Guidelines for regional CCS development

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1 Executive Summary

In 2012 DCMR and Ecofys together finalised their research on the evaluation of the Rotterdam CCS approach (WP2.4, D13). This report was public and can still be found on the GCCSI website and nowadays also on the related but broader website Decarboni.se.

Together with the people from the GCCSI project office, DCMR has transformed the evaluation to lessons learned for Regional CCS cooperation. These lessons (insights) were split into five section and can be found on the Decorboni.se website:

1. http://decarboni.se/insights/regional-ccs-cooperation-part-1-5
2. http://decarboni.se/insights/regional-ccs-cooperation-part-2-5
3. http://decarboni.se/insights/regional-ccs-cooperation-part-3-5
4. http://decarboni.se/insights/regional-ccs-cooperation-part-4-5
5. http://decarboni.se/insights/regional-ccs-cooperation-part-5-5

The texts of these insight is shown further on in this report. These Insight are already publicly available.

Distribution List

(this section shows the initial distribution list)

External	copies	Internal	Copies
Website			

Document Change Record

(this section shows the historical versions, with a short description of the updates)

Version	Nr of pages	Short description of change	Pages
n.a.		(current version is the first and final version)	

Table of Content

2 Applicable/Reference documents and Abbreviations

2.1 Applicable Documents

(Applicable Documents, including their version, are the “legal” basis to the work performed)

	Title	Doc nr	Version
AD-01d	Toezegging CATO-2b	FES10036GXDU	2010.08.05
AD-01f	Besluit wijziging project CATO2b	FES1003AQ1FU	2010.09.21
AD-02a	Consortium Agreement	CATO-2-CA	2009.09.07
AD-02b	CATO-2 Consortium Agreement	CATO-2-CA	2010.09.09
AD-03i	Program Plan 2014b	CATO2-WP0.A-D03	2014.10.16

2.2 Reference Documents

(Reference Documents are referred to in the document)

	Title	Doc nr	Version
RD-01			

2.3 Abbreviations

(this refers to abbreviations used in this document)

3 Insights on regional CCS cooperation

Below you will find the text version of the insight that have been published on the Internet.

3.1 Insight 1 – introduction

Regional CCS cooperation - an introduction

25 Sep 2014

This is the first in a series of Insights by Barend van Engelenburg, senior energy expert at DCMR - the environmental protection agency in the Rijnmond region of the Netherlands. In this series Barend will explore the issues surrounding regional carbon capture and storage (CCS) cooperation, beginning in this Insight with an introduction to the unique aspects of regional cooperation on CCS projects and some of the basic requirements. In the coming weeks the series will go on to discuss the essential elements of good regional cooperation, methods for improving cooperation to maximise the value of CCS projects, tools for engaging with stakeholders and measuring success, and how regional cooperation impacts on the efficacy of CCS and can contribute directly to emissions reductions.

Overall guidance for regional CCS cooperation
Regional collaboration on CCS projects can happen in a number of ways. The form of collaboration can range from the very loose “gentlemen’s agreement” type of exchange, or ad-hoc cooperative projects, to an approach governed in a very detailed way as might be seen in a public-private partnership.
Regional CCS cooperation is heavily influenced by the fact that CCS is restricted to a certain real and physically designated area: like an existing industrial area such as the Humber Valley, Canada; the Port of Rotterdam, Netherlands or the region below Perth, Australia. It also includes a province or state like Victoria, Australia or Groningen, Netherlands, or indeed any other contained area. In this I have gathered all my experience with the aim of giving useful guidance for those who participate in CCS cooperation and especially for those who lead or want to lead such cooperation. My experience stems from seven years of participation in the Rotterdam CCS Cluster and involvement with several CCS case studies and interactive workshops across the world.
This first Insight more or less sets the scene for regional CCS cooperation and will link you to four more detailed Insights. Our workshop participants highly appreciated these lessons learned. I hope you will, too.

What is needed for a functional regional cooperation?
A regional CCS cooperation is aimed at a final situation in which multiple CO_2 sources will capture CO_2; the CO_2 is collected in a common transport infrastructure; and the collected CO_2 will then be delivered to end-users or stored in deep geological formations. The first characteristic is that the CCS activities are at a substantial scale. The minimum final amount of CO_2 gathered on an annual basis is supposed to be much more than the emission of one coal fired power station (so the minimum is about 10 Mega-ton (Mt) per annum in the final stage when all the plans for CO_2-capture are realised). In such cooperation a lot of different parties are involved, on the industrial side as well as on the support side (financial, regulatory, local authorities, etc.). For a functional cooperation to work, one could think about this as requiring hardware, software and financial means.

Hardware requirements – technical artifacts and conditions:

- Enough CO_2 sources
- Possibility for combining the shipping of that CO_2 (availability of land or water)
- Storage sites or industry that uses the CO_2 or will transport the CO_2
- Industry and contractors that will build (parts of) the regional CCS chain

Software requirements – organizations and relations

- Commitment (the single most important factor)
- Active and motivated stakeholders.
- Shared vision on how to deal with energy/climate/CCS
- Business cases for all parts of the CCS chain/cluster
- Common communication approach
- Network for cooperation / cooperation tool
- Common advocacy approach
- Suitable legislative arrangements (laws; rules; monitoring; supervision)

Financial means

Two forms of financial means must be identified:

1. to let the regional collaboration function
2. get the different business cases realized for the project

Both are very different in nature but they will interact where the regional collaboration will function as a driver and advocate for the business cases. The business cases have to be approached on a step-by-step basis, starting with building a solid case in order to ensure that key organisations have a motivation to cooperate.

Stadia of regional CCS cooperation

Regional CCS cooperation has two stages:

1. The development phase – in this phase the regional CCS cooperation is prepared; the vision is developed; first business cases are sketched; the form of collaboration is established
2. The maintenance/operational phase – in this phase the regional CCS cooperation is operating to fulfill its goals; and as the environment changes in due course the arrangements in the regional CCS cooperation have to adapt to the new drivers and barriers.

Stakeholders of regional CCS cooperation

The following types of stakeholders can participate in regional CCS cooperation:

- Public entities: authorities, regulators, political parties, political executives, and non-governmental organisations.
- Private entities: diverse set of industrial companies, individual entrepreneurs, contractors, engineering firms,
- Other entities: universities, public knowledge institutes, private knowledge institutes and think tanks.

The level of participation can be at local and regional level, sometimes even at national/federal level or international level. Next to the stakeholders that participate directly, one should be aware of the stakeholder that one needs to make regional CCS cooperation a success (same types of stakeholders; but in a different role).

The ‘Six Commandments for CCS developers’

Rotterdam developed an action plan to achieve ambitious CCS goals (see an example). Together with Paul Noothout of Ecofys, I evaluated the Rotterdam CCS approach in 2012. We learned from the evaluation that the challenges for CCS are not only in the technical and economic domains, but also in the organisational, legal and communication domains. We have summarised these learning points in “the Six Commandments for regional CCS developers” in a feature article in the journal “Greenhouse Gases – Science and Technology”.

We clustered the most important lessons into the following ‘Six Commandments’:

1. CCS is an integral part of your energy, climate and economic policy.
2. You shall accept that CCS is in the pre-commercial phase.
3. You shall use any window of opportunity.
4. You shall not restrict yourself to the usual suspects.
5. You shall build on sound business cases.
6. You shall communicate and advocate broadly.

Read more about these commandments and the reasons for them in our journal article. In the coming weeks I will publish four more Insights providing great detail on regional CCS cooperation and how to apply these commandments:

- How to develop regional CCS cooperation? – the organizational steps to be taken to come to structured collaboration.
- How to organize support? – the do's and don'ts of internal and external communication and advocacy.
- How to use a stakeholder perspective? – CCS involves very diverse stakeholders. It is essential to understand each other's position. This document is an analytical helpful tool for understanding and engaging stakeholders.
- How to secure storage capacity? – The history of CCS projects shows that everybody started with developing capture and that everyone had to conclude in the end that the (timely) development of storage capacity appeared to be the bottleneck. This document focuses on a step-by-step approach to secure storage capacity for your region.

3.2 Insight 2 – How to develop regional CCS cooperation

02 Oct 2014

Part two of an insight series on regional CCS cooperation

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The single most important factor for success in regional carbon capture and storage (CCS) cooperation is commitment. This means real commitment from a large number of regional stakeholders including:

- local/regional authorities and politicians,
- local/regional captains of industry,
- social organizations (like environmental NGO's) and
- companies active in CCS development.

Real commitment from a party means that the goals of the collaboration have a perfect fit to the party's most essential motives. Organising commitment is a bit like juggling. One has to know and understand the relevant stakeholders. One has to challenge them with attractive opportunities. And one has to nurture a collective effort. All three have to happen at the same time. The big challenge for collaboration around CCS is that you need to cope with quite a few of stakeholders from quite different sectors, many more than you would for other energy projects like solar station or wind farms. Below I give some suggestions on how best to deal with the three juggling issues.

1. Knowing and understanding relevant stakeholders

It starts with mapping all possibly relevant stakeholders and categorising them. Who are the main players in the area that could be interested in CCS? This question is broader than "Who has to capture CO2?" One also needs to know who can benefit from CCS activities, like engineering firms, transport companies, gas handling business or CO2 users. In categorising, it is important to know which stakeholders will be beneficial for the CCS case, which stakeholders stand to benefit, and which are likely to perceive that they are suffering because of a project. The following types of stakeholders can participate in a regional CCS cooperation project:

- Public entities: authorities, regulators, political parties, political executives, and non-governmental organisations.
- Private entities: diverse set of industrial companies, individual entrepreneurs, contractors, engineering firms,
- Other entities: institutes for education and training, universities, public knowledge institutes, private knowledge institutes and think tanks.

When you have an overview of the possibly relevant stakeholders in your region, you can pose the next level of questions which include:

- What are the possible (combinations of) drivers that will stimulate these parties?
- What is the corporate position or strategy on CCS from the different stakeholders?

Preferably, you then interview each stakeholder separately to know and understand him or her. Trust is important and you also have to organise meetings in which they can see and approach each other (see third section). These first survey activities will give you some ideas for selecting candidates for cooperation. With this type of group to start you off, you can begin the vision building (see second section). This will however not finish your activities in this field: you will constantly have to assess and re-assess your knowledge on the relevant stakeholders in your region; also meaning that you have to have open 'channels' to newcomers.
For more help in analysing and understanding stakeholder perspectives see .

2. Committed to a compelling and attractive collective vision

The current practice in CCS collaboration is working together around a certain CCS project or a bundle of CCS projects, a CCS cluster. In most cases, at least the European ones, such collaboration has a 'CCS focused' goal ie, "we want to prove that we can capture 10 Mton of CO2 in 2025". Such goals had their root in the push for European and national policy that started in 2008. These goals were not always embedded in or attached to the real interest of the regional partners. I have learned that such conditions are mostly too fragile to survive the normal volatility of policy making. What can maintain the commitment for longer is by creating a shared vision built on the personal and genuine interests of the major stakeholders in the region, both public and private. The Rotterdam case (see text block) gives an example of vision building in practice.

Example of vision development: Rotterdam

Rotterdam hosts an international port with a large CO2 intensive industrial sector, which is responsible for 16% of the carbon dioxide (CO2) emissions in the Netherlands. The port of Rotterdam was and is a fossil fuel oriented port. The port has a dominant position in Europe and to maintain that position in the long run, all stakeholders agreed (and still agree) that the port should focus more on sustainability and should become the first sustainable major port in the world. To make the port ready for the future, all stakeholders (public and private) felt the necessity to set emission targets that would both ensure sustainable and economic viable operation. The approach is based on three options: energy efficiency improvement, use of renewable energy, and implementation of CCS. This was translated into a clear goal and ambitious target: a 50% CO2 emissions reduction in 2025, as shown in Figure 1. As the figure illustrates, CCS will play a major role in achieving the goals.

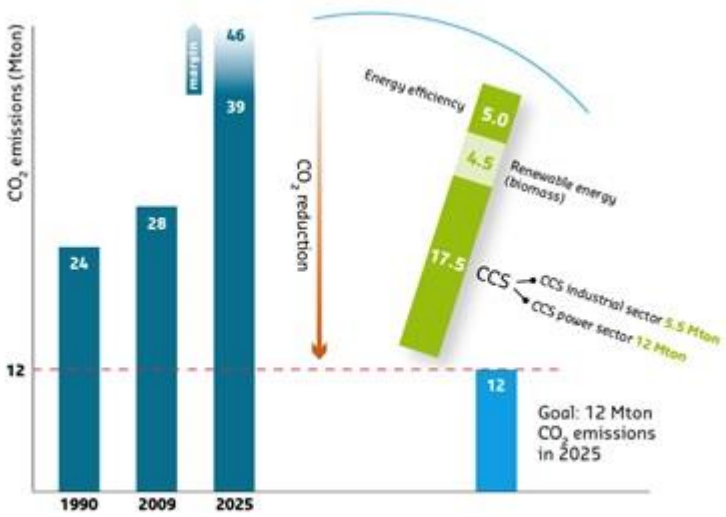

Figure 1: Expected results of the RCI program

This common view on the future was the main reason why the Rotterdam Port Authority and the industrial association (Deltalinqs) wanted to cooperate with the City of Rotterdam on the subject of

energy and climate change. Together they analyzed the situation and formulated a shared vision. As a result, the commitment of Deltalinqs and the Port Authority triggered the interest of other industrial partners. Rotterdam developed this vision by using a broad approach to tackling climate change (mitigation and adaptation; efficiency improvement and renewables and CCS). The logic of the location (much energy intensive industry) led to the focus on CCS. So CCS was a result of a broader vision. The broad approach offered public confidence in the validity of the outcome of the analyses. As a result, this meant that general support for CCS was easy to achieve because there was a broad and common understanding that CCS is essential for the future.

From my own experience, I would like to suggest that you start with looking for a common vision with at least ambitious goals to tackle climate change and to strengthen the economy at the same time. And also aim for a broad support for the vision from industrial and political executives. The order should be first a general vision and then assessing which climate mitigation options are necessary for your region. In the case of CCS, there should be a broad and common understanding that CCS is essential to reach the targets. Such a solid commitment is essential in decisive moments for CCS projects - like a final investment decision for a common carrier pipeline or a demonstration capture plant.

Next to the commitment, the broad and collective vision has one essential added value: the relevance of the vision is not solely dependent on the perceived urgency of climate change mitigation. The vision is valid in times of great urgency (like 2008) and in times of rather low urgency (like nowadays). Such a support for a vision will, very likely, lead to a stable and solid commitment, also in uncertain times. A second added value is that the vision and the parties behind it can have a strong appeal. In the Rotterdam case, the vision appeared very attractive and a lot of industrial stakeholders wanted to participate.

Vision building – practical issues

What should be in the vision for the short and the longer term? From the Rotterdam case I have learned that the following ingredients can help: (i) define a strict goal, (ii) focus on the future and (iii) apply a soft approach:

- Strict goal – The parties in Rotterdam embraced a target of 50% emission reduction in 2025 of which CCS will realise a large share. That target was strict.
- Focus on the future – It helps to stay focused on the future and its opportunities. Why? In the first place: the future has more collective opportunities than the short term (where competitors compete and politicians have to allocate restricted budgets). A vision for the future is thus more attractive and unifying than a short-term blueprint. In the Rotterdam case, they coupled the vision on the existence of the port (prosperity and sustainability) and the role of CCS. Secondly, regarding CCS is it important to concentrate on the phase after the demonstrations as well as on the demonstrations themselves. For any future phase of CCS, there is a need for real (commercial or regulatory) incentives for CO2 emission reductions. There also might be a need for a 'superintendent' for infrastructure and storage locations. If you combine such long-term necessities into your short-term actions, you prove to be a reliable and above all a credible partner, especially for NGOs.

How to focus on the future? Firstly, by choosing a reliable long-term vision. Secondly, by reflecting again and again on the risks and opportunities after the next 5-10 years and what has to happen to minimize the risks and maximize the opportunities.

- Soft approach – The soft or flexible approach is about getting from here (the position where your project is now) to there (the future goal): because of all the uncertainties you need to be flexible on the approach and very flexible on short term goals. You have to adapt your approach and your short-term goals as best as you can to achieve the strict target for the long-term.

3. Organizing the collective effort

This section is organized like a cookbook: you have ingredients and you have activities with those ingredients. The ingredients are more or less static assets, like the characteristics of your region. The activities are the actions that you can carry out to achieve your goal.

Ingredients

What ingredients are helpful to become a successful regional CCS cooperation? You must have a clear picture of the following elements before you even start considering such a project:

- CO2 sources – What is the density of medium and large-scale CO2 emitters? The higher the density the easier it is to justify a cluster. Is there a minimum? Calculations for infrastructure cases tend to conclude that below 5 Mton per year, it is not very sensible to build a detailed collection network.
- Storage locations – Where are the possible storage locations? When depleted oil and gas fields and EOR or other suitable geological formations are big and close by, that will make a better business case. And does shipment of CO2 fit in the normal way of functioning of your region? If that is the case, then the storage locations may be located somewhat further away. What is nearby? For the first project(s) in the cluster it makes sense to keep the costs as low as possible and we suggest looking for a distance under 200 km. Is there a minimum for availability? We do not think so, but it certainly helps to prove the case when you can store the maximum amount per annum for about 40 years.
- Experience – Experience in infrastructure development and shipment of gases is certainly an advantage. Also the availability of existing infrastructure for CO2 or CCS related gases (oxygen and hydrogen) make a business case for a cluster approach easier.
- Mental starting position – What is the mentality of your region? Answering that question has two parts: the cooperative origin of all parties involved and (ii) the attitude towards “solving problems”. When parties are used to working together you will have an easier job than when parties are used to competing with each other. In the case of existing cooperation, you mostly have a shared idea or vision of the future of your region (or city or port). In the Rotterdam case, CCS is commonly assessed to be necessary for the continued existence of the port. The second part starts with the question: “How does one perceive a problem?” In Rotterdam we are used to see a problem as a challenge to achieve our common vision for the region. In such a sense CCS was and still is seen as an opportunity. And what do you do with an opportunity: depending on your attitude you can study it or you can act, or do both. In Rotterdam one is used to “speak less and act earlier”. But that is not the only way to react sensibly to challenges. Why is knowing the local mentality especially necessary for CCS or for cluster projects: CCS, more than any other technology, depends on good cooperation around the whole value chain from capture, to transport, to storage. This is even more true when you are in a start-up period where every distraction or disagreement can become a showstopper. So, when exploring the possibilities of regional CCS cooperation, you must have an idea on the ins and outs of the local mentality.
- Personalities – With personalities I mean persons that have authority in the region and also outside the region. These people are mostly (also) politically engaged, they know their way in the political arena and can talk the political language. Personalities that can speak the language of companies are needed as well, preferably those with a central position in the local or national industry.
- Active companies – Active companies can be companies of different kind. It could be companies that are interested in supplying their CO2 to the CO2 transportation network. It could be companies that want to deliver services to the cluster (like pipeline companies) or be responsible for other parts of the CCS value chain (like transport companies or operators of storage locations). It is important to get the decision makers from active companies engaged in the organization of the cluster.

How do you use this tool of ingredients in practice? When your project is in a heavily industrialized area in the neighborhood of a seaport, then your starting position is already pretty positive. Additionally, when storage locations are nearby the position is exceptionally good. And last but not least: it helps substantially when industry and politics are used to working together and are in the habit of acting together. On the other hand, when the majority of these ingredients have a low score, the starting position for CCS cooperation is unfavorable.

Activities

The network organiser is the entity that is responsible for the organization of regional CCS cooperation. The network organiser could be one person but should preferably be a team of people tasked to bring all relevant stakeholders together, motivate them to go ahead, stimulate or push them

to carry out the next steps, attract new companies to enforce the cluster project and act as the support unit for all stakeholders to the external world (advocacy, regulatory issues, etc.).
The network organiser can carry out the following activities (or stimulate others to) with the main goal to achieve an active group of cooperating stakeholders:

- Achieving (Public) Funds – It certainly is easier to start a CCS cluster project when (public) funds are available. That is not always easy to achieve, but it helps when you can prove or argue that this fund will act as seed money and will trigger larger private investments. In the case of Rotterdam, the start of the Rotterdam Climate Initiative was coupled with an action program and 50 million Euros for the first four years. Of that amount about Euro 7 million were spent to organize and speed up the CCS cluster approach. The multiplication factor is estimated to be about 10-20, meaning that in the meantime private parties have spent more than Eur 70 million. There may well be local examples that can support your case to obtain public funds.
- Make the vision tangible by developing business cases – For a network organiser like you, it is one thing to obtain commitment for CCS, but the main thing is to organise credibility of the transport and storage part. The Rotterdam case has taught me that you cannot start too early with developing this credibility and the best thing to do is make a business case for transport and storage. There is not a single recipe for making business cases like that but the bottom line for credibility is: have the relevant companies at the table (pipeline companies, storage companies and investors). Particularly for the infrastructure and storage part is it necessary to strengthen your knowledge. The data normally used for these issues in literature is rather academic and can be very different from a real world case for pipelines and storage sites.
- It is essential to stimulate those parties in your region who together would have enough practical experience and knowledge to develop a real business case for transport and storage. With real case we mean: take some real locations where the CO2 could likely be captured and design a real pipeline infrastructure (with or without the component of ships for transport) from these locations towards some really existing and likely storage locations. The assessment of such a real case we call a business case. In Rotterdam they did a first case in 2008 and a more detailed one in 2009. The last is still a good source of reference for the project that will start today. Such business cases can form the backbone of the approach. They will also raise most of the potential problems. When assessed at an early stage, the problems can be made clear to ‘your audience’ in advance of the problems themselves and they can also be tackled more easily. Both aspects will help to achieve greater credibility for the project. Stimulate stakeholders to work together – The diversity of parties involved in regional CCS cooperation is large. Already on the side of industry this is a mixture of companies that normally do not work together and talk to each other. Depending on the needs of the parties, it helps to establish one or more platforms for knowledge sharing or discussing certain issues. In Rotterdam they have constituted a CCS Business Platform for general and low profile exchange and ad-hoc working groups for specific issues like the quality of CO2 in the common carrier.
- Support building an adequate policy framework – It certainly helps when a policy framework exists in which the project can be fully developed. The policy framework is, however, is hardly existent in 2014: it is still new and requires co-development with regional CCS cooperation.

For other suggestions about support and communication: see

Disclaimer

The kind of collaboration needed for successful regional CCS cooperation depends on a lot of factors. A private entrepreneur may say: “too much uncertainty”. One needs a public entrepreneur or regional personality to “rock that boat” and move it to the next level. The advice and plan given above do not deliver a practical result alone, it won't result in the development of a CCS project or cluster. But it helps to build a support structure for CCS projects. At this moment in time CCS still is in its pre-commercial stage, meaning that a lot of social funds (subsidies, tax relieves, etc.) and policy support may have to be provided from outside your region. This structural dependence on external support is far beyond regional influence. I am convinced that the regional network organiser can benefit from the lessons given above in building his/her own regional support structure. But even the best-organised

CCS region will come to a standstill when the broad national or international policy support collapses. Therefore, the disclaimer for this plan is: “it helps but it is not a guarantee for success”.

3.3 Insight 3 - What can you do to improve communication and support?

12 Oct 2014

This is the third Insight in a series by Barend van Engelenburg, senior energy expert at DCMR - the environmental protection agency in the Rijnmond region of the Netherlands. In this series Barend will explore the issues surrounding regional carbon capture and storage (CCS) cooperation. In this instalment Barend describes some methods for improving cooperation to maximise the value of CCS projects. Later Insights will discuss tools for engaging with stakeholders and measuring success, and how regional cooperation impacts on the efficacy of CCS and can contribute directly to emissions reductions.

Author: Barend van Engelenburg, DCMR Centre for Environmental Expertise, The Netherlands

In many countries there is not yet public consensus on the need and necessity of carbon capture and storage (CCS). General knowledge about CCS is also very diverse: peer reviewed analyses can be found, but these are not written in common language; lots of internet sites (blogs) exist with biased or partially wrong information. Furthermore, the relationship between knowledge institutes, academia, politics, industry and Non Government Agencies (NGOs) is not always constructive where a possible lack of mutual trust is not the strongest starting position.
What we do know, is that relationships were good and if they would cooperate and develop a shared information supply (consistent messaging) this would lead to more confidence and trust from the public, making CCS a more widely understood technology. There have been pockets of successful public opposition to CCS, in particular projects using onshore CO2 storage such as the Barendrecht Project and their have been pockets of resistance in the Northern part of the Netherlands and some parts of Germany and the US. Public opposition tends to be a problem when there is a lack of political consensus in a region undermining the vision for a project and the stakeholder trust in project developers. Research has shown that the societal groups most likely to be involved in early CCS developments (industry and public authorities) are frequently ranked as the least trusted groups in society - increasing the communication and engagement challenge with these projects. When stakeholder understanding is low, trust in developers is key. This means that often when, people are first confronted with a local storage project, it is likely that they will be triggered to look for and find information that helps them to oppose it rather than support it.
However, there is some positive news. Since 2007, Rotterdam has succeeded in communicating CCS in such a way that the media presented the Rotterdam CCS activities with a positive attitude. The communication strategy of Rotterdam had positive effects. What was the cause of the positive reception of Rotterdam's communication and advocacy approach? I call it the mix of credibility and visibility. In addition, Rotterdam succeeded in obtaining support for its plans from industry. The basic slogan for that support is “cooperate and take responsibility”. Below I have given some suggestions to the reader to improve support for a CCS project, split in the three themes of credibility, visibility and cooperation with industry.

<u>Credibility: developing vision, demonstration and collaboration</u>

1. Start with a general local or regional vision and goal towards energy and climate change. Analyse what you need to do to reach that goal. When that analysis is independent and reliable and when the outcome (in your regional situation) is that CCS should be part of the portfolio, you have a case to promote CCS. In Rotterdam the goal was to become a sustainable energy port and achieve 50% emission reductions of CO2 by 2025. The scenario analysis showed that the industrial activity in the region is such that one cannot reach such a target without substantial use of CCS.

2. Make CCS part of all general means of communication (website, presentations, annual reports), along with the other parts of the general vision, just like energy efficiency and renewable energy. CCS in Rotterdam was communicated along with subjects like wind energy and electric vehicles. In Rotterdam, this approach functioned well, in the sense that the necessity of CCS was not really debated in the public arena. The broader message (sustainability) and the broader approach (not only coal but the whole industry) was, however, not really captured by the media, since media are generally more focused on single issues than on the broader context.
3. Deliver a CCS status report every year. Try to use peer review and external auditing to increase the credibility of the data. In the Rotterdam case, the annual status reports have been instrumental in achieving good relations with the media with a positive image. The credibility of the report and of the Rotterdam Climate Initiative has been increased by the consultation of Dutch CCS experts (report 2008) and by the external verification of Foster Wheeler and Climate Change Capital (report 2009).
4. Co-operate not only with your natural partners (industry, local authorities and local politicians) but also with other parties like NGOs and knowledge institutes. They can supply you with some illuminating information, giving insights on your strengths and weaknesses from their perspective.) This approach allows you to keep them updated on your progress, giving them the opportunity to ask direct questions immediately. It is even better if they are willing to become part of the consortium that develops the cluster project, but it is not necessary. You can also plan to write jointly authored newspaper or newsletter articles and opinion pieces.

<u>Visibility: developing an effective communication and advocacy plan</u>
Develop a broad communication and advocacy plan right from the start of your project. Broad means: it should connect to the total scope of your vision and goal (see above).
What should be in that plan?

- Analysis of the target groups; and conclusions on the preferred method of communication and the best way of defining content for that target group.
- Basic storylines on CCS, incorporated in the broader context, such as energy efficiency and renewable energy.
- Main messages that everybody has to use when communicating with external parties. Both on the broad approach as well as on the CCS approach and adapted to the target groups. Help others to communicate in the desired way by supplying them with a toolbox with attractive pictures, text.
- Communication and advocacy agenda for the coming year.
- Scan the media regularly, on an at least weekly basis, so that you know about changes in issues and opinions.
- An analysis of the likely events of next semester and the opportunity and necessity to combine those events with a communication or advocacy action.
- Develop Q&As: what kind of (critical) questions can you expect and what are the best answers to give in which situation.
- Update this plan every semester, based on external developments and media analysis.
- Appoint one coordinating office for all communication activities. If possible, use a staff that has extended experiences in communication and advocacy and has some distance to the everyday practice of the activities of the cluster project.
- Assess all your activities with regards to suitability for media attention. In the Rotterdam case that resulted in about four press releases per year on CCS and several press inquiries.
- Support high level officials and regional personalities in their contacts with the press and other media and also use them for advocacy activities. Political personalities (in the Rotterdam case: the former Dutch Prime Minister Ruud Lubbers and the mayor of Rotterdam Ivo Opstelten) do really increase the effect of the advocacy towards the national government and the European Commission.
- Deliver speeches and presentations at meetings, national and international.

<u>Work together and stimulate companies to take responsibility</u>

In the case of CCS, broad cooperation is needed between companies, authorities and environmental experts. This cooperation is not only needed to achieve a common approach, it is necessary also because the CCS innovation system is a very different technology system than one is used to, with a lot of new interconnections. To get a better understanding of the opportunities and risks in your region, you need to involve a set of people that cover at least the whole value chain of CCS, from capture until storage. Cooperation could also be improved by involving social organisations, like environmental NGOs and by involving financial institutions.

How to cooperate best in your region?
While we are not able to advise on that, I can advise that in Rotterdam the constitution of the CCS Business Platform functioned effectively and efficiently under the supervision of the business association Deltalinqs. Such a platform stimulates industry to become part of the approach: in the meetings they are informed on the initiative and they can meet potential partners. It is important to engage people (local personalities are preferred) that can speak the language of industrials, answering questions and displaying strategic thinking. In the Rotterdam example, for every problem they wanted solving, they posted a message regarding attendance to their email list of interested stakeholders. That led to several ad-hoc meetings in which a lot of relevant industrial parties were present. It can also be successful to formalise collaborations with industrial partners by signing Letters of Cooperation (LoCs) or Memorandums of Understanding (MoUs). This gives more certainty and confidence on the development of plans. In those formalised agreements there needs to be a mutual benefit: the network organiser, for instance, gets validated capture data and the companies can expect support and a second opinion on their plans in return. You may also need some “seed capital” to get industry involved in the action. This helps prepare investors for the larger private investments that maybe required in future.

3.4 Insight 4 – How to understand your partners in CCS cooperation

25 Sep 2014

This is the fourth Insight in a series by Barend van Engelenburg, senior energy expert at DCMR - the environmental protection agency in the Rijnmond region of the Netherlands. In this series Barend explores the issues surrounding regional carbon capture and storage (CCS) cooperation.

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The following types of stakeholders can participate in regional carbon capture and storage (CCS) cooperation:

- Public entities: authorities, regulators, political parties, political executives, and non-governmental organisations.
- Private entities: a diverse set of industrial companies, individual entrepreneurs, contractors, engineering firms,
- Other entities: institutes for education and training, universities, public knowledge institutes, private knowledge institutes and think tanks.

In a study that was called “the Case Study on Lessons Learnt”, Paul Noothout and I developed a tool to analyse stakeholder perspectives. The use of the tool was analytical, designed to ask how we could assess the course of events in Rotterdam in a sensible way. Secondly, we sought to find a way to draw lessons that can be used and understood by a broad variety of interested persons. We used the tool for analysing the past. Some of you already have regional CCS cooperation underway and can use this tool for evaluation purposes. We think that the tool is also useful for preparatory purposes: for the planning or improvement of your regional CCS cooperation. The tool helps to structure the pros and cons from the perspective of certain groups of stakeholders and it can help you in improving your understanding of the interests of these stakeholders.
Tool for analysing stakeholders perspectives

The core of the tool is that one tries to put oneself in the position of a relevant stakeholder to understand the events from their perspective and tries to use the language of that stakeholder to frame results. The tool helped us to structure the perceptions and opinions of stakeholders and all the people we interviewed. The tool, most of all, helped us to understand the different positions and to translate the results of the analysis into a language that could be understood by readers from each of the stakeholder groups.
What is the structure of the tool? We started by categorising the different stakeholders. In the end we decided to use four perspectives that cover most of the relevant stakeholders on the following basis:

1. **The politician** – an active member of a political party and has a current function as an executive or a member of a council (could be local, regional, national, federal or international like the European Commission).
2. **The policy-maker** – a civil servant and who is involved in the policy-making process around economic, innovation, energy and climate change issues; mainly at the national or federal level at a department.
3. **The entrepreneur** – an owner or manager of a business enterprise who makes money through risk and initiative.
4. **The network organiser** – responsible for the organisation of the regional CCS cooperation. The network organiser could also be a team of persons, like the CCS team of the Rotterdam Climate Initiative.

What does using a perspective for an analysis mean?
Using a 'perspective for analysis' means you try to look through the eyes of a typical representative in a stakeholder group. It helps to have a lot of experience in working together with these stakeholders; but it also helps to have a general description of the essential features of a person in that perspective. It also helps to have useful questions to ask yourself, your environment or the respective stakeholder him/herself. In the table below I have detailed those two aspects for each perspective.
We also observed that using a general perspective led to unattractive and unwieldy descriptions in report. We also found that using a concrete voice for each perspective made our analysis more attractive. In the table below, you will find our choice for a voice of each perspective. This choice was based on the experience of the Rotterdam Case Study. You should consider and use your own voices, fit for use in your own region.
[the table has been excluded from this report because it does not fit to the format; you can access the table by the link above]

3.5 Insight 5 – How to secure storage capacity?

10 Nov 2014

This is the fifth and last Insight in a series by Barend van Engelenburg, senior energy expert at DCMR - the environmental protection agency in the Rijnmond region of the Netherlands. In this series Barend explores the issues surrounding regional carbon capture and storage (CCS) cooperation.

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Finding and developing a suitable storage location has become a major bottleneck for a lot of large CCS projects. Not only in Europe but also in the US and Australia the development of a storage location appeared to be the (unexpected) showstopper. How to prevent such a downfall? The **bottom line** here is: you cannot start too early and abundant capacity is a demand rather than luxury.

Experience shows that CCS projects start with the capture and storage comes in when one has enough confidence in the capture plant. Experience also shows that the lead-time for developing a storage site is much longer than the lead-time for a capture plant; and, also, that storage sites have more unique characteristics with related distinctive uncertainties, whereupon there is an almost certain “unexpected” increase of the development time of storage. Actually, to be parallel in the timing

of the investment decision for storage, capture and transport, you need to start with storage and then transport and then capture. That is however in most cases not feasible, so I would like to advise one basic rule: **integration and parallel timing of capture, transport and storage is essential.**

Experience also shows that it is not wise to focus on exactly the amount of storage you need: the chance that one of your reservoirs is not suitable or is not ready in time is nearly 100%. So you need to develop more reservoirs than you actually and technically would need: **redundancy is thus a must**.

Since the industrial partners (who deliver the CO_2) are focused on capture and all of its problems, it is the responsibility of the CCS cluster developer or organizer to achieve and maintain a focus on storage. From the argumentation above you can also conclude that the main task of the cluster organizer is to develop a portfolio of storage "prospects" (plural!!) right from the start. And next to that main task, the organizer has to influence the environment[1] to be become more active on supporting storage. Lets assume that you are such a cluster organizer. The following suggestions could improve your performance for both types of activities.

How to achieve a portfolio of storage prospects

- You could start with a storage screening exercise: make a rough estimate of the potential storage in an area of reasonable distance. In most countries the Geological Survey Institute has data on the hydrocarbon reservoirs and sometimes these data also contain the data of the surrounding aquifers. The current and global state of knowledge is such that in each country there could be a research institute that is capable of carrying out such a screening. Storage screening is a necessary activity to achieve confidence for all stakeholders. Relatively easy to do (public data and some private data are sufficient) with limited costs (around 300 k€).
- The next step is to do some detailed reservoir studies. The question here is whether a storage provider (an E&P operator) needs to have the lead or that you will lead this part of the work. See the text box in this section to connect to the Rotterdam experience in this area.
- When relevant stakeholders agree that a certain cluster of storage sites are promising and that they have confidence that storage is feasible, they should as soon as possible engage in a storage development plan. The latter is actually a FEED study in which all the technical and cost aspects are described in changing the wells from production to storage. In this step, you will play the role of initiator of this process. The private parties that are developing their (part of the) CCS business case are the ones that make decision and carry out the implementation.

[1] With environment we mean all parties, entities and institutions that have an influence of the project: like the local politicians, the national government, the regional business association, individual companies, financial institutions, and the regulatory framework.

Text block

Rotterdam experience on storage assessment

RCI did its first detailed study in 2008 because the transport operator and the future storage operator came to us and said that they saw an opportunity to develop a certain hydrocarbon reservoir. In 2010 industrial parties expressed the need for a storage survey and Rotterdam brought together parties from both sides: emitters and storage operators. This resulted in carrying out the ISA (Independent Storage Assessment) study (see <link: http://www.globalccsinstitute.com/publications/independent-assessment-high-capacity-offshore-co2-storage-options). Replicating the ISA approach for your own region can be very helpful. In <link: http://www.globalccsinstitute.com/publications/co2-storage-capacity-assessment-methodology> the methodology to do so is explained extensively.

Some practical things I like to share with you on the storage assessment:

- Timing: screening takes about 6 months; the detailed assessment in the ISA took about 12 months; storage development will cost 4-5 years.
- Costs: screening of hydrocarbon fields costs about 300 thousand Euros; detailed assessment cost about 1 million Euros in the Rotterdam case; storage development of an aquifer with one platform and one well is now estimated to cost about 110 million Euros. The cost for developing a hydrocarbon field can be lower but depends on the possible re-use of assets and the necessity to explore and recover the risks of existing wells.
- In screening and detailed assessment: for aquifers more engineering costs are needed in this stage whereas in the case of hydrocarbon fields you can draw upon a lot of existing data and experience. The upside of aquifers afterwards is that they are mostly available right away, whereas the availability of hydrocarbon fields also depends on the market development of gas or oil and the strategic use of the respective reservoir.

How to influence the supporting environment?
The following aspects are important to support the development of storage sites:

– **National Strategy** – Getting nearly empty gas fields available for storage can be a complex and lengthy process. It helps when a country has a policy or a strategy towards the use of reservoirs for CO_2. You should develop an approach for advocacy towards national government to achieve such an overall storage policy. Rotterdam for instance was a major party in setting the agenda for the discussion on national level with regards to a storage strategy. Rotterdam participated in all parts of the national discussion and advocated their case accordingly.

– **International Strategy** – In the regions around the North Sea, but maybe also elsewhere in the world, CO_2 storage will become a cross border issue. In the long run, for instance, the Scottish reservoirs might be the best to store large volumes of CO_2 in the North Sea. In the short term other reservoirs will be chosen for CO_2 storage. How do you connect short-term activities and long-term options in an efficient and effective way? How do you organize the CO_2 transport infrastructure that it is efficient and also prepared for larger volumes in the future? The EU CCS Regions Network <link: http://www.globalccsinstitute.com/networks/eu-ccs-regions> expressed a strong need for a common approach and strategy; there may even be a need for a European 'superintendent' to manage storage availability on the North Sea. What can you do in such a case where international coordination seems necessary? You can work together with stakeholders in similar regions and try to come to agreement with them on the common priorities for developing a transnational storage and infrastructure network. Such cross-border regional cooperation can stimulate national governments and (in the European case) the European Commission to act in a coordinated manner. The EU CCS Regions Network is a collaborative group of CCS regions that

have a mission to exchange experience. They have been able to influence decisions of the national and international authorities.

– **Regulatory environment** – National, federal and international authorities are faced with a lot of regulatory challenges (like cross-border transport, the liability issue around storage and, in Europe, the implementation of the European CO_2 Storage Directive). You can help these authorities by supplying the experience and knowledge that you have gathered in your organization and by your partners. In most cases that is the kind of practical knowledge that the authorities or regulators themselves are missing and I have experienced that that kind of contribution is highly appreciated; and it also helps your case.

– **Stimulate exchange as much as possible** – Knowledge and experience in storage is sparsely available, as is the number of CO_2 storage experts. I have observed that this is already a cause for delay (on the regulator side but also on the operator side). It is very helpful when all relevant parties exchange information on the subject of CO_2 storage as much as possible. In the Rotterdam case one could also make use of the outreach and study opportunities of the national CCS research program (CATO2). It is essential that you try to find such opportunities in your region or country as well. The exchange of all issues around CCS is necessary but with respect to storage these kinds of exchange are key in achieving progress. It is even that important that it should not only be done inside a region but also outside and across national borders.