by the community during the permitting process, in order to inform subsequent steps in the community engagement process plan. (regulatory authority and regulatory policy designers)

- Analyze the evolving inventory of questions and their respective answers over time, in order to flag local issues that can inform future regulatory requirements. (regulatory authority and regulatory policy designers)

- Use media and social media to communicate information about the regulatory process to the community. (regulatory authority and sometimes regulatory policy designers)

- Provide answers to community questions in real time when possible, as opposed to logging questions and providing answers at a later date. (regulatory authority)

- Designate an agency representative—preferably someone familiar with the community or linked to others who can provide the necessary guidance on local context—whose explicit responsibility is to communicate information clearly and concisely and designate time to listen and respond to questions from the community directed to regulators. (regulatory authority)

LOCAL DECISIONMAKERS:

- Make early contact with project developers and regulators, potentially establishing a working committee or task force to understand implications of CCS on the local community. Ensure that such committee adequately represents the diversity of views embodied in the community. Be proactive as soon as the community learns about the project; do not wait for developers to come to you.

- Ask questions about the project and the technology. When answers are not available, identify a plan and a process for follow-up with the regulator and/or project developer.

- Identify which data the community would like to access, and work with the regulator and project developer to ensure an effective process for making that data accessible and comprehensible to interested citizens.

- Establish clear roles and expectations for communication processes in order to avoid misunderstandings.

Guidelines for Exchanging Information about the Project (CONTINUED)

- Inform the project developer of the community's desired venues for communication. Seek opportunities to exchange information that will best suit the needs of the community. If needed, request from the developer additional support or resources, such as translators or mobile communication enablers.
- Participate in public meetings and other venues for information exchange organized by the project developer, or consider hosting such an exchange.
- Use social and traditional media channels to communicate information about the project to community members unable to attend public meetings.
- Seek out information from sources independent of the regulator and project developer, such as academic institutions and NGOs (see also potential additional sources of information in Appendix 3).
- Consider the benefit of connecting with other communities that have been through similar processes (successfully or not), and establish a dialogue to take advantage of any lessons learned that could be applied to your community—keeping in mind that every CCS project and local context combination is unique.

PROJECT DEVELOPERS:

- Designate an experienced and trained representative to act as the community's link to the project. This representative's responsibility is to build relationships, communicate information clearly and concisely, and take the time to listen and respond to questions, relaying community inputs and concerns back to the rest of the project team. Consider making funds available for the community to hire its own independent expert to aid the engagement process, if needed.
- Be prepared to provide information, and to do so in an open and transparent process. Transparency includes providing information about project alternatives that are (or could be) under consideration, explaining project timelines, and addressing questions on how the project may positively or negatively impact individuals and the wider community.
- Engage community leaders as early as possible in the planning process, and begin community engagement well before any decisions are finalized. Seek community input on alternative project characteristics, where possible.
- Establish engagement opportunities before formal meetings required by regulations occur, and use formal meetings as only one in a series of vehicles for engagement opportunities. Avoid using a formal public hearing or town hall meeting as the first engagement with a community, lest being perceived (either correctly or incorrectly) as "only doing what is required by law."
- Consider a wide variety of methods for communicating and answering questions. These can range from one-on-one dialogues with individual community members to a series of regular town hall meetings. Ensure that proper transparency principles are fully employed in all interactions with community members.
- Recognize opportunities to use both traditional and social media, and employ best practices when doing so.
- Be prepared to answer in a factual manner very detailed questions about the project proposal or the technology.
- Keep track of questions asked over time in an inventory, and address these openly and in a timely fashion. This includes admitting when you do not have an answer to a question and agreeing to a process for providing additional information in response.
- Use the inventory of questions from the community to gain insight into the local context, refine the community engagement plan, and identify potential issues that need to be proactively addressed.
- Take into account that the information you provide may not be fully trusted and interpreted as neutral. Whenever possible, encourage community involvement in the monitoring and reporting of information. Consider having third parties contribute to the monitoring and/or verification processes.

3. Identify the Appropriate Level of Engagement

Community engagement can satisfy a variety of purposes, ranging from deciding whether a project can go forward to designing an emergency response plan. One-way information exchanges are appropriate in some situations, but two-way communication leads to a deeper level of and more productive engagement, in most settings. Identifying a clear engagement process upfront is essential to effective two-way communication, as is providing mechanisms whereby questions from the community can be answered.

Where possible, the engagement process should be initiated with the goals of establishing a trusted relationship between the community, regulators, and project developers and, especially, of incorporating the community's input on the proposed project design. This can give project proposals real flexibility to offer alternatives or changes to the project's development, in order to address any community concerns. This engagement goal must come with the understanding that potentially irreconcilable concerns or opposition may eventually lead to the voluntary decision by project developers to relocate or cancel the project, even in the absence of a community's formal capacity to reject the project unilaterally.

The optimum level and mode of engagement for each individual issue will vary according to the specific project site, local context, and the current phase of the project. Figure 7 below outlines the spectrum of approaches project developers may take to engage communities, highlighting the differences between one- and two-way engagement and including three primary levels of engagement: inform, consult, and negotiate.

All three levels of engagement can be conducted between project developers, regulators, and individual stakeholders within the community, or the community as a whole, and can address the entire project or specific areas of interest.

Informing may be the easiest mode of engagement for simple issues that have little impact to the local community or to keep community members aware of anticipated developments in the project. However, community engagement around potential CCS projects should be two-way whenever decisions may impact the community significantly or if the project is evolving unexpectedly. In consultation, as opposed to simply informing, engagement happens before key decisions are made and the decisionmaker—who could be the project developer, regulator, or a local community member—consequently takes into account the other stakeholders' input. Negotiation takes an extra step beyond consultation, by incorporating elements of joint decisionmaking between the project developer and the local community. Negotiation is usually employed when the community has formal authority over the given issue (such as landowners authorizing access to their property). However, negotiation may also be employed for a broader set of issues, leading to a much closer relationship between the community and the project developer, and sometimes the regulator, with potential long-term benefits for the project and improved public perception toward the developer and CCS.

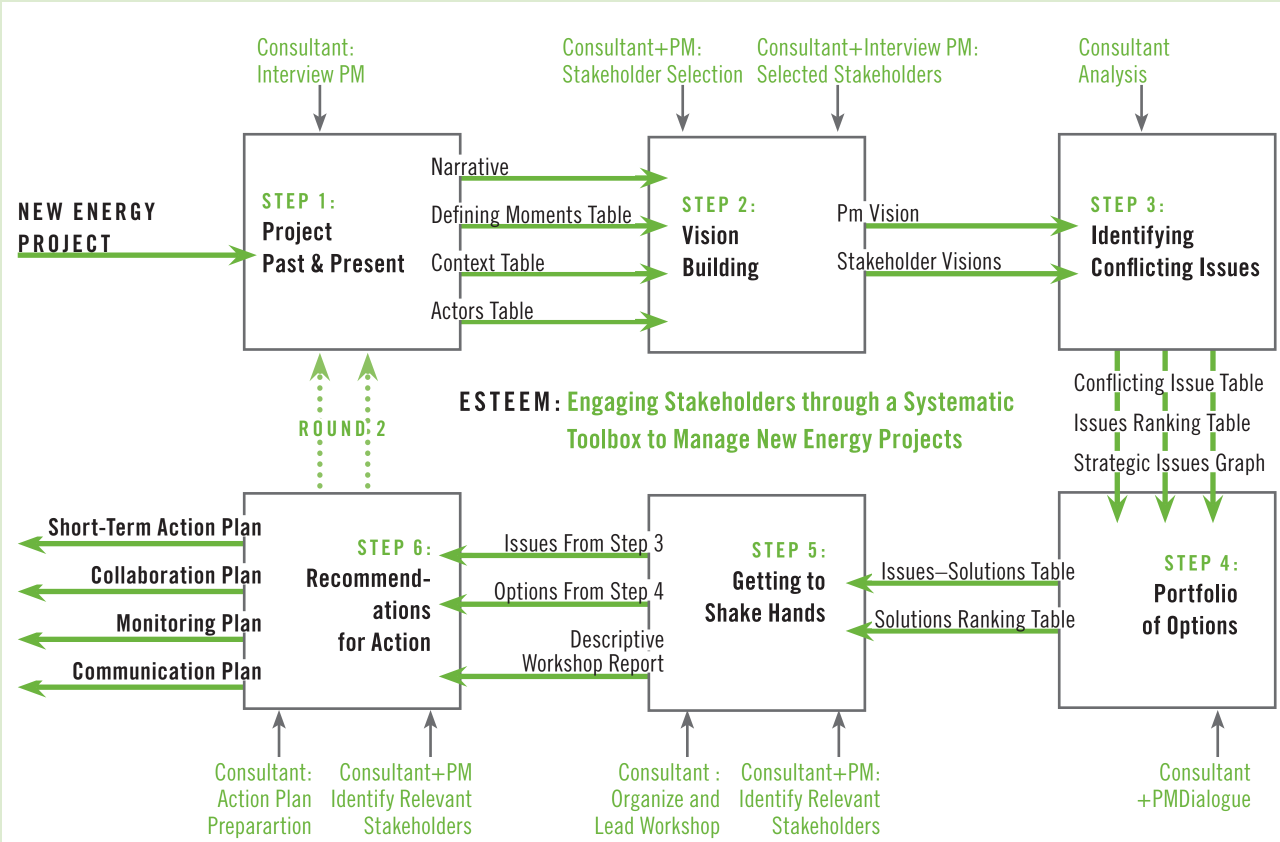
Figure 7: Spectrum of Community Engagement Approaches

PROCESS	ACTION	OUTCOME
INFORM	**One Way:** Project developer informs community after decision is taken	Improved community understanding of the project.
CONSULT	**Two Way:** Project developer seeks input before a decision is taken	Project developer records input and demonstrates to community how input is incorporated into decision.
NEGOTIATE	**Two Way:** Joint decisionmaking on issues that impact the community	Negotiated agreement and/or free, prior and informed consent.

Source: Herbertson, K. et al. *Breaking Ground: Engaging Communitites in Extractive and Infrastructure Projects.* (Washington, D.C.: World Resources Institute, 2009). 2009.

ESTEEM Community Outreach Model for Project Developers

A short introduction to ESTEEM and experiences applying it in a Dutch CCS project (by C.F.J. [Ynke] Feenstra and R. Mourik, Energy Research Centre of the Netherlands).



ESTEEM, which stands for Engaging Stakeholders through a Systematic Toolbox to Manage New Energy Projects, is a multistakeholder methodology developed to support project managers in achieving and maintaining social license to operate the project.[1] It represents one methodology among different potential strategies that might be effective when establishing an engagement process with local communities.[2]

The tool is based on literature research on theories and experiences with societal acceptance of and resistance to energy projects, and an extensive analysis of the rejection of 27 past and existing new energy projects in Europe, including some carbon dioxide capture and storage (CCS) projects. ESTEEM is a freely available online tool and includes a step-by-step manual for instructions and examples.[3,4,5,6]

ESTEEM is structured in six steps that should be executed by an independent facilitator (usually an external consultant) in cooperation with the project manager in the planning phase of the project. Each step consists of a set of instruments to collect and process the necessary information.[7] ESTEEM was tested in five pilot projects in Europe in 2007, including a CCS project in the Netherlands described below.

Step 1 Project Past and Present: This step aims at reflecting upon the history and current situation of the project and its context. By interviewing the project manager, the consultant describes the project's past and current situation in a narrative and several tables, summarizing the defining moments, stakeholders, and contextual factors that have shaped the project's current situation.

Step 2 Vision Building: By interviewing the project managers and core stakeholders, the consultant records their expectations and visions in a one-page document with a summarizing title and a "sociogram," in which the current and future roles of all the stakeholders in the project are visualized.

Step 3 Identifying Conflicting Issues: This step seeks insight into the potential tensions and opportunities described in Step 2. The consultant compares the visions of managers and stakeholders, points out the conflicts and opportunities, and ranks them according to importance in a table and graph format.

Step 4 Portfolio of Options: This step aims at describing project variations that align the visions of the stakeholders and the project manager. The consultant discusses with the

ESTEEM Community Outreach Model for Project Developers (CONTINUED)

project manager possible solutions and the actions needed to make use of the opportunities. Four types of project variations can be described in this step: physical adaptations to the design of the project, new research questions to reduce uncertainties, economic or financial solutions, and other aspects that often can be described as network activities. A ranking of these project variations is done by the project manager, and this ranking then becomes the input for the workshop in Step 5.

Step 5 Getting to Shake Hands: The aim of this step is to create a broad set of concrete recommendations from the stakeholders to the project manager about possible adaptations to the project's design. In this workshop the project manager holds an open discussion with a large group of stakeholders.

Step 6 Recommendations for Action: The last step aims at embedding the outcomes of the ESTEEM process in concrete action plans for the project manager, local community, and other stakeholders. The consultant translates the recommendations from the stakeholders into actions for the project manager to take in the short-term, collaborative actions, and a monitoring plan focusing on external circumstances that may have a large impact on the project but cannot be influenced by the project manager. Each energy project is unique, and to indicate the relevance of ESTEEM for each project, it is recommended to start with Step 0, a poll with questions focusing on the experience of the project manager, existing societal acceptance, the flexibility of the project, and the impact of the project on its environment.

ESTEEM Experience in the Netherlands: In 2000, planning began for a 50-megawatt, zero-emission power plant in the city of Drachten, the Netherlands. The potential site was an industrial area above a semidepleted natural gas field. The project proponent, SEQ Nederland, wanted to build an innovative demonstration plant based on the novel Oxy-fuel CO_2 capture process and perform enhanced gas recovery from the old natural gas field by storing the CO_2 collected in the reservoir.

Local stakeholders—including the municipal and provincial authorities, local nongovernmental organizations, neighboring industries, and others in the community—supported the project (sometimes under conditions such as additional research on safety). Only limited signs of resistance were initially identified, including some critical articles in a local newspaper.

During the implementation of the ESTEEM tool, some differences emerged between the future visions of the project manager and the local stakeholders. Most of these differences were related to technical and financial aspects of the project, based on uncertainties about the innovative technologies that were still to be developed and a financial gap to be filled. The stakeholder visions also described many opportunities for the project: for example, linkages to other local developments, such as the building of a swimming pool that could use the residual heat of the plant, making use of local installation and other technical companies, and the creation of an information and education center on CCS and other energy topics.

The process was evaluated as largely positive by the project manager, the stakeholders involved, and the ESTEEM consultant. All were surprised by the openness of the detailed dialogue in this very early planning phase. This led to mutual understanding and reinforced the network of stakeholders in the project. The success was largely the result of the project manager's openness to the ideas of the stakeholders and the consultant and the motivation of the stakeholders to participate in the process. The project manager indicated that although some parts of the process were time consuming, the outcomes were worth the investment.

The financial gap, indicated by both the project manager and the local stakeholders as an important barrier for the development of the project, ultimately proved to be insurmountable. Because of a lack of financial resources and investors, the project was cancelled in early 2008.

While it facilitates an open debate between project developers and local communities and may at times be perceived as a negotiation process, ESTEEM is still a consultation procedure because the final decisions rest with the project managers.

The Dutch experience shows ESTEEM working at its best to surface tensions and opportunities that were previously unnoticed. As an engagement tool, ESTEEM embodies many of the engagement principles presented in this report.

[1] ESTEEM is one of the outcomes of the European Research project Create Acceptance, coordinated by ECN between 2006 and 2008 as part of the Framework Programme 6 of the European Commission. Apart from ECN 10, other research institutes from different European countries were partners of the project.

[2] Other sources for engagement strategies include the International Association for Public Participation's (IAP2), and the International Association for Impact Assessment (see Appendix 4).

[3] ESTEEM and the manual with instructions (Jolivet, editor, 2008) are freely available at: www.esteem-tool.eu

[4] Raven, R.P.J.M. et al., 2008. "Modulating Societal Acceptance in New Energy Projects: Towards a Toolkit Methodology for Project Managers." *Energy* 34(5): 564–574.

[5] Raven , R.P.J.M. et al., 2009. "ESTEEM: Managing Societal Acceptance in New Energy Projects. A Toolbox Method for Project Managers." *Technological Forecasting & Social Change*, in press.

[6] Jolivet, E., editor. 2008. ESTEEM manual. Deliverable 5 of Create Acceptance. Petten. ECN-E–08-031. Available at: http://www.ecn.nl/docs/library/report/2008/e08031.pdf

[7] A more extensive description of the experiences with testing ESTEEM in the Dutch CCS-case is presented in Raven et al. (2009).

Guidelines for Identifying the Appropriate Level of Engagement

REGULATORS:

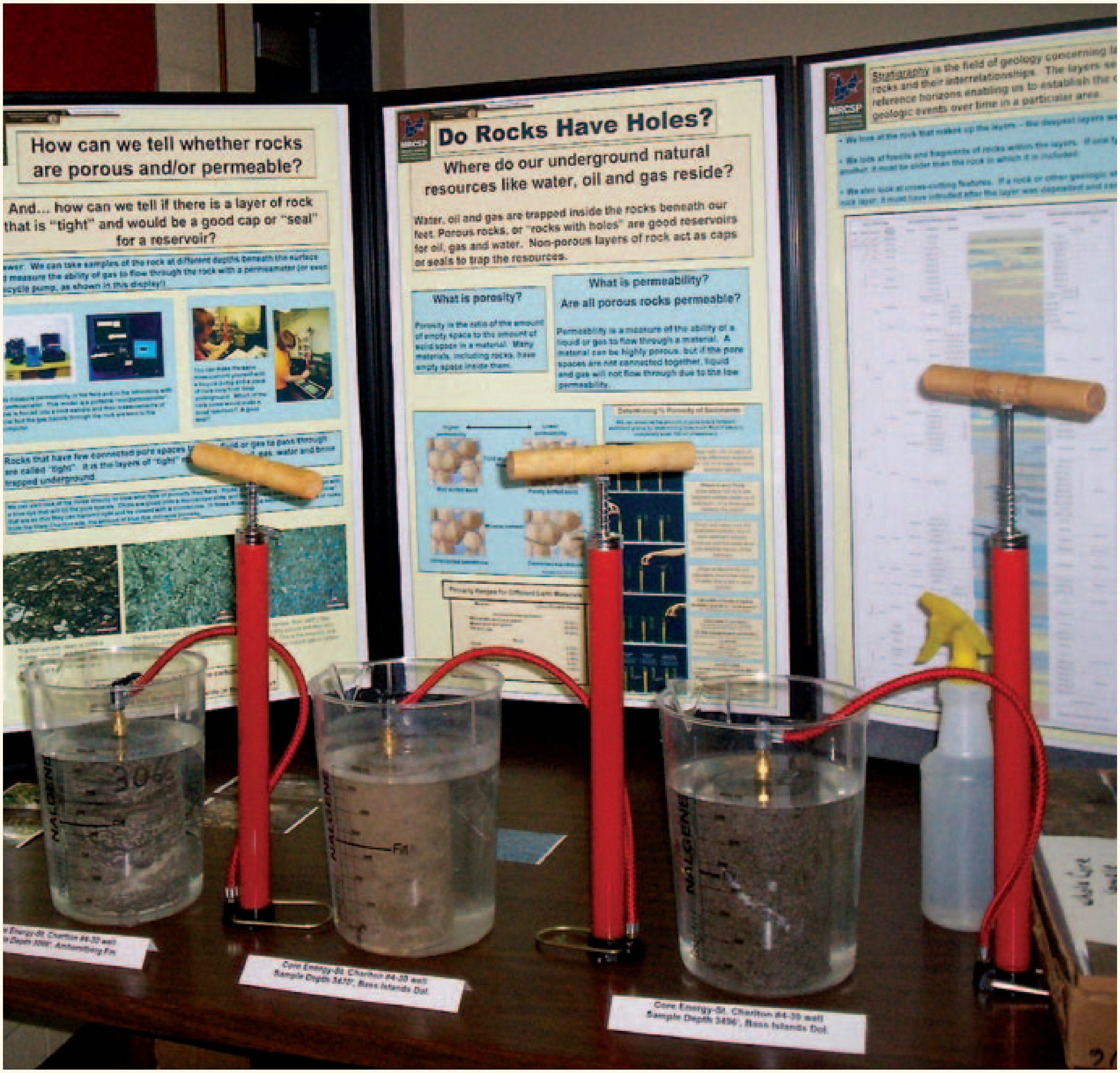
- Establish processes for multistakeholder engagement with the community as part of the rulemaking process. (regulatory policy designers and sometimes the regulatory authority)

LOCAL DECISIONMAKERS:

- Determine whether the community will be engaged in a consultation or negotiation, and on which issues, and work with the project developer to define a transparent and effective process for engagement.

PROJECT DEVELOPERS:

- Assess options for engagement in specific issues, and seek opportunities to foster two-way engagement by consulting and negotiating with communities, subgroups, and individuals, rather than simply informing them.
- Recognize that different groups among the local community stakeholders will sometimes require different levels of engagement to satisfy their needs, in addition to different engagement strategies to address their specific characteristics.
- Assess and convey the level of engagement that is feasible based on your ability to alter elements of the project design.



4. Discuss Potential Impacts of the Project

Like any major industrial activity, a CCS project comes with a unique set of project-specific impacts for a community to consider. Providing an ongoing forum for exchanging information and discussing the risks and benefits of a proposed or operating project should be central to the overall community engagement process. Beyond this, it is important that the project developer and regulator (where applicable) proactively attempt to involve the community in all decisions that affect it.

A CCS project may impact local communities in five main areas, described briefly in Figure 8 below. This section highlights key questions a community member and/or regulator may ask the project developer and/or regulator in order to understand the potential impacts in these five areas. This categorization of inquiries is based on scientific research and current CCS project experience. However, it is not exhaustive and should not prevent project developers from also listening and responding to other potential concerns voiced by the community or the regulator. In addition to the questions listed below, a comprehensive database focused on potential environmental and safety issues of CCS was compiled for the IEA Greenhouse Gas Programme and is available online.[62]

> *"Local citizens or groups may adopt a 'Not Under My Back Yard' attitude due to a perceived imbalance between:*
> *1) the local risks and/or negative impacts of the project,*
> *2) the value of the public good of reducing CO_2 emissions, and*
> *3) any local socioeconomic benefits arising from the project."*

Figure 8: Breakout of Potential CCS Project Impacts by Category

Socioeconomic	Health & Safety	Storage Security	Environment	Stewardship
Social impacts and economic consequences for individuals and for the local community as a whole	Potential impacts on public health and the physical well being of local citizens	Presence of the geology and technology needed for safe and secure storage	Potential impacts on air, soil, groundwater, or ecosystems	Long-term impacts associated with CO_2 storage in the subsurface

Adapted from Hnottavange-Telleen et al, 2009
This framework was based on a risk assessment approach that has been deployed in a CCS project in the United States, which is described by Ken Hnottavange-Telleen et al., 2009. Illinois Basin-Decatur Project: initial risk-assessment results and framework for evaluating site performance. Energy Procedia 1(1): 2431—2438.

Understanding Potential Impacts

SOCIOECONOMIC

A CCS project will likely have a significant socioeconomic impact on the local community.[63,64] Examples may include infrastructure expansion and maintenance, direct economic development, training and education, and increased media attention.[65,66] The following key questions may help communities to better elicit information on the type and range of positive and negative social and economic impacts that could occur around a proposed project.

- **Jobs.** How many local jobs will the project bring to the community? What are the general characteristics for these jobs? Will an effort be made to hire local talent? How many of these jobs will be permanent versus temporary? What temporary infrastructure will be needed for construction jobs? Will there be a different local job market after the project is operational?

- **Infrastructure and Community Projects.** Will any new infrastructure be built as a result of the CCS project? Will this infrastructure (especially any new roads) be available for public use? Are there any other investments in the community the project developer plans to make?

- **Emergency Response.** Is the community's current capacity for emergency response adequate for the CCS project during its construction, operational, and post-closure phases? How will the project developer work with the community to plan and test emergency response scenarios? If the current structure proves to be insufficient to absorb the additional capacity required by the project, how will the developer supplement it?

- **Impacts to the Local Economy.** Will CCS increase the cost of electricity for local ratepayers? How will the project affect local businesses? Will there be any impact on the community's tourism potential? How will real estate prices in different areas fluctuate over time because of the project's presence? How will the town deal with changes in economic activity during different phases of the project (construction, operation, and post-closure)?

- **Traffic.** Will the CCS project result in increased or modified local traffic? Will there be potential damage to existing roads owing to heavy vehicles? Which roads will be affected, and are there ways to minimize the anticipated impact?

- **Education.** Will the CCS project be open for educational tours? Will the project developer work with local schools and use the project as an opportunity to enhance science curricula? Will an effort be made to educate and/or retrain local workers for employment by the project? Will there be an affiliation with local colleges and universities?

- **Sociocultural Impacts.** How will the project change the community's traditional ways of life? How might media attention and other external influences related to the project impact the community? How might the community's perception of itself change because of the project?

HEALTH AND SAFETY

Although CO_2 is ubiquitous in nature and non-toxic in commonly encountered situations, in high concentrations it can pose a risk to human health and safety because it is an asphyxiant, potentially causing unconsciousness and even death with prolonged exposure to very high concentrations. Sustained exposure to high CO_2 concentrations is very unlikely with CO_2 storage; however, such risks must be understood and explored in a site-specific context. Most of the risks for CCS occur during the operational phases of a project and are comparable to other industrial workplace activities.[67] The following key questions may help communities better understand the type and range of health and safety issues that could arise.

Defining Risk

Risk is often defined as the product of (1) the probability of the event occurring and (2) the event's impact. For example, an event with a significant impact and a high probability would have a high risk. However, an event with a significant impact and a low probability would only result in a moderate risk. Similarly, a low impact, high probability event would also result in a moderate risk.

Measurements of impact and probability are commonly estimates based on available knowledge and some assumptions derived from educated guesses about unknown information, with ranges and/or confidence intervals. The probability of the event occurring combined with these ranges and intervals constitute uncertainty when estimating and defining risk.

- **CO_2 and Trace Gases.** What is the composition of the CO_2 that will be transported, injected, and stored? Will there be any potentially harmful gases (such as hydrogen sulfide) injected along with the CO_2, and if so, what extra precautions are being employed? Are there other contaminants or coconstituents that could increase health or environmental risk?

- **Workplace Safety.** What standards will be put in place for worker safety and the safety of residents near pipelines or injection sites? Will emergency response scenarios be practiced? If CO_2 venting becomes necessary, how quickly will the CO_2 disperse, and what procedures are in place to keep workers and the public safe?

- **Notification.** What procedures will be put in place to let the public know where the CO_2 is underground? Will signs be posted to alert people not to dig within the pipeline right-of-way? Will the location of the CO_2 or any other information about the project be released to the public? How will this information release occur, and how often will this information be updated? In the unlikely event of a significant leak, what plans are in place for notifying the public and evacuating the area, if necessary? What plans will ensure that the notification process will be functional 10, 50, 100 years or more into the future?

- **Risk Assessment.** Has a site-specific risk analysis and assessment been conducted? Was that risk assessment based on geological data from the site? How often will it be updated as the project develops? Did the risk assessment also include different types of immediate and cumulative impacts to the community, and if so, can the project developers or regulator describe the findings? How will the community's input be taken into consideration? Have contingency measures been identified for each of the identified risks? How will the identified risks be managed throughout the lifetime of the project? Did the risk assessment scenarios take local terrain and weather conditions into consideration and model dispersion of CO_2 in case of a leak under completely calm conditions, as a worst-case scenario?

- **Monitoring.** What tools will be used for monitoring the CO_2? Have these tools been effective in other CCS efforts? What specifically will be monitored? Will pipelines and capture facilities also be monitored during the operational phases of the project? Will landowners who live within the project footprint be trained in reading any monitoring devices? Will others in the community be involved in monitoring? How frequently will the site be monitored during the operational phases of the project? Will monitoring continue after injection? If so, how frequently and how will the results be shared with the community?

STORAGE SECURITY

When sites are chosen, operated, and regulated appropriately, and when the inherent risks are appropriately assessed and managed, current scientific research suggests that the CO_2 injected into the storage formation is permanently stored and has an extremely low potential to leak.[68]

The key questions suggested below are based on the criteria for responsible CCS deployment outlined in the WRI *Guidelines for Carbon Dioxide Capture, Transport, and Storage.*[69] Readers are encouraged to refer to that document for technical details on any of these issues.

- **Injection Zone.** How deep is the injection zone? How thick is it? How much land area does it underlie? What is the projected capacity of this zone to store CO_2? Have core samples from the site been collected to measure the porosity and permeability of the injection zone? Have models and simulations been run using site data that include the projected movement of CO_2? Has data been collected and used to model interaction between the CO_2 and any water in the formation? Have tests been conducted to ensure that the formation has the ability to store CO_2 at the proposed rates? If not, when will such tests and simulations be conducted, and how will the results be shared with the community?
- **Cap Rock.** Are there one or more cap rocks above the injection zone? How thick, dense, and permeable is the cap rock? How extensive is it, in terms of land area? Has the cap rock area been mapped at a regional level? Has the integrity of the cap rock been tested?
- **Geologic Faults.** Are there any faults that transect the injection zone? Do these faults extend through the cap rock? Have any tests been conducted based on information from the wells to determine whether these faults could provide a pathway for CO_2 leakage? How will fault stability be measured and monitored throughout the project? What corrective measures can be used if a fault unexpectedly allows transmission of CO_2?
- **Seismicity.** Is this area seismically active? Will the injection rates exceed fracture pressure of the cap rock, potentially inducing seismicity? What assessments have been

done to evaluate the potential for seismic activity, and has this information been incorporated into the simulations of CO_2 injection and risk assessments? What are the potential impacts of seismicity to the local infrastructure and to the community in general? Will monitoring for seismicity occur?

- **Existing Wells.** Has the project area been assessed for different types of existing wells (e.g., oil, gas, water, etc.)? Do any of these wells extend into the injection formation? Do they extend through the cap rock? If wells are present, have they been tested to determine whether the material used to plug the well is intact and capable of preventing leaks of CO_2 and potential constituents? What extra monitoring will be used to ensure that any existing wells do not provide leakage pathways? What contingency measures are in place in the event of a CO_2 leak from an existing well? What will prevent the drilling of new wells into the CO_2 reservoir in the future, thus potentially releasing the stored CO_2?

ENVIRONMENT

When evaluating the potential impact of a CCS project on the environment, the assessment should include protecting the groundwater and local ecosystems and understanding the impacts to air and soil, as well as the role the project plays in addressing climate change. A few key questions are outlined below.

- **Climate Change.** What is the estimated total quantity of CO_2 emissions that will be stored underground, and how will this help avoid climate change? Will procedures be in place to verify the emissions reductions through accounting procedures and monitoring?
- **Air.** If there is an unexpected leak from the storage site to the atmosphere, how will it be detected? Have assessments been conducted to model the dispersal of such an unexpected leak, based on local environmental conditions and possible weather patterns? What do they show?
- **Soil.** What is the overall footprint of the project? If the soil is unexpectedly exposed to high concentrations of CO_2, what would be the impacts to humans and ecosystems, and what corrective actions can and will be taken? What is the level of knowledge about soil exposure to CO_2 and corrective action? How will the landowner be notified, and will there be compensation for any losses due to impacted cropland?
- **Ecosystems.** Will the land above the CO_2 storage area be accessible to the public? Will this represent a change in current land use practices? Are there any threatened or endangered species in the project area, and will the project impact them? Have biological surveys been conducted at the site?

"Providing a forum for exchanging information and discussing the risks and benefits of a project is central to the overall community engagement process. Beyond this, it is important that the project developer and regulator proactively attempt to involve the community in all decisions that affect it."

- **Surface and Groundwater.** How much water will be needed for the CCS project during the construction and operational phases? What is the source of this water? Is the CO_2 storage formation below underground sources of drinking water? What is the salinity of any water within the injection formation? Will the water from the injection reservoir be taken out prior to or after CO_2 injection? If so, where will it go, and how might the project impact current and potential local drinking water sources? What measures are being taken to prevent such impacts? What is the plan if these measures do not work?
- **Ancillary Project Impacts.** Will the project's construction disrupt the community's well being? What is the expected amount of particulate matter or other forms of air pollution caused by the project? Will the community have to endure higher levels of dust, noise, or vibration because of the site's construction and/or operation? What measures can be taken to mitigate these nuisances?

STEWARDSHIP

- **Post-closure.** What happens after the injection stops at the site and the wells are closed? Is the project developer still responsible for the site in the near term? Will the project developer continue to engage with the local community after the site is closed? For how long and in what ways? Have criteria been established for a site closure certification to show that the injected CO_2 is not expected to endanger human health or the environment? Has the integrity of the wells been tested? How often will it be retested, and who will pay for these services?
- **Monitoring.** Have the CO_2 simulation models been matched and compared with monitoring data from the site to demonstrate that the storage is secure? How long will monitoring continue after injection stops and the wells are closed? What will be the basis for stopping the monitoring program?
- **Routine Site Maintenance.** How often will routine inspections be conducted? Who will be responsible for conducting such inspections and taking any actions needed if issues arise? What are the procedures for the community in reporting any maintenance issues to the regulator or the project developer?
- **Liability.** If there are damages to the environment, people, or property, who is responsible for compensation? Is there a difference in responsibility based on whether or not the damage is a result of something the project developer neglected or intentionally did wrong? Does the responsibility for payment change over time? What is the process for reporting damages? Is there a limit on damages?
- **Financing.** Have appropriate financial resources been earmarked for the long-term maintenance, monitoring, and engagement activities carried out by the developer and/or regulator? What happens to long-term maintenance or compensation responsibilities if the developer runs out of business or sells or transfers the site to third parties?

How to Design Effective Risk-Communication

The mental models approach is a methodology for developing effective risk-communications. There are four steps:

1. Solicit expert input on the risks.
2. Solicit community input on the content.
3. Develop communication tools that include information that is important to the community.
4. Test the communication.

Common Mistakes in Developing Risk-Communication:

- Comparing risks that are not comparable from the general public's perspective
  For instance, saying that the risk of suffocation from a carbon dioxide capture and storage (CCS) leak is much smaller than the risk of getting hit by a car when crossing the street is not a good comparison. People assess risks that are not in their control or considered catastrophic, new, or unknown differently than risks without these qualities.
- Providing risk numbers without any context
  For instance, stating that the risk of a CCS pipeline rupture is 1 in 100,000 does not mean much to someone who is not an engineer. Stating that there are fewer risks in sending carbon dioxide through pipelines than there are in sending it in trucks, trains, or tankers is a much better method for representing the risk.
- Failing to pilot-test the communication materials with the intended audience
  Even if the communication is tested on only a few individuals in the community, this would provide some understanding of whether community members understand

Morgan, M.G. et al., *Risk Communication: A Mental Models Approach* (New York: Cambridge University Press, 2002).

> *Compared to regulators or project developers, community members may place different degrees of importance on project risks and are likely to have a different time-horizon when weighing these risks. All stakeholders should base their risk communications and discussions not only on their technical knowledge but also on the community's own perceptions of risk.*

Discussing Risks Effectively

One of the challenges to community engagement on CCS lies in its novel nature as a technological solution to climate change, and there is only now beginning to be a series of successful demonstrations in place that the public can see operating safely. A common perception is that new technologies are always more risky than established practices, irrespective of what they entail.[70] One way to improve the risk perception of CCS technology is to establish a series of expanded field tests and demonstrate the safety and limited risks of storage. This is one of the main reasons for the current push to develop commercial-scale demonstration projects around the world.[71]

Compared to regulators or project developers, community members may place different degrees of importance on project risks and are likely to have a different time-horizon when weighing these risks. Because of these asymmetries in risk perception, assessment, and tolerance, it is important that all stakeholders base their risk communications and discussions not only on their technical knowledge of risks involved in a project but also on the community's own perceptions of risk.

For CCS projects, there may be situations where each of these types of risk communication becomes important. As a project progresses and more projects are deployed elsewhere, local citizens and the general public may become more used to expected issues pertaining to CCS, and those issues initially perceived as risky may gradually cause less alarm over time.

Guidelines for Discussing Potential Impacts of the Project

REGULATORS:

- Include regulatory requirements for a risk-communications plan that includes descriptions of contingency measures. (regulatory policy designers)
- Require regular updates from the project developers throughout the project life cycle. (regulatory policy designers)
- Regularly compile a list of concerns from the community, and require project developers to constructively address these concerns with the relevant stakeholders, even if the real risk around such issues is negligible. (regulatory authority)
- Evaluate the environmental impacts of a project, including ensuring the preservation of endangered and threatened species and the protection of drinking water resources, and make the findings publicly available and easily accessible. (regulatory authority and sometimes regulatory policy designers)
- Require thorough assessment and full disclosure of all costs and impacts to different parties, comparing—where appropriate—the cost and impacts of the proposed project with potential alternatives. (regulatory authority and sometimes regulatory policy designers)
- Accept or reject permit applications based on a comprehensive review process. If accepted, require risk communications, contingency measures, and regular updates during project life cycle. (regulatory authority and sometimes regulatory policy designers)

LOCAL DECISIONMAKERS:

- Identify risks that pose concerns over the life cycle of the project, and then ask the regulator and/or project developer questions about these risks and the planned contingency measures.
- Identify and clarify processes for follow-up, when answers to risk- and benefit-related questions are not immediately available.
- Acknowledge differences between perceived risk and quantifiable risk, being as objective as possible when considering the impact of newly available information on the original perception of risk.
- Discuss potential benefits from the project, including benefit-sharing or other improvements to the community's well being.
- Insist on full disclosure and considerations of costs and potential impacts of the project, ensuring that locally important natural and cultural resources are protected.

PROJECT DEVELOPERS:

- Discuss the potentially positive and negative aspects of the project as a key part of the two-way community engagement process, following best practices for risk communication when needed.
- Respect an individual's or community's concern of a particular risk—even if the real risk is perceived by the developer to be extremely low or nonexistent—and provide data in a transparent manner to the community, in order to inform and potentially reduce discomfort from risk perceptions among local citizens.
- Acknowledge uncertainties and assumptions in risk assessments, and explain contingency plans that will be put in place to mitigate any realized risks.
- Be open to ideas coming from the communities on benefit-sharing schemes and ways to improve the project, and ideally take the initiative to propose benefit-sharing or project improvement procedures to address specific needs or concerns from the community.

5. Continue Engagement Throughout Project Life Cycle

Community engagement for CCS must not end with the successful initiation of the operational phase of a project. Instead, effective community engagement will involve a community's input and multistakeholder dialogue throughout the project life cycle, beginning with feasibility studies and site screening and continuing into the post-closure stewardship phase of a project. This communication should be two-way; parties should both inform and incorporate feedback to improve the project over time.

Continued engagement is critical because over the course of any given project, the physical and social composition and characteristics of the community will change. For example, construction of new roads and buildings, population growth, changes in land use, and growing understanding within a community will demand a continued and possibly closer engagement on monitoring agreements and updates to emergency response plans. Project developers, regulators, and local stakeholders should over time be continuously discussing their short- and long-term expectations for the project and overcome potential divergences before they grow too wide.

There will be natural avenues for active community engagement at key points throughout the project life cycle. These include development of and updates to an emergency response plan, characterization or injection permitting processes, and site closure certification. An operator or regulator could also involve the community during the operational phase of the project by engaging it in a review of the monitoring results (or even establishing participatory or independent monitoring by the community), or providing site tours and engaging in educational opportunities. Community members may be interested in forming a community task force that supports or ensures accountability of the regulatory authority throughout the project, including the closure and post-closure stewardship phases.

Project developers and operators will often not go beyond what is legally required of them for a variety of reasons, including but not limited to compliance and legal liability concerns.[72] This may be true during both the planning and the operating phases of a project but is most likely to occur in the post-closure phase. In a similar fashion, regulators may be limited by regulatory or statutory requirements. To ensure regulatory effectiveness, as regulatory policy is further designed and detailed for CCS and as regulations are created, revised, or expanded, additional steps and new best practices in public engagement should be incorporated. Notably, in most state and country contexts, operators are not required to continue any kind of engagement after they have met the requirements for site closure. With the post-closure stewardship responsibility shifting to the regulator, a private entity, or another designated government agency (depending on the country or jurisdiction), it is their duty to ensure that appropriate long-term planning and local community engagement initiatives are carried out during the post-closure phase. Instead of purely abandoning the site once the responsibility shift occurs, project developers may wish to take advantage of their long-established relationship with the community and ensure that a smooth transition takes place. This will likely reflect positively on their reputation and on the public perception of CCS in general.

"Community engagement for CCS must not end with the successful initiation of the operational phase of a project. Instead, effective engagement will involve a community's input and multistakeholder dialogue throughout the project life cycle."

Guidelines for Continuing Engagement Throughout the Project Life Cycle

REGULATORS:

- Require public participation at key stages throughout the project as part of the permitting, operating, and site closure certification processes, and consider engaging and ideally involving the community in post-closure stewardship activities, such as maintenance at the site when possible and periodically discussing monitoring and updates of the site's stability during long-term stewardship. (regulatory policy designers and regulatory authority)
- Consider avenues for increased and updated local community engagement in the regulatory development process. (regulatory policy designers)
- Ensure that necessary resources are allocated toward and made available for appropriate engagement initiatives by the regulatory authority during the post-closure phase of the project. (regulatory authority)

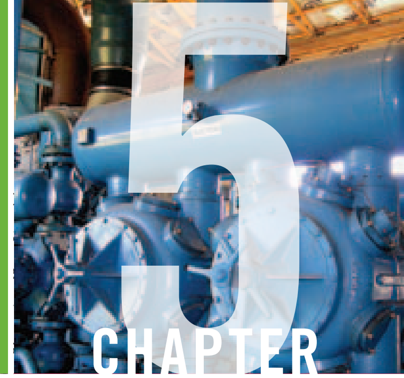
LOCAL DECISIONMAKERS:

- Consider forming a community task force to work with the project developer and regulator, and ensure they provide periodically updated information about the project to the general community on an established timetable.
- Consider the potential role of the community in monitoring and reporting the project's impacts over time, and work with the project developer and regulator to formalize these activities.
- Encourage key community members who understand the project to uphold institutional memory by building and maintaining long-term relationships with regulators and project developers. Encourage youth to participate in the process, in order to pass the community's experience to subsequent generations and ensure effective engagement continues throughout the project's lifetime.

PROJECT DEVELOPERS:

- Include community engagement activities in each step of the project's schedule, beginning with feasibility studies and ending after site closure or when the responsibility for the site transfers to the competent authority.
- Consider maintaining an informal relationship with the local community, even after responsibility for the site is transferred to other parties, and take steps to ensure a smooth transition to the new site stewards by leveraging the long-established relationship with the community.

SUPPLEMENTARY INFORMATION



CHAPTER 5

This chapter includes:

- Appendix 1: Existing Legal Frameworks for Public Participation in Select Countries and Regions
- Appendix 2: Reference List for Public Attitudes on CCS
- Appendix 3: Key References about the Technology
- Appendix 4: Other Potential References and Tools

APPENDIX 1: EXISTING LEGAL FRAMEWORKS FOR PUBLIC PARTICIPATION IN SELECT COUNTRIES AND REGIONS

China[73]

Interim Measures of Public Participation in Environmental Impact Assessment (February 22, 2006)

On February 22, 2006, the Interim Measures of Public Participation in Environmental Impact Assessment was enacted, in which the government definitely encourages the public to participate in EIAs. It is the first regulation in China about public participation in environmental fields.

Environmental Information Disclosure Measures (April 11, 2007)

On April 11, 2007, Environmental Information Disclosure Measures (Trial) was enacted, which forces both the environmental factories and the polluting enterprises to disclose important environmental information and helps people get involved in emission reduction by technological supports. It is not only the first normative document about Chinese Government information disclosure but also the first comprehensive sector regulation related to environmental information disclosure.

European Union[74]

Public Participant Directive 2003/35/EC (June 25, 2003)

Public Participant Directive 2003/35/EC, which provides for public participation in respect to the drawing up of certain plans and programs relating to the environment, was adopted on June 25, 2003. The directive is predominantly a technical measure. It amends public participation rights in the EIA Directive (85/337/EEC) and the Integrated Pollution Prevention and Control (IPCC) Directive (96/61/EC). It also lays down rules for public participation in plans and programs drawn up within other existing directives:

- 1975 framework waste Directive (75/442)
- 1991 batteries Directive (91/157)
- 1991 agricultural nitrate pollution Directive (91/676)
- 1991 hazardous waste Directive (91/689)
- 1994 packaging Directive (94/62)
- 1996 ambient air quality Directive (96/62/EC)
- 1999 waste landfill Directive (99/31)

United Kingdom[75]

- Environmental Information Regulations: provide a right of access to environmental information, subject to certain exceptions
- Freedom of Information Act 2000: provides a right of access to information held by public authorities, subject to certain exemptions
- Data Protection Act 1998: provides access for individuals to their own personal data
- The Pollution Prevention and Control Public Participation Regulations (for England and Wales) 2005

United States[76]

National Level Administrative Procedures Act (APA)

This act is the principal statute governing public participation in environmental decisionmaking and encompasses the provisions of the Freedom of Information Act, the Privacy Protection Act, and the Government in the Sunshine Act. Federal agency rule-making is governed under this act.

Code of Federal Regulations

The Code of Federal Regulations (CFR) is the compilation and codification of rules published in the Federal Register by federal government departments and agencies.77 Title 40 specifically addresses environmental protection and contains two relevant parts, 25 and 124. Title 40, part 25 details minimum requirements and suggested elements for public participation in activities under the Clean Water Act, Resource Conservation and Recovery Act, and the Safe Drinking Water Act. This part includes specific sections on public information, notification, and consultation; public hearings and meetings; advisory groups; and responsiveness summaries of the public participation process, results, and effectiveness. Title 40, part 124 addresses procedures for EPA decisionmaking on various types of permits, including underground injection control. Specifically, sections 10 through 14 detail requirements for public notice, comments, and hearings. Currently proposed rules, such as that for Class VI Underground Injection Control permits, may add to these requirements.

National Environmental Policy Act (NEPA)

Under this act, federal agencies are required to prepare a detailed environmental impact statement (EIS) for all proposals that are “major Federal actions significantly affecting the quality of the human environment.” An EIS must include an examination of the environmental impacts of the proposed rule, any unavoidable adverse environmental effects, and an alternative analysis including a “no action” alternative.

National Marine Sanctuaries Act and Magnuson-Stevens Act

Many environmental statutes relevant to the management of marine protected areas (MPAs) contain additional provisions for public participation. For instance, the National Marine Sanctuaries Act requires that within 30 days of issuing a notice of a proposed national marine sanctuary area, an agency must hold at least one public hearing in the coastal areas that will be affected. In addition, the Magnuson-Stevens Act requires the Fisheries Management Councils to provide for public participation in the development or amendment of fishery management plans.

Coastal Zone Management Act

The major public participation requirements of this act include the following:

- Each state coastal management program must provide opportunities for public participation in all aspects of the program (i.e., public notices, opportunities for comment, nomination procedures, public hearings, technical and financial assistance, and public education).

- Public hearings must be announced at least 30 days in advance, and all relevant agency materials must be made available to the public for review beforehand.

APPENDIX 2: REFERENCE LIST FOR PUBLIC ATTITUDES ON CCS

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APPENDIX 4: OTHER POTENTIAL REFERENCES AND TOOLS

Impact Assessment

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Regulations, Rulemaking, and Other Government Resources

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- U.S. Environmental Protection Agency's Office of Groundwater and Drinking Water website on Geologic Sequestration of Carbon Dioxide under the Underground Injection Control Program. http://water.epa.gov/type/groundwater/uic/wells_sequestration.cfm

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GLOSSARY, ACRONYMS, AND ABBREVIATIONS

Basalt formation	Geological formations of basalt, a volcanic rock, which may have the potential to store carbon dioxide because the carbon dioxide may react with silicates in the basalt.[78]
Business-as-usual	The future emissions trajectory based on projections of continued production and use of energy without substantial changes in policies and practices.
Carbon dioxide capture and storage (CCS)	The process of (1) capturing carbon dioxide from an emission source (e.g., power plant, cement manufacturer), (2) converting it (through heat and/or pressure) into a supercritical state, (3) transporting it to an injection site, and (4) injecting it into deep subsurface rock formations for long-term storage. CCS is sometimes referred to in the literature as "carbon dioxide capture and sequestration" or as "carbon capture and storage."
Carbon dioxide (CO_2)	A naturally occurring gas that is also a product of fossil fuels and biomass combustion, as well as other industrial and chemical processes and land-use changes. Carbon dioxide is the principal anthropogenic greenhouse gas responsible for climate change.
Coal bed methane (or Enhanced Coal Bed Methane [ECBM] recovery)	A process by which carbon dioxide is used to enhance recovery of methane from typically unminable coal deposits. Depending on the site-specific conditions, the carbon dioxide may or may not be stored in the coal deposit.[79]
Coconstituents (of a carbon dioxide stream)	Coconstituents of a carbon dioxide stream include other compounds that may be present in streams primarily composed of carbon dioxide captured from fossil fuel combustion or other industrial processes. Such coconstituents may include sulfur dioxide (SO_2), nitric oxide (NO), hydrogen sulfide (H_2S), hydrogen gas (H_2), carbon monoxide (CO), methane (CH_4), nitrogen gas (N_2), oxygen gas (O_2), and argon (Ar).[80] Some of these coconstituents may cause health and safety issues and their concentrations will likely be project specific.
Commercial scale	Commercial scale has a variety of definitions, depending on the specific process or technology. In this report, a commercial-scale CCS project captures, transports, and stores over 1 million metric tons of carbon dioxide per year.
Commercialization (of technology)	The process of making a proven technology commercially viable, or able to make a profit.
Diffusion (of technology)	The state of a technology being widely available and commonly used.
DOE	U.S. Department of Energy.
EIA (or EIS)	Environmental Impact Assessment (or Statement).
Enhanced oil recovery (EOR)	Injecting a gas, typically carbon dioxide, into an oil well to displace and reduce the viscosity of the oil, allowing more oil to be pumped out of the reservoir.
EPA	U.S. Environmental Protection Agency.
First-of-a-kind	An installation, typically industrial, which represents the first time a technology, series of technologies, or process is implemented on a given scale.
Flue gas	The gaseous emissions from a power plant or other industrial facility that are emitted to the atmosphere through a pipe or smokestack.
Fossil fuels	Carbon-based energy resources created over geologic time scales as organic matter is compressed and heated. Examples: coal, oil, and natural gas.

FPIC	Free, Prior, and Informed Consent. See box on page 39.
G8	A term typically referring to a group of eight industrialized nations, or the forum at which they meet. The G8 nations include: Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States.
Geological storage (also Geological sequestration)	The indefinite, ideally long-term trapping of carbon dioxide in a subsurface formation and in isolation from the atmosphere. The injected carbon dioxide is often trapped in pore space, dissolved in saline solutions, and, over longer time spans, mineralized.[81]
Grievance processes (or mechanisms)	Terms typically applied to methods by which community members, project developers, or regulators can raise and communicate concerns.
Hydrogen sulfide (H_2S)	An impurity sometimes found in carbon dioxide streams, hydrogen sulfide is a health and safety concern. Exposure to low concentrations can cause eye, nose, and throat irritation and at higher concentrations can lead to a loss of consciousness or death.[82]
IEA	International Energy Agency.
Integrated gasification combined cycle (IGCC)	A power generation method where a carbon-based fuel (e.g., coal, oil, biomass, etc., or a combination of these) is gasified and reacted to produce synthetic gas (also known as syngas, a combination of carbon monoxide [CO] and hydrogen gas). The syngas is then typically reacted with steam to produce more hydrogen and convert the carbon monoxide to carbon dioxide. The resulting syngas can then be cleaned of impurities, and the carbon dioxide can be separated out. The resulting hydrogen-rich syngas is then combusted in a specially designed gas turbine where the excess heat from the combustion, potentially along with that from the gasification process, can be used to power steam turbines that produce electricity.
ISO	International Organization for Standardization.
ISO 14063	A standard established by the International Organization for Standardization (ISO) to give organization guidance for "general principles, policy, strategy and activities relating to both internal and external environmental communication."[83]
Job-years	A measurement of the amount of employment a policy or project creates. One job-year is equivalent to one person working for 1 year. For example, 10 job-years could entail 10 people working for 1 year or two people each working for 5 years.
Local community	The collection of citizens of one or more towns/cities/counties living near a project who may potentially be directly affected by one or more of its components.
Local decisionmaker (also local citizen)	A citizen of a town/city/county living near a project who may potentially be directly affected by one or more of its components.
Man-hours	A measurement of how long a project will take or, sometimes, how much employment is generated by a given project or policy. One man-hour is equivalent to one man (or woman) working for 1 hour.
MW	Megawatt; 1,000,000 watts (Joules/second); a measure of the rate of energy.
$MtCO_2$	Million metric tons (1,000,000,000 kilograms) of carbon dioxide.
NGCC	Natural gas combined cycle.
NGO	Nongovernmental organization.

Overpressure	A transient air pressure, such as the shock wave from an explosion, that is temporarily greater than the surrounding atmospheric pressure. In a CCS context, overpressure refers to the underground pressure buildup as carbon dioxide is injected in a geologic reservoir, which diminishes over time after injection ceases.
Oxygen-fired (Oxy-fuel) combustion	A process by which a fossil fuel is combusted in an oxygen-rich environment (relative to air) to increase the carbon dioxide concentration in the resulting flue gases, easing its separation and capture.
Point source	A source of pollution or other emissions that is localized (typically in space) at a single facility or facility subunit. Point sources are often contrasted with nonpoint sources, where pollution or other emissions are moving or distributed across space. For example, a coal-fired power plant is a point source of carbon dioxide emissions, while the cars in a given city constitute a nonpoint source of carbon dioxide emissions.
Pore space	Small spaces between grains of underground rock that can naturally contain air, water, hydrocarbons, carbon dioxide, or other gases or liquids. In some situations, pore space may be usable for geological carbon dioxide storage.[84]
Post-combustion capture	A method of separating and capturing carbon dioxide from the flue gases emitted by fossil fuel combustion or other industrial process. The carbon dioxide is often separated from the flue gases by a solvent, such as chilled ammonia or amines. Other capture methods, such as biological or cryogenic processes, are also being researched.
Pre-combustion capture	Typically associated with integrated gasification combined cycle (IGCC) power plants, a method to capture carbon dioxide before combustion (typically of hydrogen) occurs. Pre-combustion capture can be used in both power generation and the chemical industry.
Project developer	A company or consortium of companies (usually privately-owned) that plans, designs, builds, implements, operates, or provides services to a CCS project.
Regulator (also Regulators, or Regulatory Agencies)	An authority or a system of authorities designated by the government of a country or state as having legal authority for implementing an existing regulatory framework and overseeing compliance to it. This may consist of conducting the licensing process, for issuing licences and thereby for regulating the siting, design, construction, commissioning, operation, closure, post-closure, decommissioning and, if required, subsequent institutional control of CCS facilities or specific aspects thereof.
Regulatory Policymaker (also Regulatory Policydesigner)	A politician or political leader who is involved in influencing public decisionmaking and formulating regulatory policy frameworks.
Renewable energy (“Renewables,” commonly)	A source of energy that is inherently replaceable by natural cycles, such as solar, hydro, wind, and biomass combustion.[85]
Saline formation	Deep geological formation of sedimentary rock saturated with water with a high concentration of dissolved salts. Carbon dioxide could potentially be stored in these formations through a combination of factors, including being physically trapped, dissolved, and/or mineralized. The high concentration of salt makes these water sources unsuitable for human consumption or agricultural use.[86]
Seismic Testing	A technique used in geologic investigation, involving the use of low-intensity shock waves and detectors to map the underground landscape of an area.
Seismicity	The frequency, distribution and magnitude of earthquake activity in a given area.
tCO_2	Metric ton (1,000 kilograms) of carbon dioxide.

Traditional coal-fired power plants

A relative term describing power plants that combust coal in air to heat steam that runs turbines to generate electricity. Some traditional coal-fired power plants also pulverize and/or wash their coal to increase efficiency and reduce pollution. Traditional coal-fired power plants are typically juxtaposed with newer technologies, such as supercritical plants—which are similar but operate at higher temperatures and pressures—and IGCC plants, which employ a different process to use the energy stored in the coal.

WRI

World Resources Institute.

Other useful glossaries include:

The WRI CCS Guidelines. http://www.wri.org/publication/ccs-guidelines

The IEA's Comprehensive Glossary of Terms. http://www.eia.doe.gov/iea//glossary.html

Schlumberger Oilfield Glossary. http://www.glossary.oilfield.slb.com/

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