BEST PRACTICES:

Public Outreach and Education for Geologic Storage Projects

2017 REVISED EDITION

DOE/NETL-2017/1845

NATIONAL ENERGY TECHNOLOGY LABORATORY

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DOE/NETL-2017/1845

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Definition
BSCSP	Big Sky Carbon Sequestration Partnership
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Utilization, and Storage
CO_2	Carbon Dioxide
DOE	U.S. Department of Energy
EOR	Enhanced Oil Recovery
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
IBDP	Illinois Basin – Decatur Project
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
MGSC	Midwest Geological Sequestration Consortium

Acronym/ Abbreviation	Definition
MRCSP	Midwest Regional Carbon Sequestration Partnership
NATCARB	National Carbon Sequestration Database and Geographic Information System
NETL	National Energy Technology Laboratory
NGO(s)	Nongovernmental Organization(s)
PCOR	Plains CO_2 Reduction Partnership
PPE	Personal Protection Equipment
RCSP	Regional Carbon Sequestration Partnerships
SECARB	Southeast Regional Carbon Sequestration Partnership
SWP	Southwest Regional Partnership on Carbon Sequestration
WESTCARB	West Coast Regional Carbon Sequestration Partnership

TERMINOLOGY

Area of Review: The region around an injection well which may be endangered by the injection activity. This endangerment could come from either the increased pressure in the storage reservoir, or the presence of CO_2.

Atmospheric Monitoring: Testing at the surface and in the atmosphere to identify and quantify possible releases associated with carbon storage operations.

Caprock: A low-permeability sedimentary layer, which immediately overlies the reservoir and serves as a physical barrier to upward migration of CO_2 or brine from the top of the reservoir.

Confining Zone: One or more geologic barriers, typically low-permeability rock units that overlie or enclose a storage reservoir and are capable of preventing upward and/or lateral migration of CO_2 or brine out of the reservoir. A confining zone may contain multiple geologic seals.

Geologic Seal: A low-permeability sedimentary or structural unit, such as shale or a sealing fault, which provides a physical barrier to upward or lateral migration of CO_2 or brine out of the reservoir.

Geologic Storage Project Lifecycle Stages: (1) Pre-injection stage; (2) Injection stage; and (3) Post-injection stage

Injection Zone: Specific sedimentary layers, within a storage reservoir, that are targeted for current or future CO_2 injection.

Near-Surface Monitoring: Testing in the vadose zone and groundwater sources to identify and quantify possible releases associated with carbon storage operations.

Pore Space: The void space in formation rocks that can contain fluids

Potential Site: A specific project site that has potential capacity, injectivity and containment for CO_2 storage but requires more data acquisition and further evaluation to be defined as Qualified Site.

Potential Sub-Region: A project region associated with a sub-regional trend of potential CO_2 storage sites, but which requires more data acquisition and/or evaluation to define Selected Areas.

Qualified Site: A project site that has met all required technical and non-technical criteria for CO_2 storage and is ready to permit.

Selected Area: A project area that shows sufficient capacity, injectivity and containment for CO_2 storage but is currently poorly defined and requires more data acquisition and further evaluation to be defined as Qualified Site.

Site Characterization: The process of evaluating Potential Sites to identify one or more “Qualified Sites” which are viable for storage and ready to permit. Technical and non-technical data is used and data sampling/analysis is site-specific. Site Characterization involves two stages: (1) Initial Characterization involves analysis of available site-specific information and (2) Detailed Characterization involves site-specific field acquisition and analysis of new data.

Site Screening: The process of evaluating Sub-Regions within basins or other large geographic regions and identifying "Selected Areas" within those regions which warrant additional investigation for storage. Available technical and non-technical data is used and data sampling / analysis is coarse.

Site Selection: The process of evaluating Selected Areas and identifying "Potential Sites "within those areas, which warrant additional investigation for storage. Available technical and non-technical data is used and data sampling/analysis is necessary and sufficient to identify individual sites.

Social Characterization: An approach for gathering and evaluating information to obtain an accurate portrait of stakeholder groups, their perceptions, and their concerns about geologic storage of CO_2.

Storage Complex: A geologic entity that is physically suitable for long-term storage of CO_2. It consists of: (1) one or more storage reservoirs, with permeability and porosity that allow injection and storage of CO_2; and (2) one or more low-permeability seals, which enclose the reservoir(s) and serve as barriers to migration of CO_2 out of the reservoir units.

Storage Formation: An established, named geologic formation that contains known or potential CO_2 storage reservoirs.

Storage Reservoir: Layers of porous and permeable rock, within a geologic formation, which are confined by impermeable rock, characterized by a single pressure system, and suitable for long-term storage of CO_2.

Subsurface Monitoring: Sampling and testing to track movement of the CO_2 plume and pressure changes in the reservoir, and to identify and assess impacts of injection in the reservoir and surrounding formations.

EXECUTIVE SUMMARY

Geologic Storage of anthropogenic carbon dioxide (CO_2) has gained recognition in recent years as a necessary technology approach for ensure environmental sustainability by reducing greenhouse gas emissions. The U.S. Department of Energy (DOE) Office of Fossil Energy's (FE) National Energy Technology Laboratory (NETL) are developing technologies that will enable widespread commercial deployment of geologic storage of CO_2 by 2025-2035.

DOE has engaged with technical experts in the Regional Carbon Sequestration Partnership (RCSP) Initiative to update its Best Practice Manuals (BPMs) for geologic storage projects. The BPMs are intended to disseminate knowledge gained through the RCSP Initiative and to establish uniform approaches for carrying out successful projects.

The first editions of the BPMs were completed between 2009 and 2013 and incorporated findings from RCSP Characterization Phase and small-scale Validation Phase field projects. The 2017 Revised Editions of the BPMs include lessons learned in more recent years, as the RCSPs have progressed to large-scale Development Phase field projects.

The five 2017 Revised Edition BPMs are:

- *BEST PRACTICES: Site Screening, Site Selection, and Site Characterization for Geologic Storage Projects*
- *BEST PRACTICES: Public Outreach and Education for Geologic Storage Projects*
- *BEST PRACTICES: Risk Management and Simulation for Geologic Storage Projects*
- *BEST PRACTICES: Operations for Geologic Storage Projects*
- *BEST PRACTICES: Monitoring, Verification, and Accounting (MVA) for Geologic Storage Projects*

The BPMs are interconnected, and together they are intended to provide a holistic approach to carrying out a geologic storage project, from inception to completion.

This manual[1] presents 11 Best Practices derived from the experience gained thus far by the RCSPs. The RCSPs encountered a few common themes in developing outreach programs for small-scale Validation Phase and large-scale Development Phase projects. These themes include a lack of understanding of how CO_2 storage works due to the "out of sight" nature of the technology; a lack of familiarity with similar storage functions already occurring in nature, and the actual performance of other geologic storage projects. Other themes include communication challenges that stem from the implementation of complex projects. Effective public outreach and education can help improve and facilitate a geologic storage project and overcome these challenges.

The Best Practices highlighted in this manual address the practical implications of conducting outreach and education for geologic storage projects across a variety of U.S. geologic and cultural settings. The objective of this manual is to communicate the lessons learned and to recommend Best Practices that have emerged from the first decade of public outreach conducted by the RCSPs. The manual is intended to assist project developers in understanding and adopting Best Practices in outreach to support geologic storage projects. Although project developers are the primary audience for this document, other stakeholders may find information that will aid them in their consideration of carbon storage projects and community engagement.

[1] This is the third edition of the document; the first was published in December 2009 and the second in 2013. The 2017 revised edition includes lessons learned during the third phase of the RCSP Initiative, which is focused on large-scale development phase field projects.

BEST PRACTICES IN PUBLIC OUTREACH PROGRAMS AND ACTIVITIES

- *Best Practice 1: Integrate Public Outreach with Project Management*
- *Best Practice 2: Identify Outreach Goals with Project Management*
- *Best Practice 3: Establish a Strong Outreach Team*
- *Best Practice 4: Identify Key Stakeholders*
- *Best Practice 5: Conduct and Apply Social Characterization*
- *Best Practice 6: Establish an Outreach Program*
- *Best Practice 7: Develop Key Messages*
- *Best Practice 8: Develop Outreach Materials Tailored to the Audiences*
- *Best Practice 9: Implement and Manage the Outreach Program*
- *Best Practice 10: Assess the Performance of the Outreach Program*
- *Best Practice 11: Be Flexible–Adapt the Public Outreach Program as Needed*

Best Practices 1 through 5 generally relate to studying or "doing the homework" necessary to understand the community in which a project will be located as well as other stakeholders. Best Practices 6 through 8 generally relate to developing outreach plans and materials that reflect what has been learned about the community and its concerns. Best Practices 9 through 11 generally relate to the operational steps of outreach including implementation, assessment, and refinement as necessary. Although these Best Practices are presented in a sequential order, the RCSPs' experience shows that they will be utilized in an iterative manner. Moreover, they are not intended to be prescriptive but rather serve as vetted approaches to be considered within the context of individual projects.

1.0 INTRODUCTION

Geologic Storage of anthropogenic carbon dioxide (CO_2) has gained recognition in recent years as a necessary technology approach for ensure environmental sustainability by reducing greenhouse gas emissions. The U.S. Department of Energy (DOE) Office of Fossil Energy's (FE) National Energy Technology Laboratory (NETL) are developing technologies that will enable widespread commercial deployment of geologic storage of CO_2 by 2025-2035.

As an important step in meeting this objective, DOE/FE/NETL established the Regional Carbon Sequestration Partnership (RCSP) Initiative (see Appendix 1). This national Initiative, launched in 2003, includes seven regional partnerships tasked with developing and testing technologies and approaches for safe and permanent storage of CO_2 in different geologic and geographic settings across the United States. An important outcome of the RCSP Initiative is the publication of a series of topical BPMs for geologic storage projects. The BPMs are intended to disseminate knowledge gained through the RCSP field efforts and to establish effective methods, reliable approaches, and consistent standards for carrying out successful geologic storage projects.

The first editions of the BPMs were completed between 2009 and 2013 and presented salient findings of the RCSPs' Characterization and Validation Phase field projects. Since that time, the RCSPs have progressed to large-scale Development Phase field projects. For the 2017 Revised Editions of the BPMs, DOE/FE/NETL has worked closely with technical experts from the RCSPs to incorporate new findings and lessons learned from these Development Phase projects.

The five 2017 Revised Edition BPMs are:

- *BEST PRACTICES: Site Screening, Site Selection, and Site Characterization for Geologic Storage Projects*
- *BEST PRACTICES: Public Outreach and Education for Geologic Storage Projects*
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Taken separately, each BPM can serve as a stand-alone guide for conducting specific activities related to Characterization, Public Outreach, Risk Management, Operations, or MVA. Taken together, the five BPMs are interconnected—each linked to the others by the interdisciplinary nature of a geologic storage project. They are intended to provide a holistic approach for carrying out a geologic storage project, from inception to completion.

Since 2003, the RCSPs have undertaken 19 validation phase and 8 development phase storage projects.[2] These field tests represent pioneering efforts across a variety of geologic and economic settings. The projects range from small-volume, short-duration validation phase tests with CO_2 delivered by a truck, pipeline, or rail and injected into a single well; to large-volume, long-term development phase field projects. Some of the development phase projects injected anthropogenic CO_2 into saline reservoirs, while others focused on storage of CO_2 in conjunction with enhanced oil recovery (EOR). The projects occurred in areas with historic and ongoing subsurface activities (e.g., oil and gas production or related injection activities) in addition to areas having little or no experience with these activities.

The RCSPs encountered a few common themes in developing outreach programs for small-scale and large-scale geologic storage projects. The themes include a lack of understanding of how CO_2 storage works due to the "out of sight" nature of the technology, a lack of familiarity with similar storage functions already occurring in nature, and a lack of knowledge of actual performance of other geologic storage projects. Other themes include communication challenges that stem from the implementation of complex projects. This manual presents the Best Practices for Public Outreach and Education for Geologic Storage Projects derived from the experiences of the RCSPs.

Throughout the manual, examples and lessons learned are provided as "case studies" from the RCSP Large-Scale Development Phase field projects. Figure 1.1 and Table 1.1 provide the fundamental information on these RCSP projects, including project name, project type, geologic basin, amount of stored CO_2, and geographic location. Some additional context for the RCSP Development Phase field projects is provided in Appendix I.

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[2] For more information on the Regional Carbon Sequestration Partnership Initiative see: http://www.netl.doe.gov/research/coal/carbon-storage/carbon-storage-infrastructure/rcsp

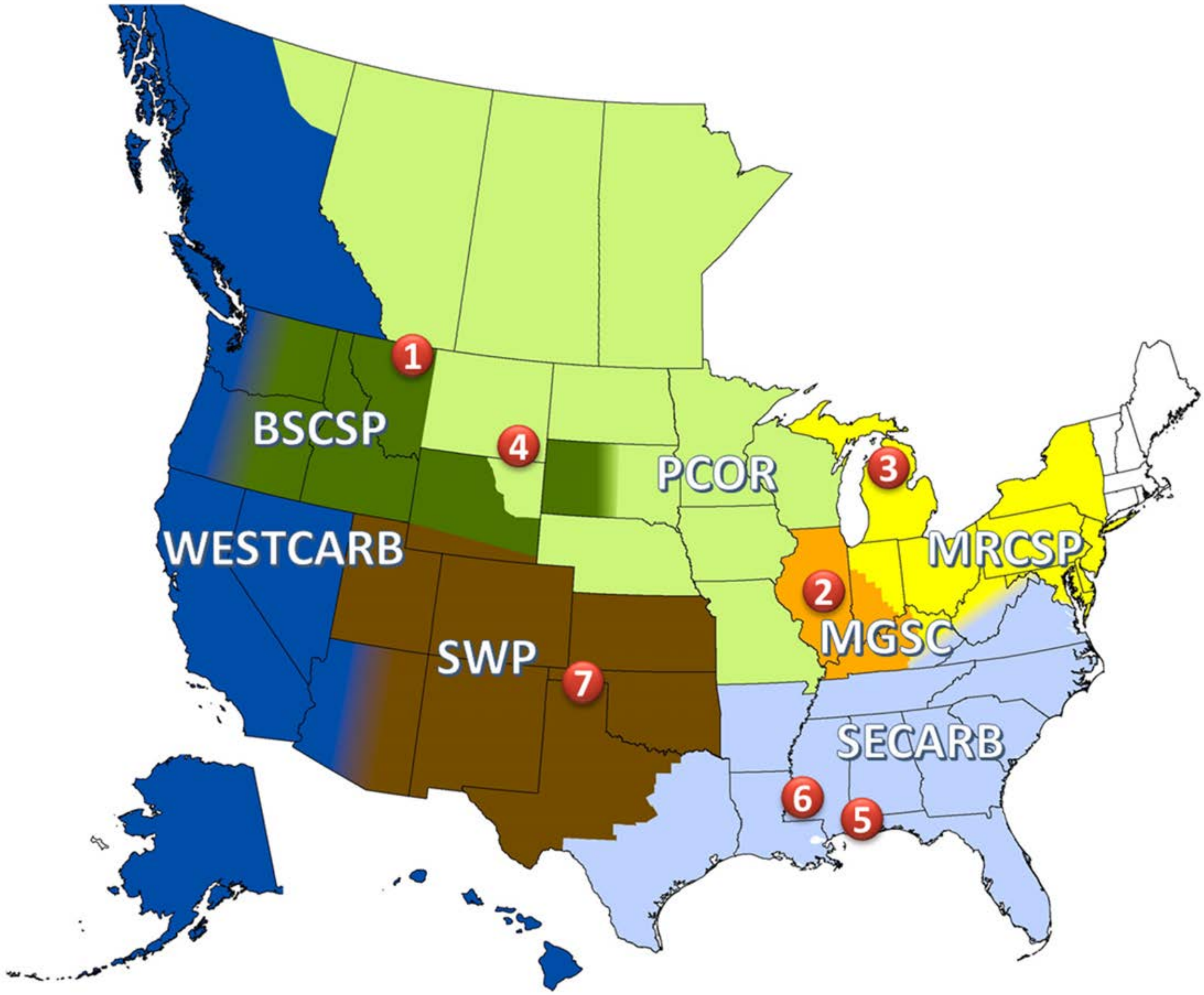

Figure 1.1: Locations of RCSP Large-Scale Development Phase Projects.

(Numbers correspond to Table 1.1)

Table 1.1: RCSP Large-Scale Development Phase Projects.

(See Figure 1.1 for project locations)

RCSP Development Phase Projects				
Number on Map	**Project Name**	**Project Type**	**Geologic Basin**	**Metric Tons of CO_2 Stored**
1	**Big Sky Carbon Sequestration Partnership–Kevin Dome Project**	Saline Storage	Kevin Dome	N/A (no injection date)
2	**Midwest Geological Sequestration Consortium–Illinois Basin Decatur Project**	Saline Storage	Illinois Basin	999,215 (final stored, and project in post-injection monitoring phase)
3	**Midwest Regional Carbon Sequestration Partnership–Michigan Basin Project**	Enhanced Oil Recovery	Michigan Basin	596,282 (as of Sept. 30, 2016)
4	**The Plains CO_2 Reduction Partnership–Bell Creek Field Project**	Enhanced Oil Recovery	Powder River Basin	2,982,000 (final stored, and project in post-injection monitoring phase)
5	**Southeast Regional Carbon Sequestration Partnership–Citronelle Project**	Saline Storage	Interior Salt Basin, Gulf Coast Region	114,104 (final stored, and project in post-injection monitoring phase)
6	**Southeast Regional Carbon Sequestration Partnership–Cranfield Project**	Saline Storage	Interior Salt Basin, Gulf Coast Region	4,743,898 (final stored, and project in post-injection monitoring phase)
7	**Southwest Carbon Sequestration Partnership–Farnsworth Unit Project**	Enhanced Oil Recovery	Anadarko Basin	490,720 (as of Sept. 30, 2016)

1.1 PURPOSE

This manual presents a framework for designing an outreach program for a geologic storage projects based on the specific characteristics of the project, its developers, and the host community. It is derived from the experiences of the RCSPs and addresses the practical implications of conducting outreach and education for a variety of geologic storage projects. The objective of the manual is to communicate the lessons learned and to recommend Best Practices emerging from the first decade of public outreach conducted by the RCSPs. The manual is intended to assist project developers in understanding and adopting Best Practices in outreach to support geologic storage projects. Although project developers are the primary audience for this document, other stakeholders may find information that will aid them in their consideration of carbon storage projects and community engagement.

1.2 PUBLIC OUTREACH IN GEOLOGIC STORAGE – WHAT IS IT? WHY IS IT NECESSARY?

Public outreach involves both the transfer of information and a means to gauge the success of the transfer. It begins at the onset of a geologic storage project and continues throughout the project's stages until project closure. Outreach involves all project team members and encompasses an array of activities through which information about geologic storage projects is shared with, and feedback is obtained from stakeholders. In this context, stakeholders encompass a wide array of parties with an interest in the project. Hence, the group of relevant stakeholders for a particular project will be defined based on the project specifics and location.

When done effectively, public outreach can be used to help identify the main values and concerns of a host community as well as the perceived benefits of a proposed project. This understanding can help a project team foster public acceptance by addressing the issues of relevance to a particular community. However, it should be noted that public outreach, even when done well, does not guarantee public acceptance of a given geologic storage project.

The RCSPs' concept of public outreach involves significant efforts to understand, anticipate, and address public perceptions and concerns about CO_2 storage in a community being considered for a project. Ideally, public outreach can lead to a mutually beneficial outcome where project developers attain the support of well-informed stakeholders who are comfortable with the project benefits and potential risks, and trust the project team.

Case Study 1.1, from the BSCSP, illustrates the importance of developing and implementing a public outreach program that takes local concerns and experiences into account. While a public outreach program cannot assure public acceptance, it can help build a common understanding of the project and help to identify any concerns that may exist.

See page 19

In the absence of a concerted outreach effort, research and experience suggest that community members will form their opinions of geologic storage based on elements that may not reflect the technical merit of the project(Bradbury et al., 1995; Bradbury et al., 2008). Public opinions may be influenced by inaccurate perceptions of project risks or benefits; by whether the project is viewed as consistent with the community's long-term goals; by social factors, such as the degree of trust placed in the project team and government agencies; and by the perceived equity in the process for developing a project. Media coverage; word-of-mouth; and, information sources, such as blogs and other electronic media, often influence how individuals form opinions. Perceptions that may seem exaggerated from a technical point of view should be taken seriously because they reflect what stakeholders actually think. In other words, perceived risks are no less "real" for purposes of implementing a public outreach program.

Geologic storage remains an approach that is largely unknown to many stakeholder audiences, including policy developers, community leaders, nongovernmental organizations (NGOs), educators, and the general public. Early public opinion surveys revealed little familiarity with the term "CO_2 storage" and even less understanding of the meaning of the term (Reiner et al., 2006; Curry et al., 2005). In addition, geologic storage projects may result in long-lived changes to the landscape (due to surface equipment for injection and monitoring) and the subsurface (due to long-term CO_2 storage). Stakeholder concern about new geologic storage projects can easily be raised when these factors are combined. Typically, questions can arise about safety and property values. Public outreach provides the opportunity for project developers to identify and address these concerns. In the absence of outreach, these concerns can rapidly transform into public opposition.

1.3 OVERARCHING OUTREACH CONSIDERATIONS BASED ON KEY ASPECTS OF GEOLOGIC STORAGE PROJECTS

The main portion of this manual is focused on the Best Practices and practical issues related to each practice. This section is intended to help the reader step back and consider a geologic storage project as a whole and some of the overarching factors that will likely influence overall outreach design. Four aspects of geologic storage projects considered here include project type, the typical project lifecycle, project visibility, and the larger community relations' objectives of the project developer.

GEOLOGIC STORAGE PROJECT TYPES

A primary distinction among geologic storage projects has to do with the type of storage reservoir. DOE is investigating five types of underground reservoirs for geologic storage: saline reservoirs, oil and natural gas reservoirs, unmineable coal, organic-rich shale, and basalt formations.

The RCSP's have learned that the local community's awareness of subsurface activities such as drilling and injection, familiarity with property rights and economic benefits from resource production, and knowledge of the regulatory agencies who oversee such activities at the local, state and/or federal level may have a meaningful influence on stakeholder views and opinions towards geologic storage projects. To learn more about understanding the local community, refer to Best Practice 5–Conduct and Apply Social Characterization.

TYPICAL GEOLOGIC STORAGE PROJECT LIFECYCLE

Typically, a geologic storage project will unfold through a series of three overlapping stages: pre-injection preparation, injection, and post-injection as indicated in Figure 1-2.

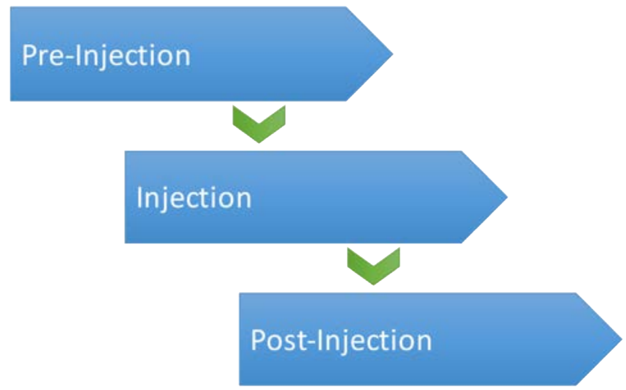

Figure 1-2: Typical Geologic Storage Project Lifecycle Stages

Pre-injection includes site screening, site selection, and site characterization activities.[3] Site screening and site selection may involve review of a number of site in different regions as candidate sites. Site characterization involves extensive onsite data collection. Pre-injection also includes site design, a stage that could benefit from community input. Permitting often entails some form of formal public engagement either through notices in the paper, public comment periods, or public hearings. Once injection stops and a project is closed, regulatory guidelines must be followed regarding ongoing environmental stewardship.[4]

The most valuable lesson learned by the RCSPs is that public outreach needs to be incorporated as an integral component of geologic storage project management—ideally starting at the time of project conceptualization/definition prior to site screening. It is useful to consider the public outreach needs and objectives for the stages of the lifecycle and the interrelation of those stages. Community goodwill built early on in a project cycle could help to retain goodwill during the later stages and this may reduce

[3] For more information on site screening and characterization, reference NETL (National Energy Technology Laboratory) BPM, 2016, "Site Screening, Site Selection, and Site Characterization for Geologic Storage Projects".

[4] For more information on site operations, reference NETL (National Energy Technology Laboratory) BPM, 2016, "Operations for Geologic Storage Projects".

problems that arise during one stage from spilling over into the later ones. Considering projects in their entirety underscores the importance of incorporating outreach into project management.

PROJECT VISIBILITY

Another influencing factor is the extent to which projects will be visible or entail significant changes to the physical appearance of a site. In some cases there may be only minimal alterations to the site. For example, in the case of storage at EOR operations where minimal new infrastructure may be necessary. In other cases the geologic storage project may need to install major infrastructure at the site such as CO_2 source processing plants, CO_2 pipelines, well drilling and completion, power infrastructure and monitoring systems. Public outreach programs can anticipate these future changes and help to build stakeholder awareness and expectations.

COMMUNITY RELATIONS OBJECTIVES

Project developers should consider the community relations objective. Public outreach planning will be influenced by the extent to which a developer seeks to establish and maintain good relations with the communities where their facilities are located. One goal of public outreach is to establish open lines of communication between project developers and a host community. This will provide a means to solicit community input, build trust, and ensure the community that the project will be safely and responsibly carried out. In many cases, the developer may have longstanding relationships with the community where a project might occur. When this is true, a goal of public outreach is to build on those relationships.

Geologic storage projects may be affiliated with existing CO_2 sources (e.g., industrial plants) or they may be part of a plant expansion or a new development. Local stakeholders may have a long history with the CO_2 source or in the case of a new facility, may be unfamiliar with both the operator and the CO_2 storage operations proposed in conjunction with the new facility. In the future, projects may also take the form of central regional CO_2 repositories serving a number of CO_2 sources linked by pipeline(s). Public outreach programs should consider the factors described in this manual.

1.4 USE OF THIS MANUAL

Although there is no single formula for conducting effective outreach, success typically relies on the following:

- A clear set of outreach goals
- A strong, capable outreach team
- A productive working relationship with the project's technical and regulatory teams
- Extensive preparation that involves listening to the community
- Readily accessible information that explains the project and addresses local concerns
- Frequent monitoring of the project and outreach team performance
- The flexibility to make changes as needed

A continuing theme throughout this manual is that outreach needs to take into account the site-specific needs and concerns of the target audience as well as the extent to which the developer already has relationships in the community. In some cases, it may be appropriate to emphasize certain Best Practices over others. This can only be determined on a case-by-case basis.

The Best Practices outlined here are intended to facilitate the development and exchange of technically sound information as a basis for transparent and mutually beneficial interaction among stakeholders and project developers throughout the life of a project. As such, the manual represents a framework for designing an outreach program associated with a geologic storage project. The way in which the manual is applied will reflect the specific physical characteristics of a planned project, the project developers, and the social setting for the project. The manual is designed for use alone or in conjunction with other Best Practice Manuals resulting from the RCSP Initiative (See Appendix 1). It provides an overarching framework for developing a public outreach program and is intentionally broad. The Best Practices are not intended to be prescriptive but rather serve as vetted approaches to be considered within the context of individual projects.

SUMMARY OF CHANGES IN THIS REVISION OF THE BEST PRACTICE MANUAL

This is the third edition of the Best Practice Manual. It builds on the first edition that was completed in 2009 and updated with minor technical revisions in 2013. This revision takes a closer look at the Best Practices and splits the original Best Practice 1 into two parts and updates the wording of the remaining Best Practices to better reflect our experience and make this document more broadly applicable.

The text itself has been updated to include more of the experience gained while implementing the demonstration projects. The Appendices include a review of the tools and methods studied by the RCSP Outreach Working Group. There is a discussion on digital communications tools and a greater discussion on the theory of conducting performance assessment. And lastly, the resources list has been updated.

The specific Best Practices have withstood scrutiny during the Demonstration Phase of the RCSP Initiative and provides a useful framework for project developers to use in developing outreach programs for their own projects.

1.5 RCSP CASE STUDY

CASE STUDY 1.1 — BSCSP

BIG SKY CARBON SEQUESTRATION PARTNERSHIP (BSCSP)

Value of Outreach

In the initial stages of the Big Sky Carbon Sequestration Partnership's (BSCSP) Validation Phase small-scale field project, the focus was on understanding the project's technical component and project logistics, and obtaining the necessary permits. Outreach activities and community engagement for the project was limited. The partnership did not view outreach as a priority because of the small amount of CO_2 that was injected and unfamiliarity with the local community. As the project moved forward, local community groups expressed valid concerns, largely due to a separate initiative of a developer interested in building a coal-based power plant on the pilot test location. Several groups in the community opposed the power plant and did not trust the developer. These feelings and attitudes transferred to the pilot test and some individuals vocally opposed the project. At this point, the project team launched a concerted public outreach effort and the project location was moved to a paper mill. A member of the BSCSP outreach team and the paper mill communications manager collaborated to develop an outreach strategy and materials that described the benefits of the pilot and its importance in providing the public with sound data on CO_2 storage technology. The team conducted dozens of interviews and discussions with stakeholders in order to develop a better understanding of the specific concerns and how they could be addressed. The media was briefed on the project prior to the issue of a press release containing new project details and information on the partnership with the paper mill. In addition to interviews, interested groups were given the chance to attend an open house and take a tour. The project team also met with several regional geology professors and invited their classes to tour the laboratories and the drilling site. This outreach resulted in an increased understanding of the pilot's objective, clarified misconceptions held by some individuals in the community, and reduced apprehensiveness about the project. These efforts resulted in little to no public opposition toward the modified pilot test, positive articles in the press, reduced project delays, and improved public trust and public relations. Additionally, student interns have become involved with the research.

Figure 1-3: BSCSP Information Session

2.0 BEST PRACTICES IN PUBLIC OUTREACH PROGRAMS AND ACTIVITIES

The Best Practices provide a framework for developing a public outreach program. They include:

- *Best Practice 1: Integrate Public Outreach with Project Management*
- *Best Practice 2: Identify Outreach Goals with Project Management*
- *Best Practice 3: Establish a Strong Outreach Team*
- *Best Practice 4: Identify Key Stakeholders*
- *Best Practice 5: Conduct and Apply Social Characterization*
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- *Best Practice 11: Be Flexible–Adapt the Public Outreach Program as Needed*

Best Practices 1 through 5 generally relate to studying or "doing the homework" necessary to understand the community in which a project will be located as well as other stakeholders. Best Practices 6 through 8 generally relate to developing outreach plans and materials that reflect what has been learned about the community and its concerns. Best Practices 9 through 11 generally relate to the operational steps of outreach including implementation, assessment, and refinement as necessary. Figure 2-1 shows a flow diagram of the Best Practices. Although they are presented in a sequential order, the RCSPs' experience shows that they will be utilized in an iterative manner. This section discusses each of the Best Practices in greater detail.

2.1 BEST PRACTICE 1: INTEGRATE PUBLIC OUTREACH WITH PROJECT MANAGEMENT

By aligning an outreach program with the typical workflow of a CO_2 storage project, outreach activities will be more effective, in sync with other key project stages, and beneficial to the overall project. A key component of integrating public outreach with project management is building in the time and budget necessary to accomplish the various steps in advance of engaging the public. Questions like how and when to engage stakeholders need to be addressed as part of the overall project management plan. This will be especially critical during the early stages of a CO_2 storage project. It takes time to develop an understanding of community needs and concerns, and to build relationships with stakeholders. Just as delays in sourcing materials or obtaining permits can have an impact on the cost of implementing a geologic storage project, so too can delays caused by the need to address community concerns, especially concerns that might be revealed early through outreach.

As shown in Figure 1-2, geologic storage projects proceed in a series of overlapping stages. These stages begin with the decision to initiate a project, continue through project design, siting, construction, operation, closure, and post-closure site monitoring. Just as the physical completion of a geologic storage project requires engineering and geological expertise, there will also be a need to attend to public and social considerations inherent in these stages. For example, there will be times when the project is legally required to interact with the public (e.g., permit hearings). There will be times when the project will have high visibility and interaction with the public is expected, appropriate, and prudent (e.g., announcement of the project approval, initiation of construction and construction milestones, start of operations and operation milestones, closure, and unplanned events). There will be times when interaction with the public is simply in the best interests of the project (e.g., information and educational engagement with stakeholders). An effective outreach program is integrated into project management by

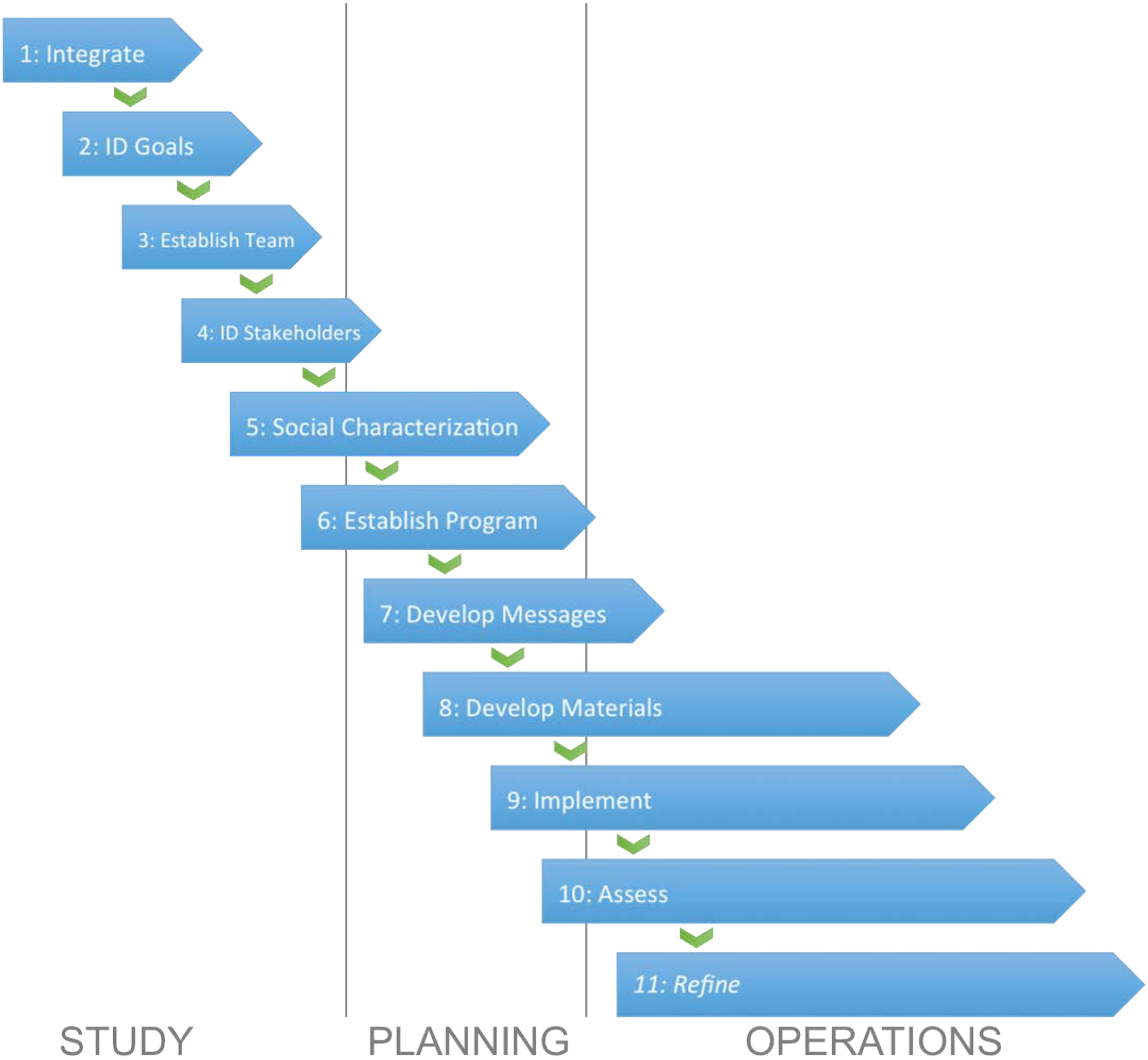


Figure 2-1: Flow Diagram of Best Practices

including a representative voice for outreach on the project management leadership team. The RCSPs found that this action provided the potential for:

- Clearly communicating the importance of the social aspect of the project to funders/investors, staff, and external stakeholders and that it constitutes an inherent part of the project.
- Providing a “go to” point for outreach issues at the core and highest level of the project team.
- Effective and efficient communication regarding outreach among the leadership team.
- The consideration of social components in technical planning and execution as well as including technical staff and considerations in the outreach planning and execution activities.

The RCSPs’ experience suggests that it is preferable to proactively implement public outreach in order to avoid or minimize having to act in a reactive or responsive mode. Flexibility also plays a role because the project team may need to adjust the nature and timing of outreach activities if events do not go as planned (e.g., delays due to weather or availability of service companies). As part of the site selection process, it is useful to ensure that the key project steps are fully understood for the jurisdiction in which a potential site is located. This includes developing an understanding of the regulatory process, as well as any other necessary permissions or approvals. The outreach team should also consider the process that will be used internally to complete final review and production of outreach materials. This kind of analysis will assist the project team in taking a proactive approach to integrating outreach into project management.

Outreach opportunities often coincide with times of high exposure for a project. To prepare for high visibility outreach interactions and associated engagement activities, it is useful to review the full range of regulatory permits and approvals that a storage project must obtain. They likely include the following (and may include others):

- National Environmental Policy Act review (if federal funds or lands are involved) or comparable state legislation or other requirements for an Environmental Assessment or Environmental Impact Statement
- Permission to conduct seismic surveys, access private or public property, and/or use public roads
- Access to land for site characterization activities, surface equipment, and/or monitoring activities
- Access to pore space for CO_2 storage and possibly the other subsurface zones potentially impacted by the CO_2 storage project
- Permission, public notice and drilling permits for drilling non-injection wells (e.g., stratigraphic test wells, monitoring wells, or other exploratory wells)
- A permit for injection including completing a public hearing, staged approvals of project design and construction
- For storage in a saline reservoir a Class VI Underground Injection Control permit is needed from the Environmental Protection Agency (EPA)
- CO_2 injection permit renewals
- Approvals by other regulatory agencies, including those with jurisdiction over wildlife areas, historic or cultural sites, local zoning, or business oversight, etc.
- Certification of closure

In addition to outreach in support of permitting and approvals, several other possible points of public interaction would include the following:

- Bid solicitations or requests for proposals
- Meetings or focus groups with stakeholders
- Interviews with community members.
- Start of visible operations (e.g., seismic surveys, drilling or CO_2 injection operations)
- Reporting of monitoring data to the regulatory agency
- Site visits or tours
- Periodic scheduled project update meetings with the public
- Interactions with the media
- Other community events (e.g., farm shows, science open houses)

Appendix 2: Planning and Managing Public Outreach Activities presents additional information about the range of activities and events to consider in developing and managing outreach programs.

An additional point of public contact that must be considered in planning for CO_2 storage projects is a potential crisis event. This topic is covered in Appendix 3: Sample Communications Plan.

Although it may not be possible to anticipate all occasions, events, or circumstances for public outreach at the inception of a CO_2 storage project, early and ongoing consideration of these matters will help the project team to define areas where more information is needed and ensure that outreach efforts are coordinated with other activities throughout all project stages.

Case Study 2.1 illustrates how the MGSC integrated public outreach into overall IBDP project management. MGSC found such integration to be an essential process that facilitated the collection and sharing of information among the project team and with the local community.

▶ See page 37

2.2 BEST PRACTICE 2: IDENTIFY OUTREACH GOALS WITH PROJECT MANAGEMENT

Within a project, each stage will have goals and objectives. These may range from broad (e.g., developing a regional reputation for excellence in geologic storage) to narrow (e.g., meeting a budget or obtaining a permit within a planned timeframe). It is important early on to work with project management to identify the goals for the outreach program. There are several benefits to working with management to identify the outreach goals including (1) The process of developing outreach goals with and getting buy-in from project management can help to educate the management team about what public outreach may be able to do or not do for the project. This can be helpful in ensuring that management has realistic expectations and adequately communicates their view of the role of outreach in the project. (2) Having management-supported outreach goals can facilitate budget discussion. Typically, the breadth and scope of outreach goals can play a major role in allocating both human and financial resources to outreach.

There are several considerations under this Best Practice. The first consideration deals with aligning the goals of the outreach program with the type of the geologic storage project (e.g., EOR or storage in a saline reservoir). The second consideration deals with matching project outreach goals with the group or groups that serve as the face of the project. The third is developing an outreach plan that matches the outreach activities with the stages necessary to implement and execute the project. These are briefly considered below.

There are a variety of scenarios for groups that may collaborate to develop geologic storage projects ranging from CO_2 source owners developing their own greenfield sites or contracting with an independent geologic storage operators, to CO_2 source owners working with oil field operators in the case of EOR with associated storage. Each of these scenarios may have its own variation on management structure to accommodate the differences in partners and their role in the project.

The main driver for a project may be the value of CO_2 reductions for regulatory/compliance purposes or in the case of an EOR project, the fundamental goal might be focused on oil production, with carbon reduction and regulatory/policy compliance being of secondary importance. These drivers may influence outreach goals.

Establishing outreach goals will also facilitate future assessment of program performance (this is discussed further in Best Practice 10).

2.3 BEST PRACTICE 3: ESTABLISH A STRONG OUTREACH TEAM

It is essential to establish a strong outreach team with a clearly defined structure that delineates roles and responsibilities. Geologic storage projects can involve many individuals from the host company and potentially from several companies, including: plant managers, scientists, government relations officers, communications personnel, safety personnel, onsite supervisors, technical service providers, field crews, and other personnel who are key decision makers. These individuals become the face of the project—whether in the community where the project is located or at other levels (e.g., state or federal); their words and conduct can have a direct influence on the public's perception of whether the project is being carried out professionally and in a safe, transparent manner.

A comprehensive outreach team will include individuals who are involved in and knowledgeable about the technical details of the project, as well as individuals who have backgrounds in communication, education, and community relations. The RCSPs have benefitted from including employees from the host company who have some knowledge of the local community and can help to identify opinion leaders, interested citizens, and other key stakeholders. These employees may also be able to help identify benefits to the community or may know other individuals or groups who can provide a better understanding of community values.

Given that the outreach team may consist of individuals who also have other responsibilities, care must be taken to ensure coordination of efforts, consistency of information, sensitivity to major concerns, and awareness of good communication practices. As discussed in Best Practice 6, a communications plan should be developed that clearly identifies team member roles and responsibilities, key messages, communication protocols, and other information. This plan should be shared with the outreach team so that all communications reflect a common understanding of stakeholder concerns and perceptions.

Accountability is another key issue. Establishing a structure for the outreach team and identifying “message developers” and spokespeople, as well as someone to provide follow-up information, will help team members to understand their roles and responsibilities.

Many companies have adopted safety as a core element of their corporate culture. In these companies, each individual has a role in ensuring and promoting safety. Ideally, within companies participating in a geologic storage project, outreach can become a facet of the corporate culture where each individual understands his or her role in helping the public to have confidence in the project.

Case Study 2.2 describes MRCSP’s use of a diverse, coordinated team to plan outreach efforts. The variety of perspectives on the team helped to develop a plan that considered a broad range of stakeholder views and utilized a number of tools to facilitate communication.

See page 38

A communications plan is an invaluable tool for documenting and communicating the outreach program plan. See Appendix 3 for additional information. During outreach planning, the team might want to consider planning for site visits. Appendix 4: Planning a Site Visit presents an approach to planning site visits.

2.4 BEST PRACTICE 4: IDENTIFY KEY STAKEHOLDERS

The RCSPs believe that it is critical to identify all stakeholders in the project lifecycle and consider how to engage with them through the outreach program. Geologic storage projects may be viewed as a local issue, but they are being carried out in the context of national and international debates on climate change mitigation. Stakeholders may come from an area that extends well beyond the project’s locale and regulatory jurisdiction.

The introduction defined stakeholders as parties with an interest in a geologic storage project. At the local level, these may include elected and safety officials, regulators, landowners, citizens, civic groups (including environmental, business, and religious groups), business leaders, media, and community opinion leaders. If storage is associated with a power plant, the plant employees are key stakeholders as they are integrated into the local community. In the case of a greenfield project in a rural area, farmers or ranchers might be a key stakeholder group.

Moving further away from the project site, state or regional stakeholders may include elected and appointed officials (e.g., governors, state legislators); regulatory agencies, including those with oversight and permitting of pipelines, utilities, natural resources, and environmental protection; economic development groups; and environmental and business groups. At the national level, stakeholders may include: government agencies, such as EPA and DOE; congressional leaders, committee/subcommittee chairs and key staff; national environmental groups; and other individuals in fields that have an interest in geologic storage projects, such as the financial community and the legal profession. Table 2-1 presents a brief description of various stakeholder groups and strategies for identifying them. Not all of these groups may be relevant in a specific community. The following table is offered to provide an overview of the types of groups that may be important to a project. The RCSPs have also found it valuable to work with a partner with an excellent reputation in the community to identify stakeholders and their concerns.

Table 2-1: Description of Major Stakeholder Groups

Stakeholder	Key Points	Identification Strategies
Officials	Individuals at the local, regional, state, or national level who represent the community or who have special interest in matters such as energy and/or climate change, the economy, or the environment. This may include elected or appointed individuals, individuals serving in volunteer capacities, executive boards, and others. Officials will be especially sensitive to activities that may affect their constituents and will want to be informed beforehand so that they can answer any questions raised. It may be valuable to talk with officials to help sort out who has jurisdiction over what area of decision-making in instances where government is multi-layered. For example, in one jurisdiction the Mayor may have authority over road use and in another it might be a Township Trustee or a Regional Engineer. Insight into how the community makes official decisions, how it is governed, and how it relates to surrounding communities can help a geologic storage project to proceed smoothly. Some officials may have a strong influence on a project even if their explicit permission is not required to move ahead with the project. For example, the Commissioner of Public Health may not have jurisdictional authority over a project but may have a leadership role if something goes wrong and therefore may have a strong opinion about the project from the outset. Thus, it is prudent to try to identify and work with officials who may become involved as well as those with direct responsibilities.	• State, county, and community websites • Local phone books • Interviews with stakeholders in this category • Local newspapers
Regulators	Typically, one of three agencies will have primary regulatory oversight of the injection portion of geologic storage projects: the EPA regional office, the state environmental protection agency, or the state natural resource (including oil and gas) management agency. However, other regulatory agencies may have authority to review the project or may govern other aspects of a project. For example, regulatory officials in charge of land management, fisheries and wildlife, water, solid waste, air emissions, or other areas of jurisdiction could have a permitting and oversight role. Permits may also require a review for potential impacts on coastal zones, historic sites, and other protected features. It is useful to have an interagency meeting with regulators to ensure that the project development team is aware of all permitting and regulatory requirements.	• Federal and state websites or directories • Stakeholder interviews
Business Interests	Economic development professionals may be elected or appointed officials and could also hold volunteer or non-governmental posts. Business groups in a community may be quite interested in a geologic storage project. This interest can range from a broad interest in long-term community development to contracting opportunities and/or concerns about secondary impacts on their businesses. In the case of CO_2 storage, there may well be synergistic relationships with the local business community, particularly if the area supports other subsurface economic development activities.	• Local chamber of commerce • Local phone books • Stakeholder interviews • Local newspapers • Industry partners
Landowners and Neighbors	These are the individuals most likely to be directly impacted by and interested in the project, although CO_2 storage may not be familiar to them. It is important to identify neighbors along transportation routes for project-related materials and/or for whom site activities will be visible, as well as neighbors who fall within the regulatory “Area of Review” or from whom access may be required for conducting a seismic survey. Open communication with neighbors ensures they have an opportunity to learn what steps are involved in a project and to voice any questions or concerns.	• Local outreach team members • Town or county clerks, surveyors • Legwork (driving around the site to identify who are the neighbors) • Industry partners

(continued on page 24)

Table 2-1: Description of Major Stakeholder Groups (continued)

Stakeholder	Key Points	Identification Strategies
Civic Groups	Even small communities can house hundreds of nonprofit civic groups. Although some of these groups will have no interest in a geologic storage project, many will and can provide a vehicle for communicating with members of the community and learning about their concerns (e.g., chapters of the League of Women Voters; clubs like Elks, Kiwanis, Rotary, and Shriners; garden clubs).	• Local Chamber of Commerce • Local economic development personnel • Local phonebooks • Group websites
Environmental Groups	Both local and national/international environmental groups have expressed interest in geologic storage projects. At the local level, an important subset could be environmental justice groups, particularly if there are "legacy issues" in the community as a result of past emissions/discharges or insufficient reclamation from industrial or governmental operations. At either the national or local level, it is common to find environmental groups that offer cautious support for CO_2 storage because of its potential role in addressing climate change, as well as some groups that oppose the technology out of concern about continued reliance on coal or other factors.	• Stakeholder interviews at local level • Website reviews • Local newspapers • Local outreach team members
Senior Citizens	Increasingly, senior groups are becoming involved in local issues and the national climate change debate. The views held by seniors' organizations can vary as much as any other segment of the community. Their interest in serving as community guardians can range from activism in environmental protection to monitoring the size and role of government.	• Local Chambers of Commerce • Local outreach team members • Local newspapers • Website reviews
Religious Groups	In some communities, the strong social networks of religious groups provide a means for information exchange. Many religious groups have an environmental stewardship focus within which to promote reduced GHG emissions and reduced impact on the environment.	• Ask local religious leaders to help identify groups
Educators	Educators are key disseminators of information in a community. They often serve as a conduit for current events and have the opportunity to interact with multiple stakeholder groups. They can also provide information specifically related to CCS or to a particular local project once they become informed on these subjects.	• State and local boards of education • Community colleges

2.5 BEST PRACTICE 5: CONDUCT AND APPLY SOCIAL CHARACTERIZATION

As used in this manual, social characterization is an approach for gathering and evaluating information to obtain an accurate portrait of stakeholder groups, their perceptions, and their concerns about geologic storage. This can be applied to identifying the factors that will likely influence public understanding of geologic storage within a specific community. The information gathered will enable the project team to develop better insights into the breadth of diversity among community members, local concerns and potential benefits, and assist in determining which modes of outreach and communication will be most effective. Social characterization is initiated in the early stages of a geologic storage project and continues throughout the project. The level of effort necessary for this varies based on the community characteristics and the extent to which the developer has existing relationships in the community. Additional information of social characterization is presented in Appendix 5: Applying Social Characterization.

Numerous factors contribute to public perception of geologic storage projects. Examples of information collected during social characterization may include:

- **Local economic conditions**: What are the major industries employing individuals in the community? Is the base more service-oriented or industrial? How is the economic health of the community and the region? What is the tax base? What are local energy costs? What are the local perceptions of the likely benefits and role of the project in the community?
- **Local empowerment**: How established/present are local property owners? Do community members think they have a voice in making decisions that impact the community? Are there examples of this? What is the community's experience with industry or environmental concerns?
- **Underlying views**: Can any overarching views on climate change, fossil fuel-based energy, alternative energy source, coal mining, drilling, oil and gas production, natural gas storage, and emissions trading be identified? How do local residents view the role of the Federal Government in funding research? Is there a history of royalty payments for mineral or other property rights?
- **Environment**: Has a community experienced environmental damages in the past? How was this issue resolved? What are the legacies from past environmental degradation?
- **Energy**: What are the local and regional sources of energy? What role does energy play in the economy? Is there a history of oil and gas production in the area? Or other related industries such as mining?
- **Trust**: Who do the stakeholders trust? Why are these individuals trusted? Do stakeholders trust regulators, project developers, and the Federal Government? Are there any key community gatekeepers? Do community members look to local universities or environmental groups for unbiased information?
- **Media**: Is there a strong local media presence? What forms of media are common in the community? Where do individuals get their information?
- **Local education:** What educational resources are in the area—community colleges, universities, schools? Are there academic stakeholders who can be brought into the project? Are there opportunities to collaborate with the local schools in implementing educational programs, such as those developed by the Keystone Center, (The Keystone Center, 2016) or with a local community college in developing training opportunities and future employment for local youth?
- **Local traffic conditions**: The impacts of project construction and implementation on local traffic congestion and safety can have a major influence on community opinion regarding a particular project.
- **Local hazards**: Questions may arise concerning issues such as microseismic events and whether or not drilling in an area or the injection of CO_2 may cause microseismic events. Similarly, in some areas the ability of CO_2 injection and storage infrastructure to withstand hurricanes or tornadoes may be perceived as having an impact on overall project safety.
- **Historic Development:** How was the area settled? What were historic industries? What historic elements shaped the area? Are there historic monuments or features in the area?
- **Tribal Activities:** Do Native Americans have history in the area? Are there Traditional Cultural Properties or cultural resources in the region?

Outreach presentations to the local community should show thoughtful consideration of the information learned during the social characterization research.

As is the case with technical geologic site characterization, the process of gathering social data is iterative. A first round of information gathering would focus on readily available sources, including government and civic group websites, media, published demographic data, local news media archives, local blogs, published surveys and opinion papers (if available), and conversations with stakeholders at all levels (local, state, and national). These data sources may be used to supplement information already available to the site host or project developer. In the same manner that readily available information is used in technical geologic site characterization to develop a preliminary or static geo-model, readily available social information can provide the project developer with a preliminary understanding of community concerns and opportunities for synergy.

A second round of community information collection involves more direct investigation. Key representatives of important community stakeholder groups might be consulted through more detailed discussions or interviews. Representatives may be initially identified through the aforementioned secondary information sources and through a project developer's existing network of contacts and subsequently expanded through a "snowball" approach (e.g., concluding an interview with "Who else should I talk to?"). These kinds of community discussions lay the groundwork for relationships that can impact a geologic storage project as it moves forward. It is also important to begin collecting information where possible to develop stakeholder lists. For example, meetings can include sign-in sheets and attendees can be encouraged to share contact information, major concerns, and their interest in learning more. Many of the RCSPs found that they went back to sign-in sheets multiple times to build their stakeholder list and for other related purposes.

As a general sense of the issues that need to be addressed is formed, several tools may be used to identify specific concerns. These tools include: interviews; focus group sessions; surveys; and small, interactive briefings involving a representative cross-section of the community. Opinions and concerns from the first round of information gathering can be validated and additional information gained through such activities.

For stakeholders with strong vested interests or for interested citizens who can afford a greater investment of time, the development of a citizen task force or citizen advisory panel may be appropriate. Such citizen groups enable active citizens to become more involved in project development and possibly serve as a more impartial source of communication to others than the project developer alone. There are a variety of resources that could be used to inform these stakeholders and tools that could be used to facilitate structured discussions. See Information Resources and Tools in Appendix 6. Such processes can be undertaken independently or as part of a citizen task force and can help in identifying crucial acceptance factors that might not stand out in less interactive sessions with the community.

These same tools can be used during project implementation to monitor changes in public perceptions over time. Once a project is underway, canvassing tools like public opinion surveys (which may not be sensitive enough before opinions are formed or informed) may become useful as stakeholders gain experience with a project and the project team.

Working with the Media

News media are a particularly important community stakeholder group because, despite the best outreach efforts, a large portion of the public is likely to hear about a project, an event, or an incident associated with a project through the media, and individuals are likely to form their opinions based on media coverage.

The strategic tradeoff inherent in media engagement is that the media provide wide distribution of project information at little cost (compared with advertising or direct mailing) in exchange for the loss of control over the message. The best chance of the media conveying the message desired by the project team results from well-prepared and well-executed media outreach efforts, but no effort can ensure success (however, ill-prepared efforts heighten the risk of unfavorable coverage).

In the news business, media types are generally categorized as “print” (e.g., newspapers and magazines) and “broadcast” (e.g., radio and television). Internet media is similarly divided, with blogs and Twitter akin to print, and video sites, such as YouTube, akin to broadcast. The nature and depth of stories for print and broadcast media differ and the associated outreach team preparations for media engagement should differ accordingly.

Media involvement is dependent upon the interests and instincts of reporters and their editors. In small communities, individual reporters may cover every type of story. At major daily newspapers in metropolitan areas, reporters have topical “beats,” and a CO_2 geologic storage project could be covered by a reporter specializing in science, energy, environment, business, or even human interest (in which case the project would be explained through a story on a profiled individual from a project team). It is useful to be familiar with a reporter’s beat assignment and the types of stories he or she has previously written on carbon storage or more broadly on industry and government initiatives to address air quality and climate change.

A media member will report on a project as he or she sees it. The outreach team should plan in advance how it will interact with the media. This typically will include assigning specific (usually only one or two) people as spokespersons and defining a process for reviewing talking points and responses. The outreach team will need to provide the media with an adequate understanding so that reporters can relate the story to others, however, providing too much detail can overwhelm busy reporters and the story could be dropped in favor of others that can be quickly completed. Journalism training (and human nature) suggest that every story has at least two sides, and as a result, despite efforts by the outreach team to be objective, it is common for news stories to contain quotes or viewpoints from a project opponent or skeptic, even though their familiarity with the project, or carbon storage in general, may be minimal.

Deadlines and timely news govern the media world. Reporters are often writing on short deadlines and do not normally provide drafts of their stories for technical review in advance of publication. Magazines may occasionally provide drafts for review or conduct fact checking, but daily newspapers operate on such short time cycles that this is impractical. Consequently, it is common to find factual errors and lost nuances. Furthermore, reporters sometimes dispense with the qualifications on information typically provided by scientists, such as the preliminary nature of data or limits on the applicability of findings or conclusions. In general, success is defined as having the major facts and messages about the project come through clearly and correctly in any given story. An understanding of the news media’s business environment can assist the outreach team in crafting and supplying project information in a manner that eases the reporter’s task in “seeing the news hook” and writing the story while building relationships for further news coverage.

2.6 BEST PRACTICE 6: ESTABLISH AN OUTREACH PROGRAM

Each of the stages of a geologic storage project has an outreach component. The outreach program serves as a framework that ties together the information, planning, and preparation to address the social needs of a project from the inception of the program through post closure and across cutting components. The raw material needed to develop and operate the program is facilitated by Best Practices 1 through 5 and the nature of the program will reflect the stakeholder needs and concerns of a particular geologic storage project.

Overall, the outreach program needs to address outreach goals, objectives, tasks, and events that coincide with the project stages, a timeline for outreach activities, and the roles and responsibilities of the outreach team. The outreach program will also identify key stakeholders and messages, and the timelines, roles, and responsibilities for producing outreach materials and managing outreach events.

A communications plan should be a central component of the outreach program. The communications plan focuses on representing the project directly to the public and through the media. The plan should contain guidelines and standard operating procedures for everyday communications as well as communications during periods of high visibility, including communications in the event of a crisis (see Appendix 3).

The RCSPs experience indicates that key points of interaction and high visibility will typically include: announcement of the project location and target storage formation; applying for drilling and injection permits; initiating site characterization activities (seismic testing, if applicable, and drilling); infrastructure development, injection activities, and routine permit compliance activities (e.g., well mechanical integrity tests); monitoring, verification, and accounting; and project closure. The outreach program can be viewed as a series of plans tailored to the particular technical stages of a project.

With respect to stakeholder groups, the outreach team should use a systematic approach (see Appendix 2) for identifying and interacting sequentially with stakeholders, and gradually building up the necessary information base.

The outreach program should include a timeline of activities or events in parallel to the project steps. The timeline can be derived by working backwards from the expected date of key steps that will involve interaction with the public. For example, a critical path item is often the EPA Underground Injection Control permit application process.[5] This activity entails public disclosure of substantial project detail for which the outreach team may wish to conduct briefings with community leaders and elected/safety officials. The lack of adequate coordination among planners could inadvertently put the outreach team into a reactive, catch-up mode. Appendix 2 provides additional details about the types of activities that are likely to take place during various stages of a project. In general, the RCSPs have found that it is best to begin detailed planning several months in advance of any planned interaction with the public.

The outreach events could be open houses, participation in local events, focused meetings, workshops, as well as one-on-one meetings. Elements related to each event include:

- An event timeline
- Expected Stakeholder groups or audience
- Research—focus groups, media clips, etc.
- Outreach objective(s) for each stakeholder
- Activities
- Performance metrics
- Needed materials/logistics
- Roles and responsibility of personnel involved in the event
- Planned follow-up after the event

Development of a comprehensive outreach program and a robust communication plan benefits the project in the following ways:

- Provides a basis for a proactive "minimal surprises" approach that clearly communicates the goals, attributes, and benefits of the project in the public square
- Promotes developing and maintaining channels for communication and enabling personal relationships within the community
- Provides a proactive mechanism to share information about how CO_2 storage works and the role it can play

[5] For more information on the EPA UIC program see: https://www.epa.gov/uic

- Provides for a mechanism that is responsive and transparent to stakeholder concerns
- Facilitates relationships among project team members and with the community
- Provides a basis for ongoing monitoring and assessment of the quality of stakeholder engagement
- Clearly lays out the role of outreach within the project and the responsibilities and procedures for outreach

One lesson from the RCSP experience is that sharing information about a geologic storage project and soliciting input from stakeholders cannot be done passively. The project team needs to seek out opportunities to engage stakeholders and make an effort to inform the media and respond to media requests for information. This proactive engagement can contribute to a sense of project openness and transparency. It is worth noting that some stakeholders may be skeptical about whether the government and/or the project developer will provide accurate information. This underscores the need to present unbiased, accurate information and to seek opportunities to partner with spokespeople who have gained the public's trust.

The outreach team will need to establish protocols for developing and reviewing outreach materials. Typically, the RCSPs follow a process that allows for the development of print and web-based materials by the outreach team in consultation with the technical team followed by review from the site host, others in the management team, DOE officials, and sometimes, external peer reviewers. This review process can take a substantial amount of time and must be accounted for in the planning phase. Slide presentations follow a similar, although somewhat abbreviated, development cycle.

Typically, a project involves various parties with different interests and areas of expertise. For the RCSPs, this has included the research team, the host company (if there is one), and in some instances technology and service providers. All individuals and companies working on the project should be familiar with the outreach strategy and communication plan. One RCSP used a sign-off sheet to ensure that all staff members read and understood the community outreach plan. Another RCSP lesson was to ensure that all of the partners involved in the project (including subcontractors) understood the importance of the project's relationships with the local community and landowners. This was especially the case for the long-term projects where a subcontractor's several months involvement at the start of the multi-year project has a large impact. This was accomplished by having all subcontractors undergo outreach training. The RCSPs also found that it was important to maintain good relationship with landowners to address long-term project needs. For example, one RCSP monitors water wells over a wide area. Each well requires an agreement and permission from the well owner. In most cases, the well owner is not receiving any compensation but the RCSP needs to obtain permission to return to the property on a quarterly basis. Similarly, in the case of seismic survey work, access to land to conduct repeat surveys requires both compensation and good relationships established during the initial survey at various stages in the project lifecycle.

As mentioned earlier, Appendix 4 presents an approach to planning site visits.

Budgeting is a key aspect of outreach planning. The RCSP's had to establish outreach budgets within their original proposals and work within those budgets during implementation. The factors to consider in budgeting include the direct costs for things like room rental, meetings logistics, travel, and materials production and distribution.

2.7 BEST PRACTICE 7: DEVELOP KEY MESSAGES

Carbon dioxide storage is technically complex, involving advanced science related to climate change, geology, and other fields of study. It also involves public policy related to energy, environment, the economy, and issues related to risk, safety, and financial assurance. Therefore, identifying a set of key messages that can be consistently repeated in outreach activities and materials can help stakeholders develop a clearer understanding of the project and how their concerns will be addressed. The following is a list of potential topics and key messages that could be used in outreach activities and materials. Developers will have to determine the key messages that are appropriate for their project.

Potential Topic Areas:

- Role of CO_2 storage in mitigating CO_2 build-up in the atmosphere
- Foundation of experience and expertise for CO_2 storage, including other projects and injection practices
- Standard practices used to ensure geologic storage project safety

- Role of government in overseeing/regulating CO_2 storage
- Experience of the project team
- Potential costs and benefits to the community from CO_2 storage

Potential Messages:

- Protecting human health and safety is a priority for these projects
- Storage of CO_2 associated with EOR has been a part of commercial operations for more than 40 years
- Natural geologic CO_2 storage has occurred for millions of years (e.g., Bravo Dome, Sheep Mountain, and McElmo Dome)
- Pipeline transportation of CO_2 is a mature and safe technology
- Many mature technologies are available for monitoring injection and the reservoir.
- There is a well-understood approach to site screening, site selection, and site characterization to ensure that geologic conditions are favorable and that geologic storage projects are conducted safely
- Sensitive tools and techniques for monitoring at the surface, in the near-surface and subsurface, including in the wellbore, can be used to ensure project safety and to comply with regulations
- There are state and federal agencies that have authority over CO_2 injection wells and the regulations require projects to obtain permits in order to inject CO_2
- Permits are in place to ensure protection of public safety and the environment

The RCSPs reviewed several tools designed to help with brainstorming, honing, and prioritizing key messages. These tools are reviewed in the resources section in Appendix 6.

2.8 BEST PRACTICE 8: DEVELOP OUTREACH MATERIALS TAILORED TO THE AUDIENCES

First and foremost, the development of outreach materials involves consideration of the intended audience. The amount of information and level of technical detail provided must be tailored to match the audience's degree of interest, education, and time constraints. Any concerns that have been identified, including perceived risks, should be addressed in language and formats suited to the intended audiences. In some instances, stakeholders may need to hear information more than once and in a different format in order to gain an understanding of the subject matter. Having multiple types of materials available provides the outreach team with the flexibility to use different options, depending on the audience's makeup and interests.

The RCSPs have developed a broad array of fact sheets, PowerPoint briefing slides, physical models, videos, websites, posters, and other informational materials that are available as examples or for use by others. Collectively, these materials describe DOE's RCSP Initiative, provide specific details about each RCSP, and outline the general processes and mechanics involved in CO_2 storage. A primary objective has been to craft materials that are readily understandable, jargon-free, and contain information that is technically accurate and addresses common concerns, such as safety.

Case Study 2.3, from WESTCARB, provides an example of how to translate the highly technical concepts of CCS into understandable terms using visualization aids and relatable analogies. Such tools can help stakeholders grasp the science behind CCS and may help to address concerns.

▶ See page 39

The most effective method for developing outreach materials has been for the outreach team to serve as the lead and work with technical team members to draft the structure and content, taking into account social characterization data and other information relating to audience concerns.

As defined by the RCSPs, high-quality outreach material should[6]:

- Relate specifically to the interests of the community
- Be easy to read and understand
- Be visually appealing
- Include the main message at the beginning and end
- Be developed by credible research, researchers, and institutions
- Be relevant to audience and attention grabbing
- Tell a story
- Include a call to action for the audience, when appropriate
- Incorporate available feedback from the intended audience
- Have continuity and consistency with other outreach materials
- Appeal to multiple learning styles (visual, auditory, etc.)
- Include an opportunity for the public to interact and be involved in learning about CO_2 storage

Topics covered by outreach materials include the following:

- The science of climate change and the potential role of geologic storage in addressing atmospheric CO_2 build-up and climate change
- How CCS works
- Information on the selected storage site to demonstrate it is safe, including the confining zone with at least one primary impermeable geologic seal above the storage reservoir, a good injection zone, and an apparent absence of transmissible faults in the rock layers
- Safety precautions to ensure that geologic storage projects will protect human life and the environment, under plausible scenarios, such as brine displacement or depending on location, microseismic events
- Explanations of the implausibility of perceived risks such as a natural, rapid release of CO_2 caused by a Lake Nyos-type event
- Project-specific information such as local geologic formations, well depth and construction information, information about injecting CO_2, and monitoring results
- CO_2 injection details, including potential sights, noises, and truck traffic, and what will be done to mitigate these impacts
- How a seismic survey is conducted and how seismic data are interpreted
- How a computer simulation of subsurface CO_2 location is developed, validated, and calibrated, and what the results show
- Permitting processes and the role of the developer and regulator in that process
- Combining CO_2 EOR with storage
- Project timelines and partners involved in the project

Case Study 2.4 shows the physical model of CCS developed by the MGSC. This and other physical models, such as the MRCSP's core sample / bicycle pump display, provide stakeholders with a fun and informal opportunity to learn how CCS works and interact with project team members. This can help in developing a common understanding of what is entailed in CCS.

▶ See page 40

[6] Based on discussions with PCOR Partnership staff.

The RCSPs and Digital Communications

The RCSP Initiative was launched before smart phones and digital communications became as prevalent as they are today. As the options for digital communication continue to expand and grow in importance with respect to traditional communication venues, the RCSPs have begun to use digital communication tools. In 2013, the Outreach Working Group of the RCSPs conducted a review of current uses, opportunities, and tactics in digital communications in order to better consider the fit and value of digital communications for current RCSP projects. One question was whether the benefits of using social media outweigh the cost and time involved in adeptly implementing and sustaining social media “campaigns.” The results of this work were presented at the twelfth meeting of the GHG-T conference. There is much written about digital communication that asserts its promise of enabling cost-effective engagement of a larger number of stakeholders while promoting better public understanding of science. However, the academic literature does not clearly indicate that these benefits are being realized by those with the primary goal of information sharing. A review of digital communication trends within the RCSPs showed that they used websites supplemented with graphics and only a minimal mix of social media tools to promote website content. This selection seems to be appropriate given the late stage of project implementation and the primary goal of information sharing for the RCSPs. As for application to future projects, our results identified two consistent concerns in the literature about social media including the potentially high labor cost associated with actively engaging users and the potential for unintended consequences if content is used in unanticipated ways by online visitors. As the RCSP Development Phase that involves relatively large volumes of CO_2 is completed and multi-year results are synthesized into reports, digital outreach may offer a useful approach for information dissemination. (S. Wade, M. Cather, C. Cumming, D. Daly, G. Garrett, S. Greenberg, R. Myhre, M. Stone, and L. Tollefson. Digital Communications: Status and Potential Applications for CCUS Public Outreach. Presented at GHGT-12 © 2013 Elsevier, LTD).

2.9 BEST PRACTICE 9: IMPLEMENT AND MANAGE THE OUTREACH PROGRAM

Outreach programs should be actively managed to ensure that consistent messages are being communicated and that requests for information are fulfilled.

The identification of an outreach leader or coordinator to manage, coordinate, and direct outreach is crucial for the success of the outreach activities. Experience suggests that the outreach lead should work directly with the project leaders and be supported in their efforts by the outreach team and other key project team members.

Outreach programs should be actively managed and monitored to ensure that consistent messages are being communicated and that requests for information are fulfilled.

Case Study 2.5, from SECARB, provides an example of active management of outreach efforts. The successful outreach model from one project was introduced to a later project and helped to both cement employee interest in the project and improved community outreach.

See page 41

Management of the outreach program should evolve over time to meet the differing needs of each phase of a storage project. During the early stages of a geologic storage project, heavy emphasis will likely be placed on developing a common vision of outreach among members of the team and using appropriate tools to develop an understanding of the stakeholders and their concerns. Extensive planning will take place as site selection focuses on a particular location. As a project location firms up, outreach will involve direct engagement with community leaders and other stakeholders. This is when the face of the project will emerge and the public will begin to judge for themselves how they view the project, the project team, and CO_2 storage. Frequent communication amongst the outreach team, the leadership team, and the technical teams helps to ensure consistency and identify that emerging concerns are addressed.

Identifying the outreach lead early on allows continuity through the operation and builds relationships that allow good collaboration as the project moves from design and permitting stages to the operations stage when every member of the project team will be involved in outreach in some capacity. Some of the most effective outreach activities may involve significant interaction with stakeholders both as a means of conveying technical information about the project and as a means for the project team to obtain invaluable information about the community's views and concerns about the project.

As a project enters operations, the focus of the outreach program may shift to sharing the progress and results. Again the outreach lead will take an active role in working with the leadership and technical teams to optimize public engagement. As a project nears closure, the outreach activities will likely shift to more active discussion with stakeholders about the status of the project over time and safeguards for the future. The outreach lead will be involved in ensuring that communication and engagement is maintained with respect to monitoring results and regulatory milestones.

2.10 BEST PRACTICE 10: ASSESS THE PERFORMANCE OF THE OUTREACH PROGRAM

Assessing the performance of the outreach program allows the project team to stay abreast of how the community perceives the project and gauge the effectiveness of the outreach activities. Assessment can also help identify any misconceptions about the project or CO_2 storage and develop outreach strategies to correct them.

There are a number of options for conducting assessments. The RCSPs have used the following:

- Informal telephone calls and/or routine interviews with key stakeholders both within the local host organization and in the community
- Tracking attendance at meetings and events
- Post-event surveys that are completed by attendees (the RCSPs have used both hard copy forms at meetings and follow-up email forms)

- Tracking the number of inquiries and the project response to stakeholder questions, concerns, and feedback.
- Reviewing of media coverage, especially noting the tone of coverage in local media and social media (e.g., blogs, Twitter, and Facebook)
- Information posted on project websites to discuss the project and provide a platform for public interaction on a more spontaneous basis
- Evaluations at public meetings, workshops, and seminars to assess the suitability of meeting content, outreach, and to identify other concerns and suggestions

Outreach program assessment also takes into account changes in local conditions, such as economic fluctuation or other significant impacts, which may influence the perception of a geologic storage project.

As a project moves from conceptualization to implementation, the same activities used in social characterization (see Best Practice 5) will be useful in assessing project performance and identifying potential areas of concern to be addressed in ongoing public outreach.

In Case Study 2.6, from PCOR, illustrates an innovative way of tracking the performance of an outreach program using GIS tools. It is critical to assess the implementation of an outreach program to determine whether changes need to be incorporated to further improve effectiveness. It can also be helpful in reviewing resource needs.

▶ See page 42

Program assessment can be used to identify the need for program revisions or changes and can also be used to inform project planning, justify budgets, contribute broad insights to the field of geologic storage, and it might also be a consideration in the performance review of key personnel. See Appendix 7 for additional discussion and resources related to program assessment.

2.11 BEST PRACTICE 11: BE FLEXIBLE – ADAPT THE OUTREACH PROGRAM AS NEEDED

The outreach team must be ready to adapt the outreach program and information to changes in information about the site, unexpected events, and other conditions that may have a strong influence on the public's perception of CO_2 storage during project implementation.

The analogy of geologic site characterization furnishes a good model for considering feedback and response processes. In geologic site characterization, a series of activities are designed to calibrate and validate geologic models. More importantly, the feedback from the data is used to improve the project performance by making the necessary updates and operational changes. Likewise, developing processes to collect, analyze, and respond to feedback gathered through outreach can be used to continually improve the overall performance of the project and the outreach team, while helping to work toward increasing public acceptance. External outreach processes and materials, as well as communications within the project organization should be updated as needed to reflect project progress, lessons learned, and communication improvements identified through target audience feedback. If a case arises where some concerns cannot be addressed, the communications materials should be expanded to explain why.

Case Study 2.7, from SWP, describes their process for using focus group interviews to develop and hone stakeholder information. Stakeholder feedback can provide critical input for improving the effectiveness of outreach materials and efforts.

▶ See page 43

[7] This section draws extensively on information provided by U.S. EPA's Source Water Protection Program website: http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action = Basic&view=general.

2.12 RCSP CASE STUDIES

CASE STUDY 2.1 — **MGSC**

MIDWEST GEOLOGICAL SEQUESTRATION CONSORTIUM (MGSC)

Integrating Outreach and Project Management

Developing and managing large-scale field projects, like those of the RCSP Development Phase, requires frequent discussion of technological and non-technological details that in turn leads to decision-making, implementation of operational activities, risk assessment and mitigation, and scientific research. The integration of communication-based activities with project management has been an essential process for meeting project goals, facilitating internal and external communication, and completing other key aspects of the Midwest Geological Sequestration Consortium's Illinois Basin—Decatur Project (IBDP).

Project management has a responsibility to engage with stakeholders to create familiarity with and potential support of CCS projects. IBDP team members have found communication and education efforts are better able to serve the project needs if the outreach process starts with the communications team gaining understanding of the scientific and technological activities, which they then translate into materials that use accessible, easy-to-understand language. The process is further facilitated at knowledge sharing functions through which project details are made available to multiple stakeholders and audiences.

By aligning communications, risk mitigation, and project management, IBDP ensured that consistent, factual information was developed and incorporated into project planning and provides the basis of public communications. Successful integration of technical and nontechnical project aspects allowed the IBDP to benefit from early identification and mitigation of potential project risks, which allows more time to manage emergent, unidentified risks. Risk mitigation strategies related to communications were designed to ensure that IBDP communications addressed:

- Communications about project events, including possible negative events
- Linkage of project with particular societal goals and/or industries
- Policies for release of data and modeling results
- Policy for review and publication
- Staff training

The integration of project management and communication has helped the project management team coordinate and facilitate different aspects of the project. This integration has fostered awareness that has also highlighted potential for high risk associated with failed communications efforts at other projects. Additionally, the IBDP staff now has a more sophisticated understanding of the role that communications play in a project and recognize that project-specific communications could have global implications.

CASE STUDY 2.2 — MRCSP

MIDWEST REGIONAL CARBON SEQUESTRATION PARTNERSHIP (MRCSP)
The Value of a Diversified, Coordinated, Team Approach to Planning

The Midwest Regional Carbon Sequestration Partnership's small-scale Validation Phase field project in Michigan benefitted from the use of a subgroup to develop a strategy and plan for outreach activities related to the test. The team included Battelle technical and outreach staff, staff from the host site who were able to apply local knowledge in planning and implementation, technical and communications staff from two local partners (Core Energy, the site operator, and DTE Energy), and geologists and educational staff from Western Michigan University. The team provided diverse perspectives upon which the project could draw, including technical understanding of planned activities, valuable knowledge about local culture and politics, an existing network of media and local contacts, and effective ways to communicate with local residents.

The team first identified several key points of interaction with the public as the technical project progressed including: announcing the test location and initiating site activities, applying for an injection permit, injection activities, and project closure. In effect, outreach planning and implementation consisted of a series of plans tailored to the particular technical stage of the project. For each project stage, the team developed timelines and a matrix to guide the specific outreach objective and the interactions and associated information materials to be undertaken with identified stakeholders. The matrix (Appendix 2) was an iterative working document that used a systematic approach for identifying and interacting sequentially with stakeholders and gradually built up the necessary information base. It also established clear roles and responsibility for each activity, which proved invaluable for keeping participants coordinated and on track.

Figure 2.2: Focusing Attention on the Research, Responding to Questions, and Building Public Awareness were Key Objectives During the Injection Stage

CASE STUDY 2.3 — **WESTCARB**

WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP (WESTCARB)

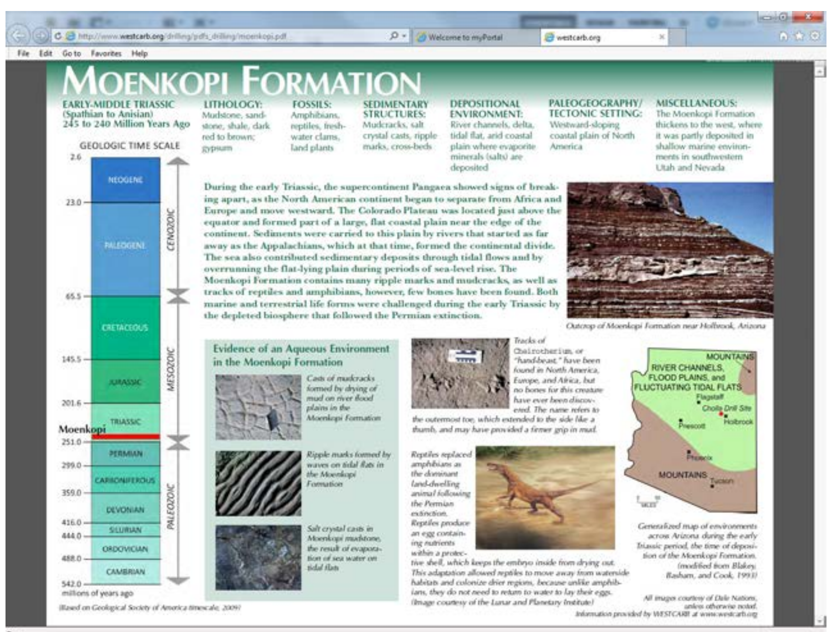
The Value of Analogies and Visualization Aids in Communication Materials

Outreach materials can help stakeholders and the public to create a mental picture of subsurface CO_2 storage processes even when the reader or listener has little or no familiarity with geology or underground injection. A combination of cogent explanations of porous rock reservoirs and geologic seals along with analogies and other means of helping an individual visualize CO_2 trapping can foster a clearer understanding. Visuals and physical models help in face-to-face meetings, but there is a comparable need for verbal means of facilitating visualization in telephone or radio interviews, lecture halls, newspaper stories, etc.

The WESTCARB outreach team observed that CO_2 storage practitioners often used particular natural and industrial analogues to illustrate technical or legal points but that outside of professional circles, these analogues (such as natural gas storage) did not necessarily convey the intended message. For example, a primary design criterion for natural gas storage sites might be easy retrieval of the injected gas, which clearly is not the objective of CO_2 storage. WESTCARB personnel used imagery that depicts ready absorption of fluids but difficult extraction, likening CO_2 storage to condensation dripping down the side of an iced drink into a sandstone coaster. In this example, the water was readily absorbed, yet turning the coaster upside down or shaking it would not release a drop.

The depth and scale of geologic storage projects may also be outside the norms of usual conceptions about the subsurface. Carbon dioxide storage sites must be more than one-half mile deep, and can often be one to two miles deep, whereas a typical water well might be 100 to 200 feet deep. That is a significant difference in terms of the path length any escaping CO_2 would have to travel to reach the surface. WESTCARB personnel found that scale diagrams of stratigraphic columns can reinforce the point that a significant number of rock layers help to keep any CO_2 that should happen to leave the storage zone from reaching the surface. One recommendation for public presentations was to show diagrams to true scale and without exaggeration of the vertical axis, which is common in professional communications among geologists (this practice inadvertently makes mild dips appear more severe, potentially heightening concerns about stored CO_2 migration upward).

In addition, CO_2 quantities are typically expressed in tons, which few individuals can conceptualize. For its small-scale injection tests, WESTCARB likened the size of a 2,000-ton subsurface CO_2 plume to the volume of water in a community swimming pool. Commercial projects will entail much larger volumes but they are still small relative to the volume of water in a lake or reservoir, which can be used as comparative references.



An understanding of a geologic storage project can also be facilitated by general interest information on the geology and paleontology of an area, particularly if natural features offer dramatic display, such as in the canyon lands of Western states. For an examples, see WESTCARB's webpages on Arizona geologic formations http://www.westcarb.org/drilling/formations.html.

CASE STUDY 2.4 — **MGSC**

MIDWEST GEOLOGICAL SEQUESTRATION CONSORTIUM (MGSC)

The Value of Physical Models and Demonstrations

MGSC approached outreach with the idea that showing audiences what storage might look like would be the constructive way to open the CO_2 storage discussion. In the Illinois Basin – Decatur project, they have had success with two different physical demonstrations that focus on key questions often asked in the context of CO_2 storage: (1) How will you keep the CO_2 in the ground? and (2) What happens to the CO_2 once it is injected into the ground?

Demonstration kits were made for key presenters, including the chief scientist and communications coordinator. The kits include a whole core sample of the carbon storage unit (Mt. Simon Sandstone), a whole core sample of the caprock (Eau Claire Shale), and a small water dropper. Using this kit allows a simple discussion of porosity, permeability, and the impermeable nature of the seal.

MGSC also created a 3D model that demonstrates EOR and storage of CO_2 in a deep saline reservoir. The model has several rock units represented by different gravel material that are isolated from each other. Oil can be placed in the EOR reservoir. When CO_2 is added to water and injected into an "injection well" oil and formation water are produced. The deep saline reservoir has a single injection well and a pressure-valve system for injection. When liquid CO_2 (oil for the purposes of the model) is injected, the observer sees CO_2 dispersing into pore spaces and being held in place by the caprock above.

The main value of these physical tools has been to provide learning opportunities for multiple audiences, from farmers to business executives and teachers to legislative decision makers. These models served as door openers during public meetings. Presenters often found that when stakeholders did not know who to approach or what questions to ask, these models provided an easily accessible way to ask questions in a non-threatening manner.

Figure 2-3: MGSC CO_2 Geologic Storage Model

CASE STUDY 2.5 — **SECARB**

SOUTHEAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP (SECARB)

The Value of Employee Advocacy, Beginning with Plant Management

Goals of the employee advocacy program include:

- Acceptance and understanding of CCS by the employees
- Outreach to the community through plant management, plant personnel, and their families
- A willingness to talk to neighbors "over the fence" about CO_2 storage
- Building support, understanding, and an educational base for community acceptance

How it Happened?

Plant management of the CO_2 provider for the Development Phase project, upon hearing of the potential for the project involving both CO_2 capture and storage, embraced the project and the concepts of CCS from the initial stages of project development. Management briefings were held with key plant personnel and information was disseminated to all plant employees through company newsletters, briefings, and even an open house for employees and their families. After all, neighbors talking to neighbors are extremely effective in taking the case to the community. In fact, when the plant manager was moved to a second plant, another opportunity to participate in a CCS project evolved and, once again, this community outreach approach was valuable in achieving public acceptance of the project.

CASE STUDY 2.6 — **PCOR**

PLAINS CO_2 REDUCTION (PCOR) PARTNERSHIP

The Value of Using Geographic Information Systems to Assess Performance

Geologic storage projects require a match between large-scale CO_2 sources and a suitable geologic storage site. These projects also occur within a human framework. Both the technical and the human aspects of storage projects have a geographic component. The technical information fundamental to storage assessments (e.g., CO_2 source location, injection location, pipeline route, terrain, geology) can be complimented by layers of "human" information. The PCOR Partnership Outreach Information System contains general layers addressing political and geographic divisions, population, households, school districts, coverage areas for key media, service areas for utility partners, and coverage areas for ongoing partner outreach programs. Additional layers containing information regarding CO_2 sources, sinks, mineral extraction activity, regulatory jurisdiction, and geologic storage projects are also included. By adding outreach information into this framework, assessments can be made that take into account coverage areas and populations served for select media (e.g., key newspapers and magazines, public television, and PCOR Partnership outreach materials) as well as outreach activities (e.g., location and number of attendees of presentations or teacher seminars, location of school teachers who have attended education seminars, and locations and attendees for focus groups). In most cases, the county is the fundamental area used for assessment. The output consists mainly of thematic maps, tables, and sums dealing with the general question "number (or percent) of households in a particular area exposed to a particular type of outreach action during a particular period" or "number, type, and number of attendees for a certain type of presentation during a particular period" and the like. Data entry for outreach activity is supported by a simple set of questionnaires and forms filled out on a periodic basis, and output can be readily customized.

Figure 2.4: The PCOR Partnership Outreach Activities are Documented and Incorporated into Layers in the Geographic Information System (GIS)

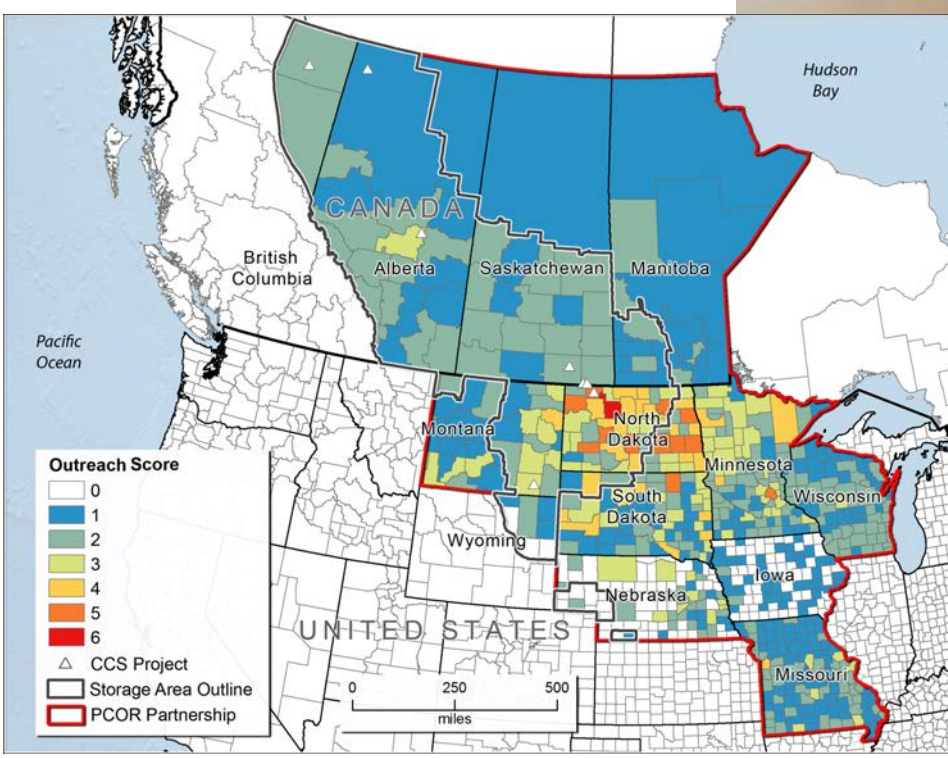


Figure 2.5: The Outreach Data can be Made Available in a Variety of Thematic Maps for use in Planning, Update, and Assessment Activities

CASE STUDY 2.7 — **SWP**

SOUTHWEST REGIONAL PARTNERSHIP ON CARBON SEQUESTRATION (SWP)

The Value of Using Feedback to Refine Outreach Programs

SWP conducted focus groups in order to provide outreach materials that responded to the primary concerns of the public. Focus group participants were encouraged to share their concerns, ask any questions they believed were important, and voice potentially controversial concerns. SWP members told the participants that they were primarily interested in learning what was important to them, rather than advocating for the technology. In addition, SWP provided assurances of confidentiality. The outreach team then developed outreach materials that responded directly to the concerns identified through the focus groups. Thus, the focus groups were initially used to identify basic concerns and questions from the public. After the materials were drafted, additional focus groups were conducted to determine whether the outreach materials provided information in ways the public believed were useful and obtained suggestions for how to improve the materials. Participant comments were then used to guide refinement of outreach materials. SWP used two separate strategies to organize participants in the focus groups. First, SWP recruited participants from communities that were near potential CO2 storage sites to uncover specific questions that may be limited to communities concerned with siting issues. Second, SWP conducted focus groups that targeted specific sectors that might be expected to have special interest in the technology, such as science teachers. SWP used the combination of community-based and sector-specific groups to guide both message development and subsequent determination of appropriate means (media, channels, etc.) for sharing the message.

3.0 CONCLUSION

This Best Practices Manual presents the lessons learned and experience gained by the RCSPs during the Validation Phase and the Development Phase of the RCSP Initiative. Early geologic storage projects will be highly visible and their success will likely influence public receptiveness to future geologic storage projects. The primary lesson from the RCSPs' experience is that public outreach should be an integral component of project management. Although conducting effective public outreach will not necessarily ensure project success, it can make important contributions to schedule adherence, cost controls, and community goodwill. Effective public outreach involves listening to individuals, sharing information, and addressing concerns through proactive community engagement. The RCSPs have developed the following Best Practices as a way to share the experience gained to date and to inform future project developers.

Best Practice 1: Integrate Public Outreach with Project Management

Best Practice 2: Identify Outreach Goals with Project Management

Best Practice 3: Establish a Strong Outreach Team

Best Practice 4: Identify Key Stakeholders

Best Practice 5: Conduct and Apply Social Characterization

Best Practice 6: Establish an Outreach Program

Best Practice 7: Develop Key Messages

Best Practice 8: Develop Outreach Materials Tailored to the Audiences

Best Practice 9: Implement and Manage the Outreach Program

Best Practice 10: Assess the Performance of the Outreach Program

Best Practice 11: Be Flexible—Adapt the Public Outreach Program as Needed

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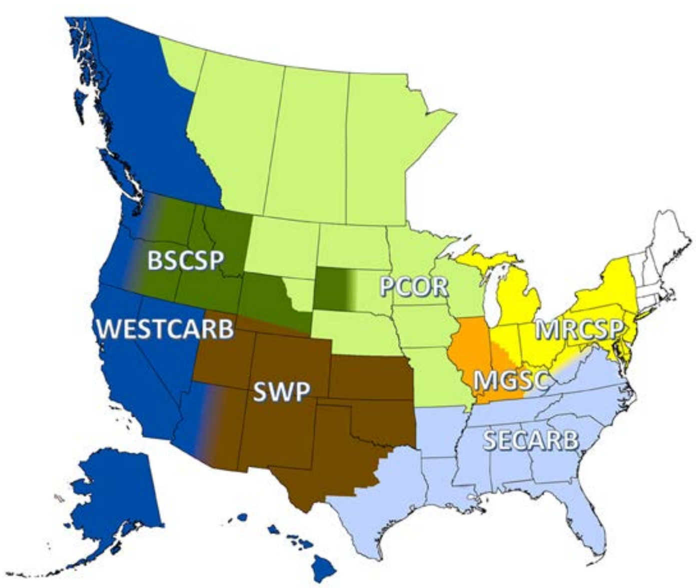
APPENDICES

APPENDIX 1. RCSP INFORMATION

In 2003, the DOE launched the RCSP Initiative, by establishing a network of seven RCSPs distributed across the U.S. The overarching objective of this national initiative is to develop the knowledge base, infrastructure, and technology needed to achieve large-scale storage of CO_2 in geologic reservoirs. The RCSPs contribute to this goal through Characterization, Validation, and Development Phase projects in their respective geographic regions.

The seven partnerships are:

- Big Sky Carbon Sequestration Partnership – http://www.bigskyco2.org
- Midwest Geological Sequestration Consortium – http://www.sequestration.org
- Midwest Regional Carbon Storage Partnership – http://www.mrcsp.org
- Plains CO_2 Reduction Partnership – http://www.undeerc.org/pcor
- Southeast Regional Carbon Sequestration Partnership – http://www.secarbon.org
- Southwest Regional Partnership on Carbon Sequestration – http://www.southwestcarbonpartnership.org
- West Coast Regional Carbon Storage Partnership – http://www.westcarb.org



Characterization Phase Projects: The RCSPs' Characterization Phase projects began in 2003. These projects focused on collecting data on CO_2 sources and sinks and developing the resources to enable CO_2 storage testing in the field. By the end of this phase, each partnership had succeeded in establishing its own regional network of organizations and individuals working to develop the foundations for CO_2 storage deployment. Characterization Phase projects culminated in the development of a standard, consistent methodology for estimating geologic storage resource, which has been applied in a series of widely acclaimed Carbon Storage Atlases for the United States and portions of Canada (NATCARB, 2016).

Validation Phase Projects: Validation Phase projects began in 2005, with a shift in focus to small-scale field projects to validate the most promising regional storage opportunities. Nineteen small-scale field projects were successfully completed, resulting in more than 1 million metric tons of CO_2 safely stored and monitored. Eight projects were carried out in depleted oil and gas fields, 5 in unmineable coal seams, 5 in clastic and carbonate saline formations, and 1 in basalt. These small-scale tests provide the foundation for larger volume, Development Phase field projects.

Development Phase Field Projects: The Development Phase projects of the RCSP Initiative began in 2008, with large-scale field projects in different geologic settings (Table 1-1; Figure 1-1). The aim of these projects is to confirm that CO_2 capture, transportation, injection, and storage can be achieved safely, permanently, and economically. Results will provide a more thorough understanding of plume movement and permanent storage of CO_2 in a variety of geologic storage formations. Experience and knowledge gained from these projects will also help support regulatory development and commercial deployment of geologic storage. The formations being tested are considered regionally significant and are expected to have the potential to store hundreds of years of CO_2 from stationary source emissions. As of September, 2016, nearly 10 million metric tons of CO_2 have been stored in geologic formations via large-scale field projects being developed by the RCSPs.

NATCARB Atlas: Additional information on the large-scale Development Phase field projects can be found in the DOE/FE/NETL Carbon Storage Atlas, Fifth Edition (2015).

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APPENDIX 2. PLANNING AND MANAGING OUTREACH ACTIVITIES

RCSPs have identified several key points for interacting with the public during the routine progression of each project. These include announcing the test location and initiating site activities (e.g., seismic testing and drilling), applying for an injection permit, injection activities, and project closure. The overarching outreach strategy can be viewed as a series of plans that are tailored to the particular technical stage of the project.

The expected outreach objectives and activities for each of four basic project stages are outlined in greater detail below. For each stage, the outreach team can develop a matrix or other tool to guide the specific outreach objective and the interactions and associated information materials to be undertaken with identified stakeholders. These matrices can be used as iterative working documents that change as events that are further away become more pressing.

Table A2-1: Examples of Outreach Objectives and Activities by Planning Stage

Stage	Objectives	Outreach Activities
1. Selection of Project, Conducting the Seismic Survey, Drilling and Core Sampling	Identify and inform key stakeholders about the nature of the project and types of likely activities, identify and inform stakeholders along the seismic survey routes, secure permit for drilling, and prepare for potential media coverage or public inquiry.	Activities may include: • Developing talking points • Conducting social characterization • Holding informal conversations with local officials and key community leaders • Developing project facts sheet and PowerPoint briefings • Developing and disseminating information about the seismic survey • Developing additional information about climate change, carbon storage, and the range of project activities
2. Submission and Review of Injection Permit	Build public awareness and support, secure injection permit, prepare for potential requirement for public hearing, and prepare for potential media coverage or public inquiry.	Activities may include: • Updating talking points, fact sheets, PowerPoint briefing and the website, and preparing and distributing additional information materials as needed. Project updates (photos ongoing activities) are a helpful way of showing what is happening • Confirming the preliminary list of stakeholders • Scheduling and conducting telephone calls or informal meetings/briefings with identified stakeholders to provide information, ensure project awareness of potential issues of concern, and need for additional outreach • Deciding on the extent of media activities • Coordinating with the regulators in conducting an open house/informational meeting • Where the regulator required a public meeting, providing an information table and staff to respond to questions at that hearing
3. Injection	Focus attention on the research, respond to questions, build further public awareness and support	The types of activity will depend on the process and outcome of the permitting process and may include: • Media event(s) • Site tours • Website and information materials development
4. Closure, Research, and Dissemination of Results	Cement relationships by keeping the community informed and disseminate results to a broad audience	Activities may include: • Website and materials development • Informational briefings • Presentations

Table A2-2: Sample Planning Matrix: Managing Pre-Site Announcement Activities and Seismic Survey

Timeframe (time in advance of event date)	Stakeholder	Outreach Objective	Outreach Approach	Needed Materials	Responsibility	Completed
3–4 Months	Prepare and print needed materials including neighbor letter, briefing (ppt.), fact sheets, and bullets				Outreach staff, corporate, and plant site to review	
3 Months, before any activity occurs	State regulatory contacts	Initiate working relationship		Project briefing	Technical lead and staff	
6 Weeks, before any activity begins	Plant employees	Inform, provide opportunity to ask questions	Brief as part of regular employee meetings and communications	• Neighbor letter • Summary fact sheet	Plant manager, project team to assist with materials	
6 Weeks, before any activity	Corporate staff	Inform, address questions				
~ 4 Weeks (coordinate with press release)	State officials (identify by name: 1, 2, 3, etc.)	Initiate low-key courtesy call	Telephone call, informal meeting	• Briefing • Summary fact sheet	Government affairs staff with assistance from project team	
~ 4 Weeks (coordinate with press release)	State & federal legislators (identify by name: 1, 2, 3, etc.)	Same	Same	• Briefing	Government affairs staff with assistance from project team	
~ 4 Weeks (coordinate with press release)	Local officials in nearby states (identify 1, 2, 3, etc.)	Initiate low-key courtesy call	Telephone call, informal meeting	• Briefing • Neighbor letter • Fact sheet	Plant manager with assistance from government affairs and project team	
~ 4 Weeks (after host site contact with key officials	Broader local public	Announce selection	Press release: Battelle press release followed by host site release	Draft release for management review and approval prior to partners' meeting	Outreach staff with technical leads	

Table A2-2: Sample Planning Matrix: Managing Pre-Site Announcement Activities and Seismic Survey (continured)

Timeframe (time in advance of event date)	Stakeholder	Outreach Objective	Outreach Approach	Needed Materials	Responsibility	Completed
2–3 Weeks ahead of seismic studies	Local road authorities and property owners	Discuss potential access/traffic issues on local roads with affected jurisdictions Obtain permission from private landowners for access to property	Individual contact	Permission form and information packet (cover note, neighbor letter, project fact sheet, and seismic graphic)	Project team and seismic subcontractor (will coordinate with outreach staff and plant manager)	
2 Weeks after press release	Broader public	Inform about broad activities, including selection of geologic and any other related work	Post information on website	• Program information and fact sheets • Site-specific information and fact sheets	Outreach staff	
1–2 Weeks, just before and at onset of seismic studies	Neighbors who may feel/see testing	Inform and provide contact information in case of questions	Door tag information package	• Neighbor letter • Project fact sheet • Seismic graphic from subcontractor	Project team and seismic subcontractor (will coordinate with outreach staff and plant manager)	
Post event: post selection of demonstration sites on project website	Leaders of state and regional environmental organizations	Inform/provide opportunity for constructive engagement	Low-key call to inform about latest additions to website and provide for continued contact	Information posted on website	Outreach staff	

APPENDIX 3. SAMPLE COMMUNICATIONS PLAN

Creating a communications plan is a major step in defining and making explicit the communication strategy for a project or partnership. Several components need to be considered when creating a communications plan such as who will be communicating, what methods will be used, which project member has priority, how will multiple partners be represented, when will communication take place, etc. This appendix provides an outline for creating a communications plan. These guidelines are meant to be used as a starting point and will not be all-inclusive for any individual project or partnership. A useful communications plan will be tied to the specifics of a project and will provide guidelines for how a partnership will conduct its communications activities.

Questions for discussion include:

- What are the communication goals for each main partner
- Who needs to be at the table
- Who will be communicating about the project
- What are the media goals
- Who talks to the media
- What is the message
- Who responds in a crisis?
- Whose communications get priority
- Which policies get priority
- Who is included in press releases
- Will there be site visits
- Will photography be allowed
- How will the communications plan be implemented
- How do communications impact safety and operations

Open and early discussion needs to take place between all partners about what their respective communications goals are. Partners may have different communication goals that will need to be integrated into the overall communication plan and strategy.

For example, one organization might want to highlight the scientific contribution they are making toward the project and be recognized as a leader in storage research. Another company may want to highlight their technological contribution to site characterization, site development, and project management, while yet another could be interested in highlighting themselves as a project cooperator.

Several meetings may need to be held to prior to writing a communications plan. The following is a sample approach for writing and review of a Development Phase communications plan.

- Hold an initial meeting to discuss project communication goals
- Create a draft plan between one or two of the major partners
- Incorporate lessons learned from other sites, if possible
- Have plan reviewed by principals
- Send draft to multiple groups and individuals who will have input into plan
- Host meetings to discuss merging of corporate policies (consider safety, crisis management, media, and photographs)
- Have a second round of revision and review incorporating all comments and policies
- Distribute final version

When implementing a communications plan, devise a way that all individuals and companies who will be working on the project receive a copy of the plan. One option is to have a sign-off sheet that is distributed with the plan (either in person or via e-mail). This assures that staff have read and agree to the plan.

Distribution of the plan is best handled in person with a brief presentation about the contents of the plan. Pick a meeting where the staff will be present, such as a mandatory Quality, Health, and Safety Training. E-mail copies of the plan to individuals who cannot attend such a meeting. All new personnel should receive a copy of the plan. Other parties to consider for plan distribution include corporate partners, new onsite personnel, office personnel, and new scientific personnel.

There are additional professional resources a project developer may wish to consider in developing communications plans. These include the International Association of Business Communicators and the Public Relations Society of America.

Sample Communications Plan Outline

1. ***Purpose of Plan***
   Explain why the plan was created, who needs to read and follow the plan, and give contact information for individuals who have questions about the plan.

2. ***Project Information and Description***
   Create a standard description of the project background that provides plan users with information. This description can also be used by the communications team when a project description is requested by the media or other contacts.

3. ***Consortium Descriptions and Funding Statement***
   Provide the standard funding statement for all publications.

4. ***Target Audiences***
   Outline your target audiences and define how this plan will be used to reach those audiences.

5. ***Communications***
   Identify the individuals who are cleared/trained to speak with the media and conduct project communications. Provide contact information for those individuals. You may also want to write a simple response statement for your project staff to use when referring media to someone on your approved list.

6. ***Papers, Presentations, and Research Findings***
   Outline how each of these categories will be handled on the project. Discuss the review process, the posting process, delivery guidelines, etc. Provide contact information, including whom to contact with questions.

7. ***Site Visits***
   Outline how site visits will be handled, who will conduct tours, onsite rules and procedures. State whether or not cell phone usage or photographs will be allowed. CO2 storage projects have the potential to attract a lot of attention. Planning ahead for visitors and providing learning opportunities is an important piece of the communications strategy. By having a plan in place you can be prepared for periods of high activity, such as drilling wells (and other activities outlined in Appendix 2). Consider possible audiences to determine how site visits will be done and your onsite policies. Audiences may consist of:
   - International visitors
   - National and local media
   - VIPs
   - Partnership meetings
   - Community members
   - Government officials
   - EPA personnel
   - University faculty and students
   - Teachers
   - Bus drivers

8. ***Personal Protection Equipment (PPE) Requirements***
   Give a brief description of the onsite PPE requirements to reinforce personnel understanding of what is expected of them onsite.

9. ***Photography Policy***
   Define and describe the photography policy: Are photographs allowed? If so, is there a designated person/group that must approve photos taken? How will approved photographs be shared?

10. ***General Safety Rules***
    Describe onsite safety rules.

11. ***Crisis Communications***
    Indicate who is cleared to speak to the media in the event of a crisis, the call tree order, and the procedure for communicating with onsite staff. It is important to stress that crisis responses to the media will be dealt with only by specific personnel who are listed along with their telephone numbers.

12. ***Webpage***
    Give the link to your website and a general outline of the contents so everyone can familiarize themselves with it and refer interested parties to seek more information.

13. ***Frequently Asked Questions***
    Consider providing a set of frequently asked questions so that the staff knows the answers and are familiar with the project.

EMERGENCY RESPONSE COMMUNICATIONS

The project manager, major subcontractors, and host industrial partner should develop an emergency response plan to go into effect in the event a technological crisis. This document (also known as a bridging document) details responsibility for specific tasks in the event of an emergency, how emergency services will be handled, and what safety procedures will be followed. The first step for the communications team when thinking about crisis response is to determine if the project has a crisis plan in place. If it does, the outreach team should familiarize itself with the details of the plan, consider how that information relates to communications, and determine what details need to be repeated in the communications plan. The team also needs to define how communications will be handled in the event there is a crisis. Who are the individuals authorized to speak to the media? How will each member of the team be notified? Who is the first call?

The point to remember in crisis communications is that many key individuals will be busy handling the crisis and the communications team should be able to respond externally with a spokesperson or two who can quickly, calmly, and effectively communicate with the media. The crisis communications plan needs to account for this fact and ensure that the individuals who need to be on the ground handling the crisis are not the same individuals who will speak with outside sources. Points to consider include:

- Crisis team defined
- Plan in place
- Call list established
- Emergency phone number posted at each telephone
- All staff safety induction
- Risk reduction and mitigation

There are additional professional communicator resources a project developer may wish to consider in developing communications plans. These include the International Association of Business Communicators and the Public Relations Society of America.

APPENDIX 4. PLANNING A SITE VISIT

Site visits and tours provide an excellent opportunity to show stakeholders what is involved in a CO_2 storage project and provide opportunities for one-on-one informal discussions with members of the technical team. This section offers suggestions for facilitating a productive site visit. There are four main phases to planning a site visit.

PHASE 1: CONCEPTUALIZATION

DETERMINE THE PURPOSE OF THE SITE VISIT

Defining the purpose of a site visit will assist in the later steps of the planning process and also allow you to gauge the effectiveness of your efforts. The purpose could include any of the following: community education, generating positive project publicity, relationship building, networking with partners, community trust building, information exchange with regulators, and/or generating community ambassadors/supporters. In all cases, staff should use the visit as an opportunity to learn from the public and engage in two-way communications. This can be accomplished by making sure there is adequate time for the audience to ask questions and to have discussions with project staff.

DETERMINE THE EXPECTED OUTCOMES

In conjunction with defining the site visit purpose, the desired outcome(s) for the site visit should be determined. If possible, the desired outcome should be something that is measureable. Desired outcomes may include: public approvals, statements, endorsements, or quotes from community leaders; favorable press in local media; generation of financial support for the project; engagement with student interns; and/or improving or streamlining the permitting processes.

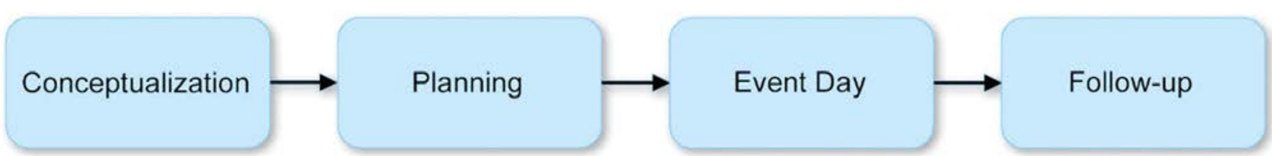
DETERMINE THE AUDIENCE

The audience will likely become apparent once the purpose and expected outcomes are defined. Audience members may include: industry representatives, researchers, non-profit members or staff, community leaders, interested groups, landowners, politicians or other decision makers, regulators, members of the media, teachers, students, or the general public. In a multi-stakeholder or public event, it is advisable to include those who may have vocally opposed the project. This will help initiate open relationships, correct misinterpretations, and ensure that community concerns or educational needs are addressed and do not become barriers for project implementation or financing.

DETERMINE THE TYPE OF SITE VISIT

Once the purpose, expected outcomes, and audience have been determined, decide on the type of event needed to accomplish the objectives. Group size, site visit location, and duration of event are factors to consider.

- ***Group Size:*** Group size should be limited if substantial one-on-one interaction with the audience is desired. In some cases, a site visit tailored to one person may be valuable if that individual can significantly influence the project. In other cases, a large group may be appropriate to gain exposure for the project in the community. Group size will also be dependent on the number of available staff and site capacity.
- ***Site Visit Location:*** Site visits are often conducted at the field site or sometimes at a laboratory. However, it may not always be possible to visit a field site due to weather, security, or other reasons. In that case, a site visit may be held at another public or private facility. Another option is to have a "tour" type visit, with stops at multiple locations. This can be a nice option if individuals need to be briefed in an inside setting prior to or after a trip to the field site. Transportation, accessibility, and



timing for the visit must all be taken into consideration to ensure that individuals can reach the site safely. Offsite parking may be necessary to keep the group together and limit the number of cars onsite or provide a gathering point for sites with restricted access.

- ***Duration:*** The duration of the event will depend on: project personnel's and attendees' schedules; travel time and time for safety briefings; and time necessary to accomplish the tour's objectives, including allowing ample time for questions, answers, and discussions.

PHASE 2: PLANNING

The planning phase will establish and organize many of the key details necessary for the event to be a success.

PREPARATORY PLANNING

- ***Planning Team:*** First determine the roles and responsibilities of the staff who will be involved in the site visit. These individuals will make up the site visit planning team and will take care of the event planning. The following roles should be identified: group leader, spokesperson/people, materials developer, safety manager, and additional staff support (administrative, note taker, photographer, videographer, etc.). It is a good idea at this point to discuss the event with project partners and determine their role(s) as well.

- ***Budget:*** The budget for the event will need to be determined. Event expenses typically include: venue fees, materials and supplies, staff time, publicity/marketing expenses, hospitality expenses, and transportation.

- ***Communications:*** Establish a communications team for the event and identify spokespersons early on. The communications team should be sure to cover both internal and external communications for the event. Company staff, while not working, often serve as ambassadors in the community and can inform individuals about the event and project outreach. Outside of the company, potential participants you may wish to invite include community leaders, partners, permitting agencies, and the public. This underscores the importance of having a presence in the community or at a minimum, some contact with invitees prior to sending out event invitations. The communications team should also determine forms of marketing/publicity to be used for the event. Marketing options may include: advertising in local news (newspapers, TV, bulletins); online calendars/e-mail list servers; flyers; radio ads; press releases; website announcements and social media (Facebook, Twitter, etc.).

- ***Safety:*** Safety should be considered in the planning effort. This would include answering questions such as: What are the provisions for ensuring the safety of visitors? If visiting a site located on an existing industrial site, what are the safety protocols already in place at the industrial site? What are the contingency plans if an accident at the CO_2 storage site or the host industrial site occurs while the site visit is underway? Do visitors need to have safety equipment (e.g., hard hats, goggles, and/or noise protection) or wear appropriate clothing (e.g., steel-toed boots, closed shoes, and/or no loose fitting clothing)? Planners should also consider the logistics of keeping track of visitors and guiding them through the site.

SITE VISIT LOGISTICS

Site visit logistics include many details and are best completed early.

- ***Determine a Time and Date for the Site Visit:*** To determine the time and date of the event, first check with the personnel who will be involved with the event. Also, consider coordination with project activities, coordination with other community events, weather and seasonal conditions, and traffic.

- ***Determine the Site Visit Location and Policies:*** Determine if the event can be held in the field on site facilities. Alternative public locations include libraries, churches, schools, town hall rooms, or community centers. If the event is going to be inside (or have an inside component), consider the number of tables and chairs needed, audio-visual equipment needed (projector, laptop, cart, microphones, speakers, podium, stage, and screen). Determine the best options for transportation to the location (personal vehicles, company vehicles, or rented vans or buses). In addition, determine the visitor capacity of the location to make sure there is adequate space for the visitors and restroom facilities. For onsite or laboratory visits, visitor safety is a primary concern. Be sure to obtain a copy of site visitor regulations and permissions for the location and allow time for any required safety training or personal safety gear check-out. Determine the photo and media policy of the host site or facility. Decide if visitors will be provided with any refreshments, but water should be made available in all cases. Write up an information sheet to include with the invitation to inform visitors of any policies or items they need to bring or wear (closed-toe shoes for example).

DEVELOP SITE VISIT MATERIALS

Invitations: In advance of the event, start working on invitations. Establish the invitee list and their contact information and determine the best format(s) for the invitations (personal phone call, e-mail, letter, newspaper announcement, website postings, etc.). It is also wise to determine who the best person to deliver the invitations is for the event. Often, an invitation from a third party, community member, or local host may be more effective than from the project developer. After sending out the invitations, send out follow-up information that includes: directions, maps, policies, what to wear/bring, background information, and the event schedule and agenda. Send out reminders near the event date and include contact information for any event-related questions.

Other Materials: Determine what materials will be needed in advance and allow adequate time for development and production. Consider having some or all of the following materials on hand for the visit: event agenda, logistical information, project fact sheets, company brochures, PowerPoint presentations, question and answer sheets, project maps, project timeline, posters, folders for handouts, nametags for speakers and guests, sign-in sheet for attendees, signs to guide individuals, host site policy information, company contact information, rock or core samples, storage or other models, and multimedia (CCS or project videos).

PHASE 3: EVENT DAY

By the day of the event, most of the work has been already taken care of to have a successful site visit. Here are some tips to run a smooth event: make sure all personnel involved know their roles, allow for ample set up and clean up time, bring all necessary materials, make sure food delivery times are coordinated, be sure to document the event (photos and notes), *and* have a “Plan B” in case of inclement weather or other unforeseen circumstances.

PHASE 4: FOLLOW-UP PHASE

Event follow-up can be as important as the site visit for the overall project outreach. Good event follow-up can solidify relationships, clarify questions, and show individuals that the outreach team is available and cares about their concerns. Possible follow-up items may include: write-up an event summary; post any materials (photos, PowerPoint presentation, and/or posters) on website or distribute as needed; answer any inquiries from attendees; send thank you notes to appropriate individuals; track all post-event press, publicity, and feedback; determine if an additional event may be needed; revise materials for the next event based audience understanding and feedback; and update the mailing list.

APPENDIX 5. APPLYING SOCIAL CHARACTERIZATION

"Social characterization" is an approach that uses social science methods to gather information about a community's perceptions of geologic CO_2 storage and concerns about the technology in order to begin to develop an understanding of perceived community benefits from a project.

In this context, RCSPs define social characterization (Wade and Greenberg, 2008) as the rigorous and iterative investigation, analysis, and use of social science methods to improve project performance throughout the stages of site selection, pre-injection preparation, injection, post-injection, and closure. By conducting social research within a community, the project team can begin to understand the ways in which individuals perceive the need for, risks of, and tradeoffs of carbon storage in a particular community. This research can yield insights about the different "publics" or stakeholders within a community and their levels of interest, information needs, and perspectives. Social characterization can also suggest appropriate ways to address those differing needs.

The purpose of social characterization includes:

- Developing a solid understanding of the stakeholders' concerns and perceptions about geologic CO_2 storage
- Developing materials and outreach approaches that inform and address various concerns, convey benefits, and making these materials accessible to target audiences
- Gaining the broader public "permission" to conduct a storage project (in addition to necessary permits) through openness and transparency

Just as the steps in geologic site characterization involve collecting and interpreting data, the steps in social characterization also involve interpretation. The two diagrams in Figure A5-1 qualitatively portray this notion (Kelly et al., 2009). The diagram on the left shows some of the data collected during geologic site characterization. The axes of the graph represent the degree of difficulty (cost or access) in collecting the data (vertical) and the relative importance of the data in assuring the performance of a project (horizontal). For example, it may cost more to conduct a seismic survey than it does to collect and review generic information on the regional geology of a site. However, the detailed information provided by a seismic survey may be more valuable in determining the suitability of a site. Yet, neither piece of data stands on its own and must be integrated for a full geologic "picture" of a site. As one moves to the upper right quadrant, it also takes more effort to interpret the data, requiring a higher degree of training and experience.

In similar fashion, the diagram on the right presents information collected during social characterization. In the upper right quadrant, the information not only becomes more important to the success of a project but it also becomes increasingly difficult to interpret.

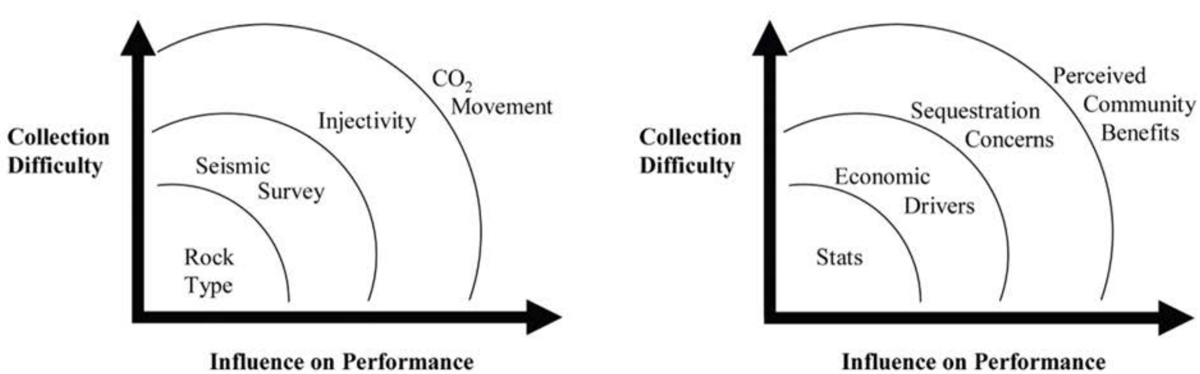


Figure A5-1: Geologic Characterization and Social Characterization Influence on Performance

Although the concept of social characterization may seem straightforward, it requires a concerted and methodic effort to do it well. To the extent public outreach plays an important role in the cost-effective implementation of projects, social characterization should be approached seriously and integrated into the overall effort to develop a project. It should be noted that social characterization is not a means by which to identify communities that are economically or otherwise disadvantaged. Rather, it is a means of gaining insight into the driving forces, key decision makers, questions and concerns, and group dynamics within a community—all factors that contribute to community engagement.

REFERENCES

Kelly, B. et al., 2009. "The Regional Carbon Sequestration Partnerships: Scaling-Up Outreach Efforts for the Deployment Phase," presentation by Outreach Working Group at Carbon Sequestration Conference, May, Pittsburgh, PA.

Wade, S., S. Greenberg, 2008. "Afraid to Start Because the Outcome is Uncertain?: Social Site Characterization as a Tool for Informing Public Engagement Efforts," Presented at GHGT-9, Washington, DC, El Sevier.

APPENDIX 6. INFORMATION AND RESOURCES

PART 1 INFORMATION: ABOUT CO_2 STORAGE

There is significant experience in selecting sites for underground injection as well as safely operating, monitoring, and closing them. This section describes some of the resources available for use in developing outreach materials and includes website addresses that are active as of the publication of the manual. The reader can also contact the partnerships through the websites listed in Appendix 1 if seeking additional information resources.

Physical Models of CO_2 Storage—There are several physical models that can be used to visually illustrate the concepts for CO_2 storage. Interested developers may be able to borrow or recreate the following:

- ***Understanding CO_2—***Dry ice is actually a solid form of CO_2 that has been compressed and refrigerated. When it is allowed to melt or sublimate in a glass jar, it gives off CO_2 gas. Because CO_2 is denser than air, it will collect in the glass jar and can be used in various ways to demonstrate the properties of CO_2. The Gulf Coast Carbon Center created a worksheet called, "An Audience-Pleasing Physical Model to Support CO_2 Outreach," to be used in conjunction with dry ice purchased at a local ice or beverage store to demonstrate the properties of CO_2. This worksheet included instructions for building a model from glass marbles, a glass jar, colored water, and vegetable oil to demonstrate porosity and permeability.

- ***Using Core Samples of Rock to Demonstrate Porosity and Permeability—***Western Michigan University developed a demonstration tool using core samples of rock taken from a deep well. One sample is of a porous and permeable rock such as sandstone; the other is from an impermeable rock, such as shale. A hole is drilled about two inches into each sample and the fitting for a bicycle pump is cemented into the hole. To complete the demonstration, each sample is submerged in a large beaker full of water and bicycle pumps are attached to the fittings. The audience is asked to attempt to pump air through the samples. It is relatively easy to pump air through the porous rock, which demonstrates the concept of an injection zone within a reservoir. It is impossible to pump air through the impermeable sample, which demonstrates the concept of a caprock or seal. Posters can be developed to more fully explain these concepts and to relate them to the local geology. Pictures of the setup are available on the MRCSP website and a copy is included below. Developers interested in using this kind of a model should either contact an RCSP representative or the state geological survey for assistance in developing a set of samples.

- ***Physical Model of EOR and CO_2 Storage in Saline Reservoirs*—**The MGSC developed a dual sectioned Plexiglas model (see Figure A6-1) that allows the audience to see a representation of the process of EOR in one section and CO_2 storage in a saline reservoir in the other section. The model operator uses a combination of colored water, vegetable oil, and CO_2 generated by sublimating dry ice in a bottle of water (or baking soda and vinegar) to show how injected fluids move through the pore space created by gravel. NETL developed four of these models for use by interested parties. There is an instruction booklet with the models and/or someone who is already trained may be able to assist.

Fact Sheets and Posters—Fact sheets and posters are a versatile method for conducting outreach since materials can be easily adapted for various publics and can cover a wide breadth of information. The RCSPs can assist in the development of posters or may have posters and fact sheets that can be used for outreach events. The RCSPs can be contacted through the websites indicated in Appendix 1.

Videos—There are several videos and animations that may be of use in outreach:

- Prairie Public Television documentaries cover several aspects of CO_2 storage http://www.undeerc.org/PCOR/documentary/default.aspx
- The CO_2 Capture Project has created two videos describing how carbon storage works and explaining its research program http://www.co2captureproject.org/
- Smithsonian documented how a well is drilled and what goes into CO_2 storage as part of series on energy. The full video series can be viewed at the following link http://www.learner.org/resources/series209.html and in particular, segments 10-12 include carbon storage. (note arrangements would need to be made with Smithsonian to use the footage elsewhere)

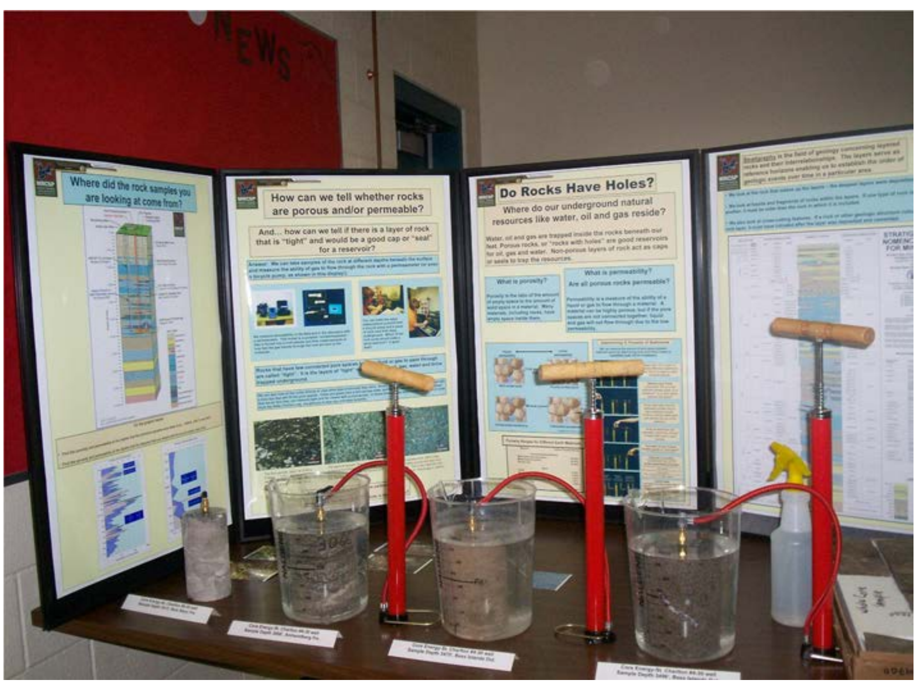


Figure A6-1: Plexiglas Model Demonstrating EOR and CO_2 Storage.

Best Practice Manuals—In addition to this Best Practice Manual, NETL has posted six others that are related to geologic storage on the Carbon Storage Reference Shelf, which can be accessed at the following link http://www.netl.doe.gov/research/coal/carbon-storage/strategic-program-support/best-practices. These manuals cover topics including: geologic formation classification; site screening, selection and sitecharacterization; monitoring, verification, and accounting; risk analysis and simulation; and well management. The Reference Shelf also contains documents and other reference materials generated through the RCSP Initiative.

Prospective Storage Resource Maps—RCSPs contributed to the development of a national atlas of potential storage formations and a basic primer on storage. This atlas is available online and as an interactive website. Most RCSPs have included a mapping function for their region on their website. In addition, a national map can be accessed at the following link: http://www.netl.doe.gov/research/coal/carbon-storage/natcarb-atlas

Professional Development for Teachers and Curricula—There are a number of resources available for teachers:

- PCOR Partnership Educators page includes multiple resources for teachers: http://www.undeerc.org/pcor/Educators/
- Keystone Climate Status Investigation: http://keystonescienceschool.org/education-programs/educator/our-programs/csi-climate-status-investigations.html

Image Libraries

- CO2CRC: http://www.co2crc.com.au/gallery/general-ccs/
- CO_2 Capture Project: http://www.co2captureproject.org/media.html

Additional CCS Information Resources

- Research Institutes
  - Massachusetts Institute of Technology: http://sequestration.mit.edu/
  - Princeton: http://cmi.princeton.edu/research/storage.php
  - Stanford: http://pesd.stanford.edu/research/climate/
  - University of Texas: http://www.beg.utexas.edu/gccc/
- Other Research
  - CO_2 GeoNet: http://www.co2geonet.com/
  - International Energy Agency GHG: http://www.ieagreen.org.uk/
  - CO2CRC: http://www.co2crc.com.au/
  - Intergovernmental Panel on Climate Change: http://www.ipcc.ch/
  - Global Capture and Storage Institute: http://www.globalccsinstitute.com

PART 2 INFORMATION: ABOUT OUTREACH TOOLS AND PRACTICES

CONVEYING THE CLIMATE CHANGE CHALLENGE

Princeton Wedges Game Carbon Mitigation Initiative, "Stabilization Wedges: Solving the Climate Problem with Current Technologies," developed by Princeton University, available online at: http://www.princeton.edu/wedges/

USING FEP PROCESS WITH STAKEHOLDERS TO COMMUNICATE AND ILLUMINATE RISKS

- K. Hnottavange-Telleen, I. Krapac, C. Vivalda, "Illinois Basin—Decatur Project: Initial Risk-Assessment Results and Framework for Evaluating Site Performance," Presented at GHGT-9, Schlumberger Carbon Services, Cambridge, MA, 2008

FOCUS GROUPS

Focus groups provide information and guidance about a research topic through the use of group dynamics and are essentially group interviews. A moderator guides a small group discussion on topics raised by the moderator. What participants in the group say during their discussions is the essential data from the focus group. According to Blankenship and Breen, "focus groups are an invaluable tool for marketing researchers and the sponsors that use them. For many purposes, nothing duplicates what can happen when a group of persons interested in a topic sit around a table for one to two hours discussing how they feel about that topic."

Effective moderation of focus groups is a specialized skill. Knowledge of facilitation techniques, developing appropriate questions, and how to analyze qualitative data are essential elements for effective focus groups. Additional information resources include:

- Morgan, D.L., 1998, The Focus Group Guidebook: Thousand Oaks, California, Sage Publications.
- Blankenship, A.B., and Breen, G.E., 1993, State of the Art Marketing Research: Chicago, Illinois, American Marketing Association, p. 225
- Hanson, Sheila K., Daniel J. Daly, Edward N. Steadman, and John A. Harju. "Carbon Sequestration— A Community Focus Group Study of Attitudes in Williston, North Dakota." PCOR Partnership, June 2005 http://www.undeerc.org/pcor/newsandpubs/pdf/CommunityFocusGroup.pdf
- Popham, W.J., 1993, Educational Evaluation: Needham Heights, Massachusetts, Allyn and Bacon

TECHNIQUES TESTED BY OUTREACH WORKING GROUP

Implications Wheel®: http://www.implicationswheel.com/ a method for "what if" scenario building Joel Barker's Implication Wheel is a divergent thinking tool designed to examine the short and long term implications of any change.

Message Mapping: Use Media Masters site (http://www.mediamasterstraining.com/media.html)

Storytelling: Use Andy Goodman on stories - http://www.thegoodmancenter.com/

APPENDIX 7. PERFORMANCE ASSESSMENT

INTRODUCTION

The RCSPs reviewed their experience and social science literature to explore approaches for outreach program assessment. This Appendix discusses important concepts and highlights some tools that may be of use to geologic storage project developers.

PURPOSES OF PROGRAM ASSESSMENT

The literature suggests that formative assessment can be used during development, early stages, and ongoing implementation of a program to develop feedback that can help shape or improve a program and to monitor progress. Summative assessment can be used at major milestones or the conclusion of a program to evaluate its performance and impacts and to inform decisions about future design and implementation.

In the context of geologic storage projects, program assessment can serve a number of purposes including:

- ***Facilitating planning:*** the Best Practices outline a framework for using social site characterization to inform the outreach plan and the assessment can be used to evaluate that effort and to develop insights as to the question of whether the outreach plan is a good plan for the respective project and community
- ***Assessing needs for outreach program revisions:*** data can be collected to help add or modify ongoing outreach efforts to more effectively engage with stakeholders
- ***Internal improvements:*** data can be used internally to improve project performance and communications
- ***Assessing implementation:*** assessment can be used to track the progress while the outreach plan is being implemented
- ***Assessing performance and impact of outreach efforts:*** assessment can be used to assess the impact on stakeholder attitudes and perceptions over the course of the project

- ***Satisfying reporting requirements:*** assessment data might be used to complete reporting for grant makers, regulators, etc.
- ***Justifying budgets:*** assessment can be used to demonstrate to management or clients the value of the outreach efforts
- ***Contributing broader insights for internal or external use***: a) the Best Practices are tailored for geologic storage projects but they might also apply to other development efforts where outreach is important b) assessment data could benefit other public outreach efforts and might be of internal or external value to the project developer, depending on whether they will implement other projects

CONSIDERATIONS

The process of assessment includes formulating research questions of interest related to outreach program goals, collecting data, and evaluating the results to glean information about the outreach program. The tasks of defining relevant questions and appropriate data are reasonably straightforward however, there are several considerations of note, including:

- The relative objectivity or subjectivity of the outreach goals. Many outreach goals focus on outcomes that are not easy to measure. For example, they might include things like building a positive relationship with the local community, preventing/reducing outrage over a proposed project, or increasing public awareness and acceptance of geologic storage as a viable technology. In order to evaluate the effectiveness of an outreach program designed to achieve more subjective goals, identifying measureable components of the overall objective such as the sufficiency of social site characterization and outreach planning, assessment of the success of plan implementation, and evaluation of changes in stakeholder attitudes can provide valuable insights into program success.
- Determining what information is relevant. The literature suggests at least four areas of relevant information[8]:
  - Activity: assessment of the implementation of an outreach plan based on completed activities or tasks
  - Reach: assessment of the audience (size, location, etc.) engaged through outreach;
  - Engagement process: assessment of when and how stakeholders engage with the outreach team
  - Impact: assessment of the effect of the outreach program on the awareness, attitudes, and actions of project stakeholders

  Generally, the first two areas measure what the outreach teams does, irrespective of stakeholder response. The second two delve more into stakeholder response given the outreach efforts or the effectiveness of outreach efforts.
- Types of Data. There are three common types of data collected in program assessments:
  - Qualitative—information that is observed, described, or cannot be expressed using numbers. For example, this might include responses to open-ended survey questions, assessments of stakeholder perceptions of information, or improvement in technical understanding.
  - Quantitative—information that is measured or quantified, typically numerically. For example, this might include the number of meetings, fact sheets, or meeting attendees.
  - Mixed (sometimes referred to as semi-qualitative or semi-quantitative)—information that is derived from both qualitative and quantitative data. For example, this might include using tools such as questionnaires using Likert rating scales to assess stakeholder attitudes, perception, or beliefs about geologic storage. Researchers might use their expert judgment to assign scores to the responses to open ended survey questions.

  Researchers will likely decide to use some combination of data types based on issues of cost, timing, and research needs.

[8] Sullivan, M., M. McDaniel, R. Siegel, "Using Metrics to Track Community Outreach Progress," American Institute of Chemical Engineers, CEP-Magazine, December 2004.

DISCUSSION

Program assessment during design, implementation, and at key milestones can provide valuable information to project developers. Program assessments should be designed carefully to provide valuable information and meet budget and timing needs. It may be useful to communicate program assessment efforts with project management early in the process in order to secure buy-in for the data and range of insights expected from the effort. There are a number of tools and resources that can be used to assist in navigating these choices.

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Brickman, Leonard, and Debra Rog, editors. Handbook of Applied Social Research Methods. Sage Publications, Inc., Thousand Oaks, CA (1998)

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Krueger, Richard A., and Mary Anne Casey. Focus Groups: A Practical Guide for Applied Research, 4th ed. Sage Publications, Inc., Thousand Oaks, CA (2009)

Sieber, Joan E. Planning Ethically Responsible Research: A Guide for Students and Internal Review Boards, Applied Social Research Methods Series, Volume 31. Sage Publications, Inc., Newbury Park, CA (1992)

ONLINE ARTICLES

The Nonprofit Times: Four Types of Metrics: Activity, Reach, Engagement, and Impact. (March 15, 2014). This article presents four types of metrics that can provide useful information about program performance. http://www.thenonprofittimes.com/management-tips/measuring-the-success-of-your-communications-strategy/

MountainTrip Wiki: Evaluating the Performance of Your Communication. (2011). This article discusses when to evaluate a communication program, what to evaluate, and how to design the evaluation. http://wiki.mountaintrip.eu/wocur/Evaluating_the_performance_of_your_communication

ONLINE TOOLS AND GUIDES

Brown University, Science Center Outreach: Outreach Programs Evaluation. This page contains tool kits for both formative and summative assessment.

http://www.brown.edu/academics/science-center/outreach/support-faculty/evaluation/outreach-programs-evaluation

Centers for Disease Control: checklist for developing evaluation questions. http://www.cdc.gov/asthma/program_eval/assessingevaluationquestionchecklist.pdf

The Communications Network and Lumina Foundation: Are We There Yet? A communications Evaluation Guide (Prepared by Asibey Consulting, 2008): This article provides a guide for developing an assessment effort for outreach programs. http://www.luminafoundation.org/files/resources/arewethereyet.pdf

Corporation for National & Community Service: How to develop the right research questions for program evaluation.http://www.nationalservice.gov/sites/default/files/resource/Asking_the_Right_Research_Questions.pdf

National Science Foundation (2002): User-Friendly Handbook for Project Evaluation. http://www.nsf.gov/pubs/2002/nsf02057/nsf02057.pdf

The Urban Institute: Evaluation Strategies for Human Services Programs.https://www.bja.gov/evaluation/guide/documents/evaluation_strategies.html

OTHER ONLINE RESOURCES

Online Evaluation Resource Library: http://oerl.sri.com/

Microbial Life Education Resources: Tips on Assessment, Evaluation and Dissemination: http://serc.carleton.edu/microbelife/research_education/assessment.html

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