

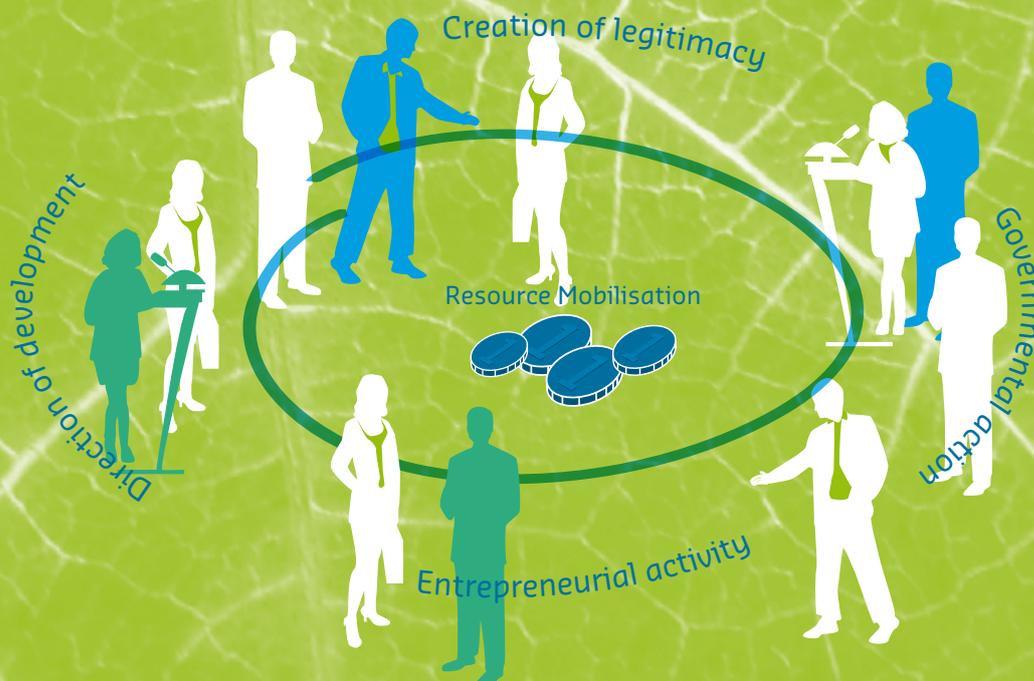


ROTTERDAM.CLIMATE.INITIATIVE

# Rotterdam CCS Cluster Project

Case Study on 'lessons learnt'

Final Report



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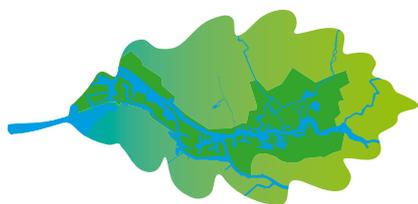
# Rotterdam CCS Cluster Project Case Study on 'lessons learnt'

## Final Report

Date: February 2012

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DCMR Centre for Environmental Expertise



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Research commissioned by the Rotterdam Climate Initiative (= RCI) with funding from the Global CCS Institute (= 'the Institute'; via the Funding Agreement of the Institute with Deltalinqs as the representative of the RCI). The authors would like to thank Klaas van Alphen (the Institute) and the Case Study Project team (Stefan Mackaaij, Willem de Neve and Reinier van der Wees) for their valuable contributions to this report.

# Executive Summary

The Rotterdam Climate Initiative (RCI) is working hard to realise Carbon Capture and Storage (CCS) in the Rotterdam area. CCS activities in Rotterdam commenced in 2006 and until now more than 18 major companies have cooperated to provide feasibility level engineering studies for CO<sub>2</sub> capture projects and a CCS infrastructure network. The Rotterdam approach appears to be effective. Domestically and internationally, people have expressed interest in the Rotterdam approach and why the RCI is so successful in promoting the development and deployment of CCS.

In 2010 RCI decided to carry out a case study in which the practical experience of the four-year-old Rotterdam CCS project was central. The Global CCS Institute (=the Institute) was interested in the results and decided to support the case study financially. RCI and the Institute formulated the following main research question: What can we learn from the Rotterdam CCS project? Furthermore, they articulated two subsequent objectives: (i) to discover the lessons useful for supporting new CCS projects around the globe and (ii) to improve the Rotterdam CCS project itself.

The case study itself resulted in a lot of products and processes. Products are (interim) reports on certain activities and presentations on lessons learnt. Processes are, for instance, the workshops in which the project team had a (bidirectional) exchange of lessons learnt in some places around the globe (UK, Australia, South-Korea and Japan).

This is the final report of the case study. It focuses on four issues:

1. **An understandable storyline** - In chapter 2 we give a brief recap of all the relevant events of the Rotterdam CCS approach.
2. **Extended (new and original) analysis** - The multifaceted analysis in chapter 3 from four outside stakeholders will give you a more colourful view of the strengths and weaknesses of the Rotterdam approach. The stakeholder views that we have chosen are the politician, the policy-maker, the entrepreneur and the (CCS) network organiser. From each view you get opinions and impressions about what happened in Rotterdam.
3. **Cookbook for new CCS project initiators** - In chapter 4 we have translated the lessons learnt from Rotterdam to a guideline for starting project leaders. The guideline focuses on building commitment, on organising a cluster project, on getting storage available and on the subject of communication and advocacy.
4. **Discussion on the 'ins and outs' of the case study** - In chapter 5 we reflect on more than a year of interesting work (somewhat less than 3000 hours of labour). The discussion focuses on the theory used and its application, on the results of the present case study and on the workshops and knowledge sharing. The chapter is completed with recommendation for further work.

Although this report marks the end of the current case study, we hope that this report and its possible follow-up activities will be of help to support and improve the development of CCS around the world. The case study has proved that Rotterdam is a good resort to find interesting conclusions, useful for Rotterdam itself but also for the rest of the world.



CHAPTER

Introduction

# 1. Introduction

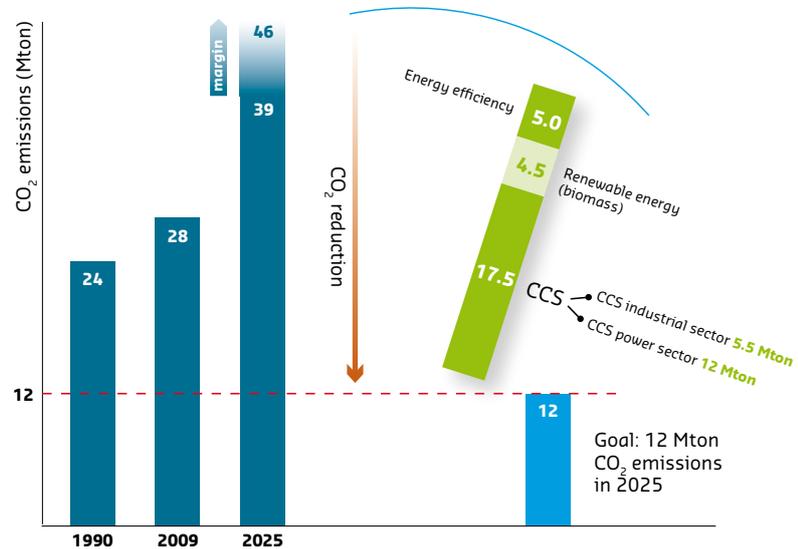
## 1.1. Rotterdam Climate Initiative

Rotterdam is responsible for sixteen percent of carbon dioxide (CO<sub>2</sub>) emissions in the Netherlands. As an international port with a large CO<sub>2</sub> intensive industrial sector, which is set to grow over the coming years, Rotterdam is acutely aware of its responsibility to act on the climate change issues it is facing. This resulted in the ambitious Rotterdam Climate Initiative (RCI) program, designed to:

- achieve a fifty percent reduction of CO<sub>2</sub> emissions in the Rotterdam region by 2025, as compared to 1990.
- climate-proof and adapt the city to the consequences of climate change.
- strengthen the Rotterdam economy.

RCI is a collaboration of the Port of Rotterdam, the City of Rotterdam, port and industries' association Deltalinqs, and the DCMR Environmental Protection Agency.

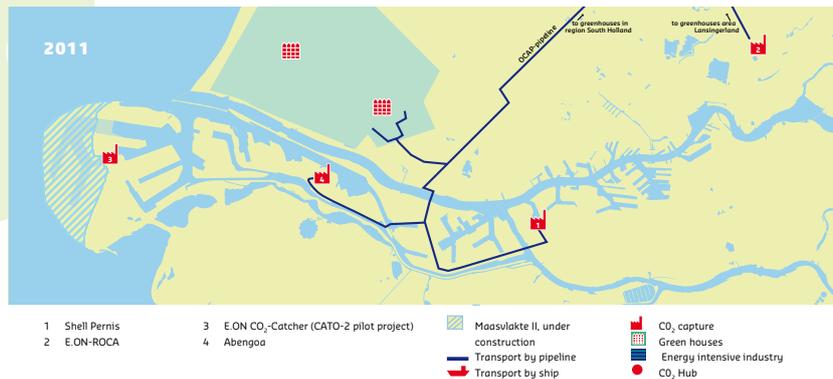
The greatest share of RCI's ambition to reduce CO<sub>2</sub> emissions will be realized through energy efficiency measures in industry (two percent annually), buildings and transportation, sustainable energy – predominantly biomass, use of residual heat and wind energy – and through carbon capture and storage (CCS).



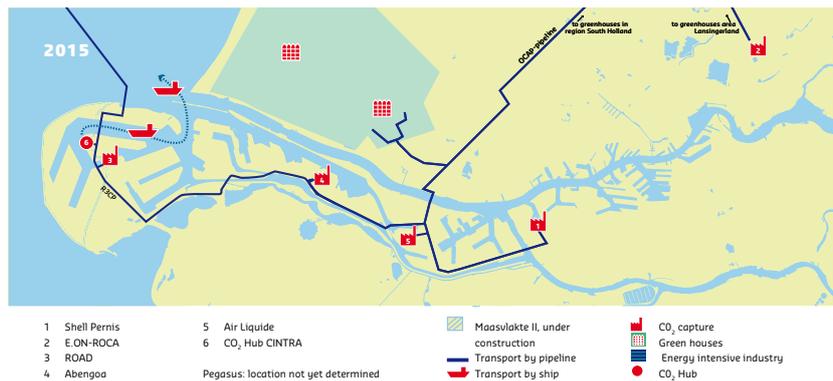
Given the large presence of the industry and power sector in the port, CCS is a logical and crucial means by which to achieve CO<sub>2</sub> emission reduction. Over half of the projected reduction, 17.5 Mton, must be achieved through CCS. Approximately thirty percent of the CCS objective comes from industrial installations. The aim is to realize full-scale CCS application by 2025.

### 1.1.1. Rotterdam CCS Cluster project

The Rotterdam approach on CCS started in 2006 and RCI delivered five CCS status reports to date<sup>1</sup>. The Rotterdam CCS network can scale up rapidly from a demonstration phase around 2015 (capturing and storing about 2.5 Mt/year) to a commercial phase, handling as much as 17,5 Mt of CO<sub>2</sub> annually from the Rotterdam industry by 2025, providing the backbone for low-carbon industrial and economic growth in Rotterdam. This development is illustrated in the maps of Rotterdam-Rijnmond below.



Map 1 shows the present situation (2011): Several companies, active in RCI, already operate CCS projects. OCAP delivers CO<sub>2</sub> from the Shell refinery (1) to greenhouses. With the addition in 2011 of Abengoa (4) as a source of CO<sub>2</sub>, OCAP continues to expand these deliveries. E.ON's CHP plant, RoCa, (2) also delivers CO<sub>2</sub> to greenhouses. Other examples include GDF SUEZ, who has operated a small-scale CO<sub>2</sub> injection project in an offshore gas field (K12B) since 2004, and the pilot capture plant called CO<sub>2</sub> catcher at the E.ON Maasvlakte coal-fired power plant. This pilot was part of the CATO R&D programme.



The second map shows the developments projected for the period in 2015, when the CCS network will evolve into its demonstration phase. Large-scale demonstrations are required as stepping-stones towards full-scale implementation:

- These pilots will lead to the development and improvement of capture technologies.

<sup>1</sup> See references [3], [4], [5], [6] and [7].

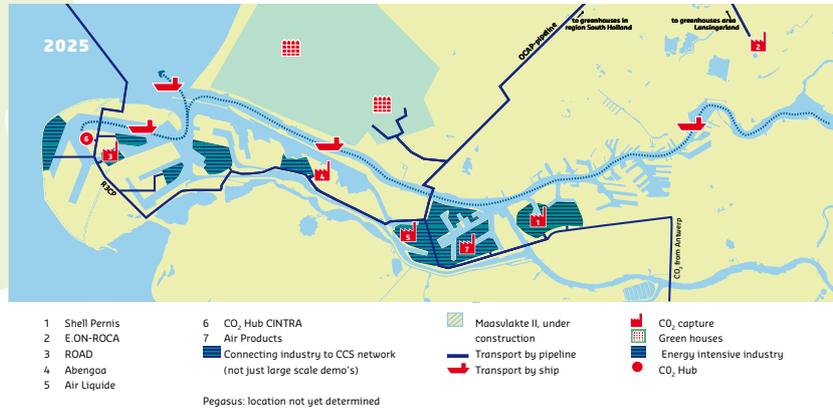
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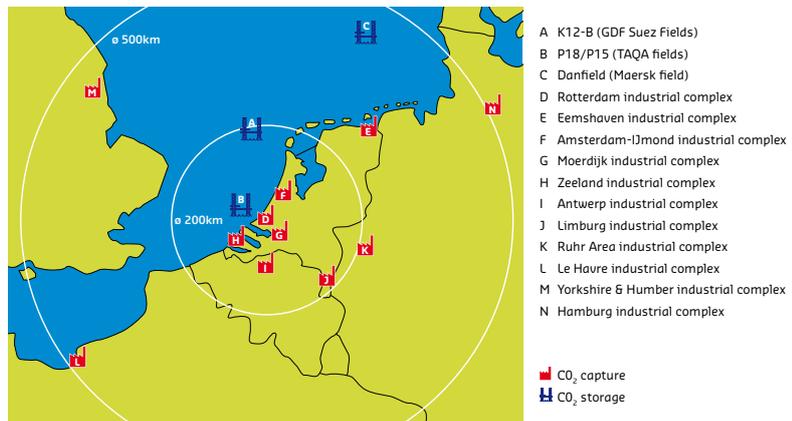
# Introduction

- They will enable cost reduction for CCS.
- They are the start of the CCS network.

The most prominent demonstration is the ROAD project (3), which has been granted funding. Air Liquide (5) has applied for a NER300 grant. RCI's partner the Port of Rotterdam is developing a Common Carrier, enabling other emitters to connect to this CO<sub>2</sub> collection network.



As shown on the third map, the demonstration projects form the stepping stones towards full-scale deployment of CCS by 2025 in the Rotterdam area, enabled by the establishment of the Rotterdam CCS network. RCI anticipates that the demonstrations will capture and store CO<sub>2</sub> on a full-scale and that an increasing part of the Rotterdam industry will apply CCS by 2025. The three transparent maps also indicate the connections RCI expects the CO<sub>2</sub> network to make outside the Rotterdam-Rijnmond region. Below is a map of Northwest Europe, showing the locations of those connections, including offshore storage sites the RCI partners intend to use.



### 1.1.2. The opportunities Rotterdam offers

Rotterdam offers excellent opportunities for the development of a shared CCS network. Large CO<sub>2</sub> emitters are clustered in the area, and large offshore storage sites are accessible nearby in depleted oil and gas fields and other suitable -geological formations. The closest suitable fields are the P18/P15 gas fields only 20 kilometres from the port, operated by TAQA. This network will connect multiple emitters to multiple storage sites. RCI expects this

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# Introduction

network to benefit both climate change policies and the investment climate in the port. The conditions described above create economies of scale and help to lower the overall cost of implementing CCS. Perhaps the most attractive benefit of a Rotterdam-based CCS network is that it would accelerate CCS deployment by providing a CO<sub>2</sub> transport and storage infrastructure with associated facilities such as transshipment and processing. The Port of Rotterdam, in cooperation with OCAP, Gasunie and Stedin is developing the Rotterdam CO<sub>2</sub> Common Carrier Pipeline (R3CP), a collection network for CO<sub>2</sub> in the port. This carrier will yield the lowest costs for CO<sub>2</sub> transportation to the Maasvlakte for market parties. This will facilitate emitters, who are currently considering implementing CO<sub>2</sub> capture, and offshore storage and/or enhanced oil recovery (EOR).

### 1.1.3. Rotterdam-based companies join forces

RCI and its partners are at the forefront of global CCS development, both in the power sector and the heavy industry. In the power sector E.ON and Electrabel are jointly developing ROAD, a post-combustion capture project at the E.ON coal/biomass power plant. This project has already secured substantial funds from the EU and the Dutch government. An industrial project is being developed by Air Liquide, intending to capture and store CO<sub>2</sub> arising from the production of hydrogen. These initiatives are supported by the CINTRA-consortium an alliance between Gasunie, Vopak, Anthony Veder and Air Liquide, for the exploitation of a CO<sub>2</sub> terminal and CO<sub>2</sub> transport by ship and the development of the Common Carrier Pipeline (R3CP).

RCI has a long established cooperation with private initiatives. This collaboration has culminated in a substantial number of Letters of Cooperation (LoCs) with projects, including: CINTRA, Maersk, E.ON, Electrabel, Air Liquide, Air Products and Shell. As a follow-up on these bi-lateral agreements, RCI is seeking ways to strengthen the cooperation between the front runner companies, to continue working towards the development of a Rotterdam CCS Network. Other stakeholders, including local communities, the Dutch and EU governments and other companies in the port of Rotterdam who are interested in implementing CCS at a later stage, support the efforts of these companies. The CCS Business Platform, hosted by Deltalinqs, provides a mutual basis for information exchange and learning in a public-private setting, in a transparent manner.

### 1.1.4. (Inter)national network

Throughout the world, many initiatives are taken to establish CCS projects. RCI collaborates closely with other CCS initiatives around the world. It is a partner in the Clinton Climate Initiative and has, in cooperation with and financed by the Global Carbon Capture Storage Institute (GCCSI), initiated a study on the liquid logistics concept (which resulted in the CINTRA-consortium), the independent storage assessment and a study on lessons learnt. The activities of RCI are also supported by the European Climate Foundation. Furthermore, RCI is involved in European initiatives on CCS, such as the Berlin Forum on (sustainable) fossil fuels, the European Technology Platform for Zero Emission Fossil Fuel Power Plants and the North Sea Basin Task Force.

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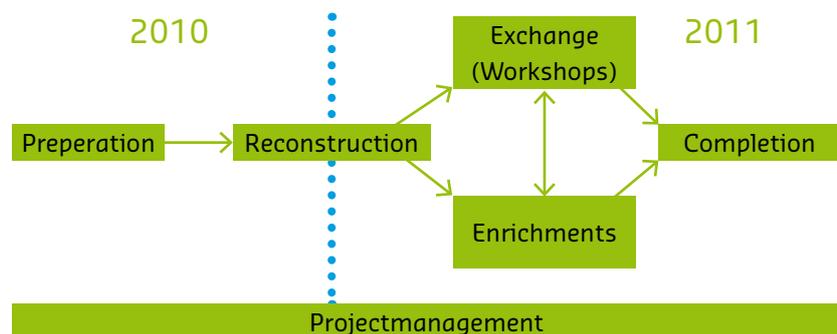
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Regions play a vital role in establishing CCS. They are key in facilitating implementation of projects and are in many cases also the drivers for CCS and CCS networks. This is why RCI is one of the initiators of closer cooperation between the CCS regions in Europe. The regions include Scotland, Yorkshire and Humber, Le Havre, North Rhine Westphalia, Brandenburg and Eemshaven. This cooperation allows the regions to share knowledge and experiences, raise key issues at the appropriate levels of government and be a sparring partner for institutions such as the European Commission.

In the Netherlands, RCI participates in the Dutch CCS R&D programme CATO2 and collaborates closely with Eemshaven - Energy Valley, another Dutch region that offers good long-term CCS development prospects.

## 1.2. The Case Study

The RCI is thus working hard to realise CCS in the Rotterdam area. CCS activities in Rotterdam commenced in 2006 and until now more than 18 major companies cooperated to provide feasibility level engineering studies for CO<sub>2</sub> capture projects and a CCS infrastructure network. The Rotterdam approach appears to be effective. Domestically and internationally, people have expressed interest in the Rotterdam approach and why the RCI is so successful in promoting the development and deployment of CCS. RCI decided in 2010 to carry out a case study in which the practical experience of the four-year-old Rotterdam CCS project was central. The Global CCS Institute (=the Institute) was interested in the results and decided to financially support the case study. RCI and the Institute phrased the following main research question: What can we learn from the Rotterdam CCS project? And formulated two subsequent objectives: (i) discover the lessons useful for the support of starting CCS projects around the globe and (ii) improvement of the Rotterdam CCS project itself. The first deliverable of the case study was the description of the research method and approach (see ref. [1] and see figure). The case that was studied was the Rotterdam CCS cluster project<sup>2</sup>.



<sup>2</sup> Also other synonyms are used for a CCS Cluster project, like CCS Network project and CCS Hub. We formerly used the word CCS Network Project (see ref. [1]) that is why we still use word Network Organiser. But nowadays the word cluster project is more in vogue. We adapted our vocabulary in this report to that usage.

# 1

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The activities in the reconstruction and the enrichment phase were focused on three kinds of analyses:

1. **Document analysis** – chronology and analysis of events based on about 2000 internal RCI documents.
2. **Media analysis** – chronology and analysis of events of media attention for the Rotterdam project (approx. 100 articles in newspapers).
3. **Interviews** – with those directly involved and with outsiders (inside the Netherlands).

These activities started at the end of 2010. Parallel to these analytical activities, we organised five workshops in 4 very different countries to exchange the first lessons learnt and to learn what the others CCS project initiators might find sensible and interesting to learn from us (and we from them). In July 2011 the provisional results of these activities at that moment were used to write an interim report on the case study [2]. The current report is the final report of the case study.

### **This report and guide for reading**

The intended audience is someone involved in the start-up of a CCS cluster project, or someone involved in a CCS (cluster) project that want to improve the effectiveness of that project.

This report has the following parts:

- Chapter 2: the storyline – this is the brief reference version of the line of events of the Rotterdam CCS cluster project.
- Chapter 3: the perspectives – this is the assessment of the Rotterdam project by four different points of view or perspectives.
- Chapter 4: the guidelines – this is the guideline for those that want to start a CCS cluster project and want to know what they need to do (and why).
- Chapter 5: the discussion – this is a critical assessment of the research approach of the present case study and what could be improved. Contains recommendations for the near future.

Reading order – the beginning reader should start with chapter 2 and then chapter 4 and eventually chapter 3. Readers more acquainted to the Rotterdam project could skip chapter 2. When the reader only wants to have guidance on his own project, he could start with chapter 4 and when he has become curious about the arguments behind the guidelines and the assessment of the Rotterdam project he can read chapter 3. The academic researcher with primarily methodological questions can start to read chapter 5. Readers interested in other parts of the analyses could start with studying the reference list at the end of the document. When still not satisfied in his hunger for details the reader can contact the project leader (see references).

# 2

## CHAPTER

# What happened in Rotterdam?

## 2. What happened in Rotterdam?

In this chapter we will give a brief version of the storyline of the Rotterdam cluster project, starting in 2006 and ending at the beginning of 2011.

In the figure on page 12 you see a graphical representation of the storyline.

Above the time scale you see the defined period (P1, P2, P3 and P4) including their abbreviated name. The structure of this chapter will follow that categorisation into period and will tell per period what happened. Directly above the periods you see the activities that happened within the Rotterdam Climate Initiative. The events above the RCI events are the events that happened “outside” the RCI but inside the region where the RCI carries out its activities (Rotterdam and the broader port area, in Dutch this area is called “Rijnmond”). Under the time scale you see the relevant activities in the Netherlands (the green arrow indicates the existence time of the national Taskforce CCS). At the lowest level, but certainly not the least important, are the relevant events inside Europe.

We would like to insert one addition. The “book” icons represent the annual RCI CCS reports. So RCI CCS Report nr. 1 is the first report written and is dated 2007. Report nr. 3 is the 2009 annual report. In the picture the wording “Infra Business Case” is used. It denotes the Business Case for infrastructure and storage. You cannot observe it from the picture but for the first Business Case report Rotterdam already invested 300.000 Euros for a gas field feasibility study; a study that was certainly a first of a kind. In this chapter every period will be described separately in the following four sections.

### 2.1. Period 1: the Birth of the Rotterdam Climate Initiative (2006-2007)

In this period a couple of companies announce plans to build a power plant in the Rotterdam region, among them are E.ON and Electrabel who plan to build new coal fired power plants. These plans spark the debate on need and necessity of new generation capacity in the Netherlands but also on coal itself. The DCMR Environmental Protection Agency is developing an assessment framework for new power plants. This framework already includes demands on capture readiness. Early in 2006, the Dutch secretary for environment (Mr Van Geel) visits Rotterdam and also discusses the coal fired power plants and the possibility of CCS is brought forward by DCMR. The secretary promises funds for a research and DCMR could start a cost/benefit and opportunity survey study for CCS activities in the Rotterdam area early in 2006.

At the end of 2006 the conference “New Energy for Rotterdam” is held. This leads to an advice of the International Advisory Board (IAB) of Rotterdam that Rotterdam should be the “world capital of CO<sub>2</sub>-free energy” in 2025, which included an emission reduction of 50% in CO<sub>2</sub> emissions in 2025. CCS is also mentioned as an important opportunity for Rotterdam. In December 2006 the Mayor of Rotterdam meets Mr Bill Clinton during his

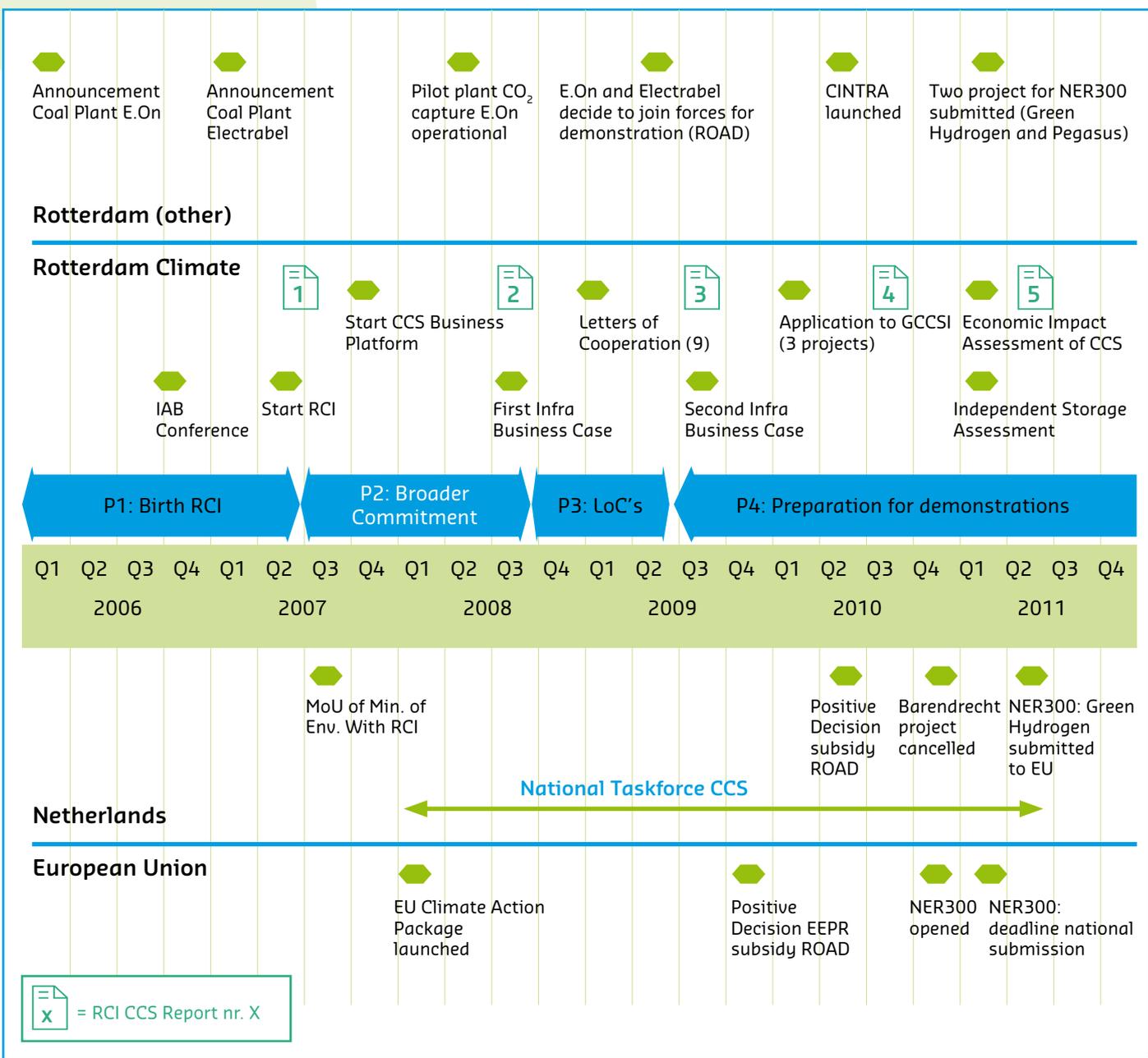


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visit to the Netherlands and Mr Clinton invites Rotterdam to the Clinton Climate Conference in May 2007 in New York. Since the meeting with Mr Clinton, the advice of the IAB has been embraced by the mayor of Rotterdam and has become a kind of commitment of the Municipality of Rotterdam.

Together with DCMR, Deltalinqs and the Port Authority, the Municipality develops a plan to realise the IAB advice. This plan is completed in May 2007 and has ambitious goals on all three domains of climate change mitigation for city, port and industry: energy efficiency improvement, renewable energy and CCS. For CCS the plan contains a summary of an ambitious business case for CCS. The plan is used to start the Rotterdam Climate Initiative (RCI). The birth of the RCI in May 2007 is celebrated with Mr Clinton at his conference in New York. First meetings with delegates from the Clinton Climate Initiative follow shortly afterwards.





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# What happened in Rotterdam?

Meanwhile the parties involved in the business case for CCS are working hard to get support from industry. Cooperation is formalised at that stage by the signature of Letters of Intent (8 companies at the start, see box) in which the signatories state to support the RCI goals. In July 2007 the CCS business case is presented to local stakeholders and the first RCI CCS report is published. This report contains an assessment of the cost and benefits for CCS in Rotterdam and a roadmap in three phases for the realisation: 1,5 Mton in phase 1, 10 Mton in phase 2 and 20 Mton in phase 3. The report is based on the assessment of public available data, like the IPCC Special Report on CCS of 2005. The conclusion of the report is that CCS in Rotterdam is feasible and an attractive opportunity for the Port of Rotterdam.

In this period, already before the start of the RCI, one of its partners (DCMR) participated in a CCS scoping study led by the Dutch electricity producing industry (EnergieNed). All relevant stakeholders in electricity (authorities, consultants, industry) participated in this study. The study report was also brought to the public domain in July 2007. For the CCS discussion in the Netherlands the EnergieNed study and the first RCI CCS report were important milestones.

## 2.2. Period 2: Achieving broader commitment (2007-2008)

The **most important event** of the second period is a European one: the European Commission published the Climate Action package in January 2008. In this package the EU energy policy for the period 2008-2020 is presented with matching financial support. CCS is an important part of this package. This EU package is used afterwards as the roadmap for national CCS policy in the Netherlands. The promise for matching financial support is seen to be the main driver for CCS activities in Europe, Netherlands and Rotterdam.

On the **national level** in the Netherlands the following events are significant in this period:

- The Dutch Ministry of Environment and the Rotterdam Climate Initiative (RCI) sign of a cooperation agreement (Memorandum of Understanding, July 2007). The aim of the MoU is to accelerate realisation of large-scale CCS in the port of Rotterdam.
- The National Taskforce CCS is established. The Taskforce aims to support Dutch CCS activities and to remove possible obstacles in the implementation of CCS in the Netherlands. The Taskforce has high-level members from public and private entities (March 2008).
- The pilot plant for CO<sub>2</sub> capture, the CO<sub>2</sub>-catcher, is opened at the E.ON site in Rotterdam (April 2008).
- The Ministry of Economy publishes its Energy Report (the main biennial policy document on this issue). Setting up a CO<sub>2</sub> infrastructure is one of the three infrastructure areas that are detailed in the report (September 2008).



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# What happened in Rotterdam?

The partners of the RCI have the following main activities:

- Achieving visibility by a well-organised advocacy.
- Enhancing cooperation with industry.
- Developing a business case for CO<sub>2</sub> transport and storage.
- Developing a strategy for (long-term) deployment of CCS.

**Advocacy** – In the summer of 2007 the CCS report was published and the main executives of the RCI determined the need for improving the visibility of the CCS activities of RCI and the need for advocacy to solve the bottlenecks mentioned in the report. RCI defined an advocacy strategy for CCS direct after that summer. It consisted of a stakeholder analysis and a decision to work together with the other region in the Netherlands that is focussing on CCS (Northern Netherlands, a cooperation of the three Northern Dutch provinces) and it defined a sequence of advocacy activities. For the activities in the Netherlands this resulted in the following three main events:

- RCI and Northern Netherlands send a joint letter to the Ministers of Economic Affairs and Environment (October 2008).
- RCI and Northern Netherlands have a meeting with the Ministers of Economic Affairs and Environment (April 2008)
- RCI and Northern Netherlands become members of the Dutch CCS Taskforce (see before).

On the European level, the advocacy achieved a real boost after the announcement of the European Climate Action package (January 2008). Mr Lubbers and Mr Opstelten contact the European commissioners of Energy (Piebalgs) and Environment (Dimas). A visit by European Commissioner Piebalgs to Rotterdam takes place in January 2008.

Content of the advocacy is twofold: first to show that Rotterdam is well-suited to start CCS deployment and, second, that the European and national authorities have to provide more clarity on the financing of demonstration projects, that they should propagate a clear and consistent message on CCS and that they need to speed up to fix the legislation in such a way that it support the application of CCS.

**Cooperation with industry** – In the summer of 2008 the CCS Business Platform is founded (in 2011 about 20 companies participate). The participating companies declare to endorse the RCI objectives and are willing to cooperate in accelerating the introduction of CCS. The main function of the platform is to share knowledge and experience between industry and RCI partners.

**Business case infrastructure** – RCI partners, led by the Port Authority, started exploring and defining a business case for the infrastructure for CO<sub>2</sub> transport. The existing pipelines of OCAP were seen as the backbone or the starting point. A couple of growth scenarios were developed and at the beginning of 2008 a real study was started to define a business case for the first phase (see RCI CCS Report 2): which financial model could work for the exploitation of this transport network and under what condition could that network function with a positive turn-over. Wintershall came to the RCI with an offer: their nearly depleted gas reservoir in the Q8a field could be possibly be used for CO<sub>2</sub> storage. The result was that Wintershall also became



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involved in the business case. The Q8a field could fit neatly into one of the growth scenarios. In 2007 the Port authority, OCAP, Wintershall and Rotterdam signed a cooperation agreement to develop the business case. In this period Linde and TNO conducted a feasibility study for storage of CO<sub>2</sub> in the reservoir Q8a. The consortium delivered a confidential report on the business case; the main results were fit in the RCI CCS report 2.

**Strategy** – After the summer of 2007, the RCI elaborates a strategy for accelerating the deployment of CCS. In that strategy the organisation of the CCS Network plays a large role as does the long-term incentives for CCS deployment. Especially on these issues, the cooperation with the Clinton Climate Initiative (CCI) becomes more intense. Mr Magaziner (director of CCI) visits Rotterdam twice to have extensive discussions with RCI partners. The formal collaboration between the RCI and CCI is signed in August 2008. CCI and RCI together have increased their understanding, especially on the ‘ins and outs’ of organising a hub approach. The RCI team uses this experience in the development of the 2008 report. This report combines the RCI analysis with an external assessment by Dutch experts. The report contains an assessment of local data on industry and an own infrastructure business case. This second CCS report is published in July 2008 and presented by Mr Lubbers to the national ministers. The message of the report is that Rotterdam is ready for applying CCS. This requires, however, a long-term and stable policy that will offer the necessary confidence to companies to make such large investment decisions.

### 2.3. Period 3: Getting Industry prepared and committed (2008-2009)

This (short) period is characterised by (i) very intense cooperation with industry, (ii) achieving more confidence on the infrastructure business case and (iii) advocacy for European funding and national co funding of CCS projects.

**Cooperation with industry** – At the end of 2008 RCI started to work on an integrated approach for cooperation with the emitters. RCI developed the possibility of a Letter of Cooperation (LoC). In such a LoC companies or consortia promise to do a prefeasibility study and RCI promises to supply an independent expert to validate the studies. Early in 2009 RCI signed a LoC with nine companies including E.ON and Electrabel. E.ON and Electrabel explicitly decided in this period to look at a joint demonstration project. A few months later they submit a joint proposal for the European EEPR subsidy scheme: the ROAD project. All nine companies carried out the pre-feasibility study in Q1 of 2009. Foster Wheeler validated these business cases for CO<sub>2</sub> capture, whereas Climate Change Capital has analysed the plans from the role of financial advisor and made a full chain analysis for the Rotterdam CCS network.

**Infrastructure** – RCI led by the Port Authority developed an improved version of the transport business case with Gasunie, OCAP, EBN, Wintershall, Taqa, Stedin and Gaz de France. In May 2009 the second report on the business case for the infrastructure appears. This is again a confidential report of which the summary is enclosed in the 2009 CCS report. In January



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2009 a parallel transport initiative started: Anthony Veder, Gaz de France, Gasunie and VOPAK come with a joint proposal for a “CO<sub>2</sub> Liquid Logistics Shipping Concept”. In this proposal CO<sub>2</sub> is liquefied (using the ‘cold’ of the LNG facility in the port) and is then transported by ship to depleted gas fields in the North Sea. The summary of the business case for this proposal is also enclosed in the 2009 CCS report.

**Advocacy** – RCI supports the European Commission’s NER proposal, the new subsidy scheme that was in development in that period. Another message that RCI starts advocating towards the European Commission is the need for additional policy and a change of focus: i.e. that the focus should be on networks and cooperation instead of stand-alone projects. RCI also campaigns for financial support from the national government for the Rotterdam CCS plans. RCI also continued the advocate that the large-scale deployment of CCS is can’t rely on industry finance for the transport and storage infrastructure, given the current and expected CO<sub>2</sub> prices. The RCI puts the aforementioned need for additional policy in the memorandum “Ensuring implementation of CCS – How can the use of CCS be guaranteed?” In this period the RCI also made the first contacts with the Global CCS Institute in Australia.

**The 2009 CCS Report** – With the publication of the 2009 CCS report, the RCI explains in a press release that international experts confirm that CCS is feasible in Rotterdam. The total cost of CCS varies between € 50 to € 80 per ton of CO<sub>2</sub>. The studies by Foster Wheeler and Climate Change Capital are an important part of the 2009 report.

## 2.4. Period 4: Preparing for demonstration decisions (2009-2011)

The main events of this period are:

- The EU subsidy for ROAD (EEPR) has been acknowledged, as is the co-funding from the Dutch government.
- The other and larger EU subsidy scheme (NER300) was prepared and started (see below).
- The Dutch government officially cancelled the Barendrecht CO<sub>2</sub> storage project in Q4 of 2010 and also decided for indefinite suspension for onshore storage of CO<sub>2</sub> in Q1 of 2011.
- RCI and Global CCS Institute started a closer cooperation (see below).

**NER300 and developments in industry** – In 2009 RCI signed 9 letters of cooperation (LoC) with industrial parties. Two of these LoC partners developed the ROAD project. The others investigated the possibility to go ahead and explore the opportunity to become a project under the European NER300 subsidy scheme.



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The companies Gasunie and VOPAK conducted a feasibility study for developing a distribution hub for handling and temporary storage of CO<sub>2</sub>. Part of that work was co financed by Global CCS Institute. The result was a new report on the business case of the Hub and the launch of a new service company with the name CINTRA in the second half of 2010. The partners of the ROAD project prepared for the FID (including execution of the FEED study and negotiations on storage), now scheduled at the end of 2011.

The time between conception of the NER300 and the final decision for the NER300 is relatively long. RCI was involved in this preparation process as focal point for the Rotterdam industry. The national government organizes a briefing for stakeholders who wish to submit applications for NER300 in July 2010. In this meeting the criteria for the pre-selection by national governments are discussed (criteria that do not seem positive for Rotterdam based companies because they directly or indirectly lead to a preference of projects from other locations). Finally the European Commission decided in November 2010 to go ahead and publish the subsidy regulation. Due to the advocacy of RCI and Rotterdam based companies the Dutch criteria were more neutral to location. Late 2010 and early 2011 RCI was completely dedicated to supporting companies who wish to apply for a grant in the NER300 procedure. RCI also tried to achieve one joint proposal from Rotterdam based companies. At the end on 9 February 2011, four proposals were submitted to the national government of the Netherlands of which two in Rotterdam area: (i) the Green Hydrogen project led by Air Liquide and (ii) the Pegasus project led by SEQ International. National government assessed these four projects and decided to only pass one project to the European assessment part: the Green Hydrogen project. Decisions about the NER300 are expected in Q1 of 2012.

**RCI strategy and reports** – In the beginning of this period, the RCI CCS Plan 2010-2011 is drawn up. In this plan the Port Authority states that it has the ambition to develop the port area to become the CO<sub>2</sub> hub of North-West Europe. The cooperation between RCI and Global CCS Institute started early 2010 and results in three research projects being co financed by the Global CCS Institute: (i) an Independent Storage Assessment (ISA), (ii) the Liquid Logistics Shipping Concept (see above on Hub and CINTRA) and (iii) the Case Study on Lessons Learnt (current report is one of the deliverables of this project). The ISA is a detailed analysis of the storage locations. ISA is meant to reduce uncertainties by determining for each potential storage site whether CO<sub>2</sub> can be stored and what the storage capacity and injectivity could be. In September 2010 RCI publishes the 2010 CCS report, this time focused on politicians, administrators and senior officials. The report identifies the strengths of the Rotterdam CCS activities: the network approach, the commitment of the companies and the involvement of industry in addition to the electricity sector. Other studies of the RCI in this period are:

- The Economic Impact Assessment, a study on the likely additional economic benefits of the investments in CCS projects in Rotterdam
- The Strategic Environment Management study (SOM, acronym in Dutch), an assessment of the position of relevant parties in and around the port area with regard to CCS projects and the related infrastructure
- A safety study on CO<sub>2</sub> infrastructure by DNV



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The main results of these studies are incorporated in the fifth CCS report that was published in May 2011.

**Policy and advocacy** – McKinsey advises in November 2009 the national CCS Taskforce on securing the development of CCS after the demonstration phase. McKinsey states that additional policy instruments are deemed necessary because the CO<sub>2</sub> price on the short term will be too low. As a matter of fact, this advice strengthens the position that RCI already defended from 2008 onwards. In that respect, RCI started cooperation with *Nature and Environment* (a Dutch environmental NGO) as part of the goal to secure the application of CCS after the demonstration phase. One possible route that is studied is the development of a national covenant for CCS. This agreement must ensure that CCS is developed sufficiently to 2020. The European Climate Foundation (ECF) supports this initiative financially. It is still on-going. On the visibility level of advocacy there are some national events. The new national CCS project director (Mr Van Slobbe) is introduced in Rotterdam in March 2010. At this meeting RCI partners and industry emphasize that Rotterdam has unique capabilities to become a CO<sub>2</sub> hub and that companies are the driving force behind the development of CCS in Rotterdam. Another discussion at national level is the shift of focus of national politics to northern Netherlands. Dutch policy documents stated since 2007 that the Netherlands needs two large-scale demonstrations: one in Rotterdam and one in the North of the Netherlands. In 2010 during the preparation of the NER300 RCI has a worry on this shift of focus: does that mean that projects from Rotterdam are not amenable for NER300? This also makes companies from Rotterdam uncertain. A lot of effort was spent on neutralising this issue. The end result in February 2011 was that the political decision on onshore storage (see above) ended this uncertainty in an unexpected way.

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# “Through the looking-glass”

## 3. “Through the looking-glass”

### 3.1. Introduction – four voices of four perspectives

The first question you can ask when you look at the storyline of Rotterdam is: how could you assess this course of events in a sensible way? How could you draw lessons that can be used and understood by a broad variety of interested persons? In this chapter we will try to answer those questions by using the voice of four differing perspectives. We used the following perspectives:

1. **The politician** – with a politician we mean someone who is an active member of a political party and has a current function as an executive or a member of a council (could be local, national, federal or European). A politician sees CCS as part of the arena where multiple public interest are considered and balanced and where feasibility in terms of dominion plays a large role.

2. **The policy-maker** – with a policy-maker we mean someone who is a civil servant and who is involved in the policy-making process around economic, innovation, energy and climate change issues; mainly at the national level at a department. A policy-maker sees CCS as (part of a broader) innovation, which fits within the dominant policy targets (such as the goals for energy security or climate change mitigation).

3. **The entrepreneur** – with an entrepreneur we mean someone who “is an owner or manager of a business enterprise who makes money through risk and initiative”<sup>3</sup>. An entrepreneur sees CCS as a technology and a business case.

4. **The network organiser** – with a network organiser we mean someone who is responsible for the organisation of a CCS cluster project. The network organiser could also be a team of persons, like the CCS team of the Rotterdam Climate Initiative that consist of member from all four partners or like the CCS team of CO<sub>2</sub>Sense in Yorkshire (UK). The main task of the network organiser is 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 in the external world (advocacy, regulatory issues, etc.). This organising responsibility is supplemental to the practical responsibility for investment of the companies involved in the cluster project. A network organiser sees CCS as a complex network project that has to be organised.

What does using a perspective for an analysis mean? It means you try to look through the eyes of a typical representative of that group. Consider the example of a politician. What are her/his priorities? Do CCS projects have an impact on other issues in her/his constituency, especially with regard to division of power, the absence or presence of political support, the economic cost-benefit balance for the region? What is the network of executive/

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3 Definition from Wikipedia (2 December 2011; searched for “entrepreneur”)

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political stakeholders involved (e.g. CEOs, public executives such as mayors and ministers, high level political party member in the region, the members of councils or parliaments)? Who has which position and what are their interests? In the CCS case: which high level persons have a favourable attitude (and why) and which have a negative attitude (and why)? And so on.

In general a politician is **not** interested in technical aspects, or on development of business cases or project, **unless** they have an impact on the position of the executive/political persons or the decision making process. A serious delay in the development of business cases that can hamper the realisation of projects are important to know for a politician, because she/he has to be prepared for (i) de-risking the operation or (ii) public defence in case of a failure.

An analysis with perspectives can lead to unattractive texts, like the one above where we had to use she/he and make all aspects less personal. In this following analysis we have chosen to use a more personal approach and for each perspective we have chosen a concrete voice. We used the following **fictional** voices:

1. The politician – She is the **governor of a major region** outside the Netherlands with high industrial activity and high CO<sub>2</sub> emissions (>30 Mton/y). She is member of the socialist party in that country. The starting position on January 2007 is that this region does not have any activities in the area of CCS but there is movement in some areas: industry, academia and politics.
2. The policy-maker – He is the **director-general (DG) of the national department of energy and environment** of the Country (in Europe, not being the Netherlands). The Country has some activities in CCS and has started a process to come to a more coherent CCS policy. During this whole period from 2007 until 2011 the Country has a centre-right government with moderate and positive climate ambitions.
3. The entrepreneur – She is the **CEO of the Company**, a large European energy company that does not have assets in Rotterdam but has interest in CCS and probably also in building a plant in Rotterdam.
4. The network organiser – He is the **manager of a new CCS cluster project**, CCSWeb. CCSWeb is located somewhere in Europe and outside the Netherlands. The Board of CCSWeb consists of high-level representatives of the cooperating parties around CCS in his region. He was commissioned for that task early in 2009<sup>4</sup>.

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<sup>4</sup> It is not very realistic to have a CCS network organiser available at the start of the RCI project, since RCI was one of the first and others followed in the years after. We have solved the assessment impossibility by a what-if approach: what would the Network Organiser have seen and thought if he would have that role from 2006 onwards.

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#### Structure of the chapter

How do we use these voices and perspectives? In the chapter on the storyline you have read a detailed account of what happened in the Rotterdam CCS process. We did not want to repeat that story in four-fold here. We have divided the analysis in two parts:

- a guided analysis of five key events by all perspectives at the same time (§3.2).
- an interview with two voices (the Governor and the CEO) focused on events and strength and weaknesses of the Rotterdam approach (§3.3).

We will give some extra guidance on these two sections below. The chapter will be completed with a discussion on the analysis (§3.4).

#### Key event analysis (§3.2)

The five key events cover the broadest possible array of outcomes. The method to analyse a history in such a way is new, as far as we now, for these types of studies. What we have concluded from our analyses and interviews is that there is some similarity between the assessment of different persons or entities of the Rotterdam cluster project in general but there is also a wide divergence in opinions in the real world with regards to elements of the Rotterdam cluster project. We wanted that the analysis of the key events at least reflected those two conclusions. What we also found in our research was that assessments and judgements can sometimes be very contingent or conditional: the appreciation or disapproval was very dependent on the condition or situation of that person or entity at that very moment. To put it extremely: when you are heavily involved in completing a tender procedure, every action of the other is judged on the basis whether he or she contributes to your goal. So when some RCI persons would be busy at that moment with regulatory issues, a company in such a tender process would assess those activities as: “RCI is not focused enough on the support of our tender”. We also wanted to show in this section some of this contingency and dependence on the situation at certain moments. And the last that we wanted to do was, somewhat hidden, to incorporate already some of the lessons learnt (do’s and don’ts) in the storyline of the different voices. If you were an academic researcher, you would ask: why make it that complex? But you are not, since the intended audience is in the first place the starting initiators of CCS projects or even CCS cluster projects. And we have chosen this package to deliver an attractive analysis with a high degree of possible identification.

What we do in §3.2 is define a starting position for each voice. With that starting position he or she comments on the first key event. That is more or less simply analytical. But then these voices all have their own development as well (just like in real life) parallel to the development of the Rotterdam project and they give comments on the next key event from that new position. Here you will see some forms of the contingency of assessments. In the development for each voice and his or her parallel comments we also address some lessons learnt.

The consequence of these choices is that we had to combine real elements and results of our research into the virtual voices in such a way that they would be credible and truthful but that we also have to say, more or less like any novel writer or editor of fiction books: each of the voices does not

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resemble any real person or entity because the chosen combination of activities, developments and opinions do not occur in Europe in the real world. In §3.2 the chosen combination for the voices is PURE FICTION but individual elements, sentiments, actions, struggles, opinions, bottlenecks, etc. do occur in the CCS reality out here and there. **The text of §3.2 is thus inspired by our contacts with real people in interviews and other meetings and our analysis but it is PURE FICTION.**

#### **Virtual interviews (§3.3)**

In §3.3 we will try to give you another view on the Rotterdam CCS approach by using the same voices. The issue here is to obtain a closer view on the strengths and weaknesses of the Rotterdam approach. The answer would differ for each voice. We have chosen two voices to be interviewed virtually and give their opinion on the Rotterdam approach. The two voices chosen are the Governor (politician) and the CEO. The assessment from these two very different perspectives not only helps the Rotterdam parties to understand how the outside world may have assessed their project but it also will help the intended reader in understanding these two perspectives and have a better conversation with the representatives of these perspectives in their own region. Also here we have to deliver a disclaimer. **The expressions of the voices in this section are PURE FICTION**; none of these words can be attributed to real persons. The aim was to let you feel how others MAY have thought about the Rotterdam CCS approach. We did however get our inspirations from interviews with real persons.

#### **Discussion (§3.4)**

The chapter will be completed with a discussion. We will start that discussion by briefly giving you insight in the straight outcomes of our analytical work (as presented in chapter 1). This will give you some background to the outcome of the analysis as presented in §3.2 and 3.3. The more analytically oriented persons can start with reading §3.4.1. The second part of the discussion section is dedicated to achieving a general view on learning from using the approach with the four perspectives (§3.4.2). The last part consists of a first discussion of the approach of the analysis (§3.4.3).

#### **Titles and language**

Since this chapter has a highly fictional content, we have chosen some fiction related titles for the chapter and some sections. We did that mainly to stress the fictional character of this chapter and because it is fun to make up such titles. We also exaggerated the language use of the entrepreneur and the politician a bit by letting them use mainly extreme forms of valuation (with words like “excellent” and “superb”).

### 3.2. Looking through the “key” hole

In this section we will use five key events to come to an evaluation of the Rotterdam approach from the different perspectives. The events were chosen based on two criteria: (i) they should be really important for the development of the Rotterdam CCS approach and (ii) they should be so diverse as to cover all relevant aspects for the voices. The following five events were chosen:

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1. The start of the Rotterdam Climate Initiative (May 2007)
2. Participation in the National Taskforce CCS (April 2008)
3. The RCI CCS annual report of 2009 (August 2009)
4. Funding agreement with the Global CCS Institute (July 2010)
5. The EU NER300 application (February 2011)

The choice of these five will be clear when you see the elaboration. For each key event we will give the assessment of each of the voices: what strikes them, what is positive and negative, what causal relations do they perceive to be the basis for the event, what do they perceive as barriers and drivers, etc. The format we use for that assessment is excerpts from a (fictitious) memorandum or memo that each voice had obtained from one of her or his advisers or written by him. These excerpts will be in a different format and since they are excerpts they are not complete verbatim copies of the memo, so we will use three dots (...) to designate that text has been virtually left out. Each section will begin with a short note containing two aspects:

- a short rap-up of what has happened since the description of the previous event;
- timing and (thus!) importance of the memo
- and the section will be closed with a hint to possible actions after reading the memo.

**Note (again): all texts in the memos are PURE FICTION and meant to be illustrative for the case. No citation can be attributed to real existing persons. To stress the fictional content of the memos, they are represented in green boxes (green = fiction).**

#### 3.2.1. The start of the Rotterdam Climate Initiative, the RCI (May 2007)

##### **The event**

The start of the RCI is celebrated by a public meeting and press conference in which Mr Lubbers (former Prime Minister of the Netherlands and now RCI ambassador) and Mr Opstelten present the Climate Plans of Rotterdam.

##### **Politician**

The day after the press meeting the Governor gets a memo on the constitution of the RCI:

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**Introduction** I have been to a press conference in Rotterdam ... Impressive accounts from both the Mayor of Rotterdam (Opstelten; high ranking member of the Dutch Liberal Party VVD) and former Dutch Prime Minister Lubbers (Christian Democratic Party CDA)... RCI is not only a government or political “happening” ... the CEO of the Port Authority of Rotterdam (Hans Smits; prominent member of CDA) is also involved, ... as is the major industrial interest group Deltalinqs, with a former right wing politician (Wim van Sluis) as chairman ... Ambitious goal: 50% reduction of CO<sub>2</sub> in 2025!!!

**History** ... Rotterdam and the Port have a long tradition of combining economic growth and dealing with environmental and other social problems ... the Rotterdam harbour is a very important economical pillar in the Dutch economy ... the region is known for their pro-active mentality ... Port has one of the best regional EPAs in the world ... the last decade the core of policy is related to “energy and climate change” ... this RCI seems to be the culmination of the political struggles in the last decade ... also as a real supplement to the fossil fuels they will use due to at least the two new coal fired power stations to be built soon.

**Political Background** ... political nexus is Lubbers ... he first convinced a high level international advisory committee under his chair that the goal was realistic ... members of that group (IAB) stem from Dutch industry and Foreign local governments ... including CEOs of Shell (Rein Willems, a high ranking member of the CDA as well), Philips, Schiphol, British Telecom ... Opstelten enforced this advice ... there was a meeting with Bill Clinton ... a collaboration with the Clintons would be a very good achievement and may open up some other possibilities ... Opstelten, Lubbers and Clinton now seem to work together to realise the goals of the RCI ... support is from nearly all political parties in Rotterdam ... and what I also have heard at the “Bar Parnasse”<sup>5</sup> is that a couple of CEOs from large energy companies are so enthusiastic about the Rotterdam approach that they are considering to locate some of their new coal facilities combined with CCS in the Rotterdam area. They told me that within one year they would make public announcements on those plans. So not only from the political side but also from the industrial side Rotterdam seems to touch the right cord.

**Opportunities for our constituency** ... Rotterdam faces and faced the same problems as in our region: pollution, public health, economic and industrial development ... we have even more problems because of the age of the industry and our larger dependence on coal ... we do not share the same history in “working together with industry” and “turning problems into opportunities; together” ... so there are opportunities for our region as well, but we would need a different approach aimed at achieving broad commitment ... we can learn from Rotterdam ... fits perfectly in the present positive mood on climate change caused by Al Gore.

## THE POLITICIAN



<sup>5</sup> Note from the authors: this is a pub where the high level persons of and around the European Commission meet when they want to have informal chats. This pub is frequented by high level politicians; policy-makers and industrial persons (like CEOs).

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#### THE POLITICIAN (cont.)

**Exposure (risks/opportunities)** ... biggest risk is loss of credibility ... what will happen if the industry “unplugs” and turn the back to the politicians? ... Rotterdam seems to be a perfect location for this initiative. Risk seems to be low, but in our case that is a serious one ... connection to Bill Clinton is an extraordinary and magnificent aspect ... must be nice for our region as well ... when and if they succeed they can earn a lot of public credits for these moves ... the bad thing about that is that the end date is 2025 and who is still available at that time, politically spoken?

**Overall Political judgment** ... My first thought was: why do they believe in this approach? The ambitions seem unrealistically high ... Both Lubbers and Opstelten convinced me that this is not a political statement only for “public relation reasons” ... they are really convinced that this is an opportunity for the region ... and they are very convinced that industry CEOs and other high level officials in the region support the goal wholeheartedly ... Maybe this is possible for our region as well ... I think cooperation with Rotterdam might be a good way to start our own development.

The Governor has a talk with the writer of the memorandum and asks her to organise a staff meeting to discuss on how to start a similar project in her own region. She is pretty impressed by the broad commitment towards nearly unachievable but nevertheless publicly attractive goals.

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### “Through the looking-glass”

#### Policy-maker

The DG gets a short memo one week after the press conference:

THE POLICY-MAKER

**Introduction** ... Rotterdam had a press conference with some high level local politicians ... a lot of visions and plans ... more ambition than reality.

**Overall Policy judgment** ... too early to see if this is real ... ambition seems unrealistic.

Weeks later the DG gets another memo. The memo writer has received from a liaison in the area some background documentation, including the new CCS report.

**Introduction** ... political pep talk at the press conference ... report on CCS offers more substance.

**Background** ... Rotterdam faces problems with regards to emissions of all kinds ... also there is debate on the increase in the use of fossil fuels in the port and industry ... the local authorities asked for advice ... some stakeholders and individuals made an analysis ... it is a curious mix of real policy development and some opportunistic visions ... you would not approve this kind of policy documents if presented to you ... but our liaison persists that we should not judge it on its bureaucratic merits but on its social merits ... he has sensed that the RCI approach is having impact already ... commitment of parties seems to be organised well ... ambitions for 2025 are still not fully argued.

About the CCS report ... we tried to check the content of the CCS report with our knowledge institutes ... they stated that the report was not transparent enough to be assessed ... overall they perceive the content to be dilettantish, in many aspects correct but far too optimistic about cost levels and CO<sub>2</sub> prices.

**Assessment** ... analysis is still shaky ... no real knowledge institutes involved, no thorough problem assessment has been made, rather politically driven than focused on content ... ambitions are still assessed to be unrealistic ... on the other hand, Rotterdam has some unique selling points ... the industry is willing to work along ... but there seems to be some positive impact or effect, which we cannot explain, and commitment is broadly expressed.

**Direct own policy opportunities and threats (innovation; energy security; climate change)** ... Rotterdam addresses the same issues we face ... energy efficiency, renewables, CCS ... the way they tackle the issue does not match our approach ... we might face political pressure when we do not offer an own policy that will address our own future challenges (in that sense the success of Rotterdam would become a risk for us) ... so we need to develop an own approach quickly because we cannot simply state again and again that the Rotterdam approach is unrealistic.

**Support other departments and in Parliament** ... there are some positive perceptions on the climate change issue (Al Gore) ... Our Prime Minister offered some room

THE POLICY-MAKER



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### “Through the looking-glass”

THE POLICY-MAKER (cont.)

to manoeuvre in this area ... but we still need to very careful, because there is only support of the Treasury and Cabinet Office as far as it does not conflict other monetary issues ... Parliament is very volatile on the issue and our Minister does not have enough personal authority to fight this battle alone.

**Overall Policy judgment** ... there could be some opportunities to incorporate elements of the Rotterdam approach in our policy ... due to the uncertainties and the shaky lines of reasoning we have to do a lot of real policy analyses ourselves ... it might however be sensible to “keep a finger on the pulse”.

The DG does not start any action at this moment.

#### Entrepreneur

The CEO gets the memo weeks after the meeting. Her staff was not aware of the press conference and of the possible opportunities for the Company. A business connection from Rotterdam informs her about the initiative and that her staff should get contact with comparable companies in Rotterdam or with the enterprise group Deltalinqs.

**Introduction** ... Rotterdam has a very ambitious goal to combine economic development and climate change at the same time ... 50% reduction in 2025 ... Established Rotterdam energy companies are very committed to the goals.

**Opportunities for the Company (tactics; strategy)** ... for the first period (2007-2010) the executives of Rotterdam allocated about 50 million euro for the whole plan ... the Dutch government has allocated 80 million euro for CCS projects ... can match with new Company activities that might be located in Rotterdam ... the circumstances in Rotterdam seem perfect ... focuses on the broad spectrum of climate and energy technologies ... not a local choice made here, except that CCS will or should play an essential role ... the combination Company and Rotterdam only has added value in the domain of CCS ... if we would have CCS plans then we could assess locating them in Rotterdam.

**Economic Impact (costs; competitors)** ... not sure whether the whole approach will make Rotterdam an attractive location for the Company ... the strict climate approach could also lead to additional costs for industry without added benefits ... on the other hand, some strong competitors like Shell and E.ON are moving ahead and thus achieve some front runner benefits, if CCS will become commercial or mandatory in the near or long-term ... there is a need for further clarification and a good analysis of the costs and benefits.

**Support within Board and Shareholders** ... CCS is not on the radar screen yet, so we need some general discussions in the Board to be able to go ahead.

**Impact on Company profile** ... CCS could help us improve our corporate image to become more “green”.

**Overall Company judgment** ... the RCI approach might be interesting if we want to develop CCS as part of our

THE ENTREPRENEUR



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portfolio ... first step: Board discussion paper on CCS ... next steps: get in touch with Rotterdam executives to get a better view on the financial support for doing CCS in Rotterdam.

Two months later, after she had met the Rotterdam liaison again, the CEO orders to write a discussion paper for the Board.

**Network organiser**

The CCSWeb manager did not take office until early 2009. So he did not have the chance to be present at the press conference. Suppose he did have to write a memo on this event to his Board: what would he write? The tone of the memo would very likely be:

**Introduction** ... Rotterdam started a similar approach for CCS as we do ... in 2007 they were in the same position as we are now (=2010) ... perfect location, a lot of emitters in a small area ... the context of their assessment has changed considerably until now ... nice elements in the factual and local data (residual heat) ... infrastructure development looks alright ... good analysis ... strong and committed consortium of partners ... excellent choice to directly start with a dedicated and autonomous RCI office with an own manager.

**Support partners** ... strong vision and broad commitment, especially the fact that the Port Authority is part of the consortium is powerful and convincing, because they can decide on infrastructure development in the region ... they also have celebrities that get a lot of media attention ... would be helpful for us to learn more about how they achieve such commitment and support.

**Overall Network judgment** ... the organisation of the RCI and the approach are pretty excellent ... our first priority is to cooperate closely.

THE NETWORK ORGANISER



The next thing he would do is phone the RCI manager to make an appointment.

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### “Through the looking-glass”

#### 3.2.2. Participation in the National Taskforce CCS (April 2008)

The Dutch National Taskforce CCS is a public private entity with the mandate to increase the speed of development of CCS in the Netherlands. The chairman is Stan Dessens, a former DG Energy of the ministry of Economic Affairs. The members mainly come from industry, two from CCS regions, one from an environmental NGO and one from academia. After the MoU of Rotterdam with the Ministry of Environment in 2007, Mr Lubbers is asked by the Minister to participate in the Taskforce on behalf of the RCI. The Taskforce was constituted in March 2008.

#### Politician

Currently the regional CCS approach is being developed and, thus, is not ready. There is some familiarity with the conditions and commitment in Rotterdam. The Governor gets a memo on the same day that the Taskforce has started.

**Introduction** ... Mr Lubbers of Rotterdam and Mr Van den Berg of Groningen are the main political persons in the Dutch National Taskforce CCS that started today.

**Political Background** ... new centre-left Dutch government started in 2007 with a new climate and energy policy ... although the policy document has a clear voice, the responsible ministers are very reluctant on the issue of CCS, especially in relation to coal fired power stations (the public attitude towards coal is very negative; more negative than in our region, especially on the left wing) ... nevertheless both ministers could agree to constitute a public private institute that should be the main adviser on CCS ... they call it the Taskforce CCS ... it consists of high level representatives from the two “CCS regions” (Rotterdam and Groningen), industry, NGOs, financial institutes and academia ... Mr Lubbers is in, as is Mr Van den Berg<sup>6</sup>, your socialist colleague in Groningen ... both men have a good political network in the centre of power The Hague and are influential in a broad variety of ways ... choice of these two signifies that the Dutch minister take the Taskforce CCS serious, and thus CCS, without having to carry out the political messaging and handiwork themselves.

**Assessment** ... a strong adviser like the Taskforce has several main functions: (i) it shows that CCS is a serious issue that the government wants to proceed; (ii) advice from such a group are strong arguments towards the Parliament and (iii) the risky part of public exposure has shifted from the ministers to the Taskforce members ... brilliant political move.

**For Rotterdam** ... great result: Mr Lubbers, the RCI ambassador is in ... proves again that the advocacy skills of Rotterdam and maybe especially the skills of Mr Lubbers and the RCI team around him are superb ... this is a great entrée possibility to the ministers and a

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<sup>6</sup> Note from the authors: a high-ranking politician of the socialist party and nowadays the Queen's Commissioner (=governor) of the province of Groningen.

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### “Through the looking-glass”

THE POLITICIAN (cont.)

good way to influence the Dutch national policy in a way that is beneficial to Rotterdam.

**Opportunities for our constituency** ... since 2008 we are putting CCS on the regional economic development agenda ... we haven't reach the position of Rotterdam yet ... but we also foresee the need for additional national support, especially financial support for the demonstration phase ... we should start building a professional and effective advocacy towards national government HQ ... the option of constituting a national advisory body with high level representatives would be beneficial for our region as well.

**Exposure (risks/opportunities)** ... advocacy towards national government solely focused on CCS has its risks ... better embed this advocacy in a more general umbrella like economic and sustainable development ... such a Taskforce could help focus the need and necessity discussion around CCS there were it belongs: at least at national level but also at European level.

**Overall Political judgment** ... Taskforce is brilliant political approach ... Rotterdam proved again to be an excellent advocate of its own (CCS) case ... after we have reached political agreement on the energy and climate package in our region in a couple of months, the next priority will be to mirror the Dutch approach and learn from Rotterdam ... Maybe it is good to call your fellow socialist in Groningen.

The next thing the Governor does is phone with her fellow socialist Mr Van den Berg and discusses the Dutch approach and they also exchange CCS ideas of their regions.

#### Policy-maker

The CCS policy plan of the Country is being prepared; main bottleneck at the moment is the allocation of sufficient funds. The Treasury is not yet convinced of both necessity and feasibility of the plan. The DG gets a memo in the week the Taskforce was announced. The author of the memo was very positively surprised and has contacted his Dutch counterpart to learn more.

THE POLICY-MAKER

**Introduction** ... Dutch government sets step towards implementation plan for CCS ... they have constituted a public private Taskforce with high level representation of all relevant stakeholders ... the chairman is a high ranking official, formerly the DG for Energy of the Ministry of Economic Affairs.

**Assessment** ... since mid 2007 the Dutch government is developing a plan to implement one of the icons of their new Energy and Climate policy ... the icon is that there should be two demonstration projects for CCS realised and started in 2015 as a preparation to the commercial phase starting in 2020 ... in both the departments of Environment and of Energy they have been developing a common approach based on an extended problem and policy analysis and will consist of several interdependent packages ... this approach will be communicated soon to

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### “Through the looking-glass”

#### THE POLICY-MAKER (cont.)

Parliament<sup>7</sup> ... in the mission of the Taskforce these work packages can be seen as well: regulation, finance, infrastructure and storage, support for technology development (pilots and demonstrations). **Direct own policy opportunities and threats (innovation; energy security; climate change)** ... the preparation and analysis underpinning the start of the policy approach and the Taskforce is excellent ... from the content side this work could be very useful for the development of our own CCS policy as well ... they do not have the advantage of having “Energy” and “Environment” in one department but they more or less were able to solve those interdepartmental battles on competencies, indicating that there is a practical policy solution possible, most likely that is also possible in our case ... they have convinced their Treasury to allocate substantial funds to CCS; that is a step we still have to take ... not sure we need a Taskforce as well but we can learn from their approach. **Support other departments** ... the proof of the implementation in the Netherlands with broad support from all other departments can help us convince the Treasury that our plan is realistic and feasible. **Overall Policy judgment** ... the policy approach of the Netherlands is well conceived and planned ... we can learn from their approach ... the role of an own Taskforce needs to be examined.

The DG asks for clarification of the role of Rotterdam. He gets the next memo after one and a half week.

#### THE POLICY-MAKER

**Introduction** ... Rotterdam is represented in the Taskforce by Mr Lubbers; a former Prime Minister of the Netherlands ... Mr Lubbers is also one of the main initiators of the Rotterdam Climate Initiative. **Assessment** ... Dutch government has made an extensive policy assessment and is now implementing the CCS part in different packages ... they are also planning to constitute an interdepartmental project organisation for CCS as the vehicle to implement the policy plan ... part of that plan is to “deliver” two demonstration project by 2015 ... possible candidates are Rotterdam and Groningen ... that is why Mr Lubbers is in the Taskforce: to represent Rotterdam ... Mr Van den Berg, the Queen’s Commissioner of the Province of Groningen, is representing Groningen. **Overall Policy judgment** ... rather straightforward reasoning from the policy department side to choose the two representatives from the regions.

The DG is well pleased by the content of both memos and asks his secretary to make an appointment with his Dutch counterpart (DG Energy).

7 Note from the authors: that was the intention at that moment, but the reality was that the communication on this subject arrived in Parliament in February 2009, or about one year later than planned.

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### “Through the looking-glass”

#### Entrepreneur

The Company is in the process of defining its own CCS demonstration project. The Board has recently approved plans for a medium scale capture facility, provided that additional funds from national and European governments will be supplied. Not only because that would make the business case complete but also because government commitment shows legitimacy. In this phase the Company is already having exploratory discussion with the local authorities of possible locations. Rotterdam is one of the possible locations. The CEO gets the memo two weeks after the announcement.

**Introduction** ... some brief introduction to the Dutch policy on CCS ... position of Rotterdam in that policy is excellent, mainly due to the political influence of Mr Lubbers (the former Prime Minister and now the CCS advocate for Rotterdam) and Mr Opstelten the Mayor of Rotterdam ... policy-makers have assessed that there is a need for a public private platform to advise the Ministers ... that platform got the name of National Taskforce CCS and high level representatives from industry, regional governments, NGOs and knowledge institutes are member.

**Opportunities for the Company (tactical; strategically)** ... our assessment is that this will be a normal Dutch kind of committee or “conversation group” ... not really where the action will take place ... but they will influence Dutch policy on CCS ... so we need to have a line with the industry representative closest to us: probably Mr Van Loon of Electrabel ... also good sign that both CCS relevant regions are in the Taskforce at high level ... makes the development of the Rotterdam CCS Hub even more important and feasible ... for our case development in Rotterdam it is thus very wise to also get in contact with Mr Lubbers ... he seems to be or become the pivot for CCS policy in the Netherlands.

**Overall Company judgment** ... the Taskforce and the participation of Rotterdam in that institute has some positive value for the development of Rotterdam as a possibly preferred location ... the Taskforce has also industrial high level members, so they will keep the balance and the outcome will hopefully be CCS project friendly ... but too much attention is drawn to this group that in essence is a “conversation group” ... the Company needs to focus on organising a practical project.

THE ENTREPRENEUR



No real action is undertaken. The CEO asks her secretary to put the names of the Taskforce members in her Blackberry. You never know when you meet them.

#### Network organiser

The CCSWeb manager did not take office until early 2009. So he did not have the chance to be present at the press conference. The development in his region in April 2008 was already a little bit advanced; there have been political discussions and some answers phrased on the challenges in the domain of climate change and energy. But there was no sign, yet, of a dedicated CCS network or Hub project. Suppose he did have to write a memo

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### “Through the looking-glass”

on this event to his Board in 2010: what would he write? The tone of the memo would very likely be:

**Introduction** ... Rotterdam started a similar approach for CCS as we do ... in 2008 they were more advanced than we are now (=2010) ... the Dutch policy etc. ... The Taskforce etc. ... Mr Lubbers of Rotterdam is member of the Taskforce.

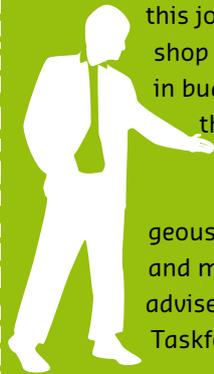
**Assessment** ... in our country the CCS policy framework is pretty undeveloped and fragile ... I think such a Taskforce would be a good idea for our country as well, since it will structure the discussion and express commitment ... would be good to take that issue on our advocacy agenda towards national government ... the chairman of our Board must become a member of that new Taskforce ... Rotterdam played the game pretty well ... I assume it was not evident that the regions would be part of the Taskforce and that some political pressure was needed to get them in ... now that they are in they will have a large influence on the national policy.

**Regional opportunities and threats** ... for our region and our project the main focus with regards to national policy was in 2008 and is still now in 2010: increase the stability of the national policy ... the rest will be a result from that (more budget, larger commitment) ... it may help to stabilise the policy situation when there would be some kind of broad, high level and autonomous group of advisers.

**Organisational impact (manpower; time; finance)** ... we need to be ready to pay the time the chairman of the Board has to spend on this job and we need to prepare and participate at the shop floor level as well ... I am not sure what that will be in budget terms but it will be more than 25.000 and less than 100.000 Euros per year.

**Overall Network judgment** ... the constitution of a Taskforce in our country would be advantageous for our project ... it would bring both more stability and more connection to national policy ... the Board is advised to define an advocacy approach to get such a Taskforce established.

THE NETWORK ORGANISER



After a short discussion in the Board, the CCSWeb manager was assigned to create and perform the advocacy approach as defined.

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#### 3.2.3. The RCI CCS annual report of 2009 (August 2009)

In August 2009 the RCI presented her 3rd annual report. That report contained at least two extraordinary parts: (i) validated capture costs data and (ii) the summary of an extensive business case for transport and storage of CO<sub>2</sub>.

##### **Politician**

The Governor was very pleased that the funding of the CCS demonstration project has been approved by her own regional Parliament. The organisational choice that was made: the project is a public private partnership (PPP) with funds from regional government for the start-up and additional funds from three large local energy companies to do the additional work (starting from FEED until execution of the demonstration plant). Additional funds from the European Union and the national government are very likely needed to fill the gap between the allocated funds and the real costs. The project is preparing for a FEED study. The Governor gets the memo on the presentation of the report more than a week after the event took place.

**Introduction** ... the RCI presented their 3rd annual report ... Mr Lubbers was again present ... key messages: progress has been achieved but the steps to be taken get more difficult ... more support from national and European authorities is needed ... mainly financial but also on the regulatory part.

**Assessment** ... there is a positive and a negative sense around the impact of the current financial crisis ... negative: the entrepreneurs are getting more reluctant, even in Rotterdam ... positive: the European Commission and the national government are allocating funds to recover the crisis, some of these funds can be used for CCS demonstration project ... the issue now is not “making funds available for CCS” but “who will get the money” ... the coming period will have the characteristics of an “election rally” ... the 3rd RCI report can be seen as part of that show case ... what is unclear to me is the other part of the focus of Mr Lubbers and the RCI: on additional support and long term certainty on higher CO<sub>2</sub> prices or other policies for the commercial phase after 2020 (they already made that case in the 2nd report) ... it almost sounds like they do not believe their own vision ... a rather diffusing part of their political message.

**Opportunities for our constituency** ... our CCS project is developing well ... commitment from industry is still large ... NGO’s do not see it as a threat towards developments of their favourites (solar and wind) ... but we must be careful ... we can learn from Rotterdam that all parties are re-considering their position and somehow “moving” in this crisis ... at this moment the focus is on stimulating economy and employment ... and that is a positive sign for the project and for the region.

**Exposure (risks/opportunities)** ... we need to be aware of the growing reluctance of industry and the public/media on spending large amounts of tax money on risky and expensive projects ... we need to be

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### “Through the looking-glass”

THE POLITICIAN (cont.)

certain that our CCS project does not get a negative label ... when we succeed in achieving the European funding then we can easily address our local opponents ... if not and no external funds will be available then we need to have a plan B for withdrawal.

**Overall Political judgment** ... it worries me that RCI gives negative signals on confidence in the future ... it also surprises me that they take a stance of repetition for the long term security and they give no sensible arguments for this repetition ... on the other hand there seems to be real and substantial progress ... especially the capture demonstration by E.ON and Electrabel ... and for our region it is good to have a strong competitor and protagonist for CCS.

The Governor and the CCS project team go ahead with defining the FEED study. The Governor makes plans to maintain a high level advocacy towards national government and European Commission.

#### Policy-maker

Since 2008 the national CCS policy plan has been approved by the Cabinet Office and has been sent to Parliament. The DG has an appointment with his Minister to prepare his discussion in Parliament. In the same week as the presentation the DG gets the memo.

**Introduction** ... Rotterdam presented a very comprehensive report on their CCS approach.

**Assessment** ... Rotterdam has a habit to annually produce a state of the art report ... this is the 3rd report ... it has three very interesting parts ... the first is the discussion on the future security for the CCS innovation system development (which they call “Ensuring the implementation of CCS”) ... covers a discussion of a lot of worries that we have addressed in our policy plan as well ... the second is the development of a business case for infrastructure and transport ... that case gives excellent insight in the way such business cases should be carried out ... could be a model for our own assessment of business plans for infrastructure ... some worries about that case: storage part is still very immature and the tariff for transport that is calculated is much higher than the ones we use in our plans ... the third is ensuring the commitment of industry and the verification of the industrial data of capture ... industrial parties have signed letters of cooperation (LoCs) with

Rotterdam in which they promise to do a pre-feasibility study of their capture plans and promise to do their utmost to realise those plans when the outcome of the study is positive ... Rotterdam promises to support their plans and to deliver an independent validation ... in the report you can read that the well-known and CCS experienced contractor company Foster Wheeler has carried out the validation ... gives a lot of confidence in the outcomes of the pre-feasibility ... the costs figures are however somewhat higher than the ones we use ... two other issues in the report are ... the introduction of the CO<sub>2</sub> shipping concept ... an overview of policy issues around

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### “Through the looking-glass”

THE POLICY-MAKER (cont.)

CCS (not new but gives me confidence we did our job properly).

**Direct own policy opportunities and threats (innovation; energy security; climate change)** ... the opportunities for us are manifold ... a good translation of approach and results of Rotterdam to the Country context could help to support our policy plan in the discussions that are now going on ... also some elements could be used during the implementation of the policy plan (assessment model for infrastructure plans; the LoC approach; the use of a third party validation of data) ... especially the LoC with E.On and Electrabel was very important ... also some worries: the costs results are higher than the ones we use in the policy plan; these data can be used against our case ... we need to have good answers to why the cost figures differ from our data and why this is not a problem ... a cost data memo will be made this week .. the developments in Barendrecht are a bit worrying and should be followed carefully.

**Support other departments** ... it is helpful to inform the other departments about this report after we have completed the cost data memo ... memo and report could support our position.

**Support in Parliament** ... it might be wise to have a discussion with the Minister whether he wants to write a separate letter to Parliament to present the Rotterdam report ... the cost data memo would be the basis for this letter.

**Overall Policy judgment** ... the annual reports of Rotterdam on CCS get better and better ... we can use the Rotterdam example in Parliament to show that our own CCS policy plan is relevant, credible and feasible.

The DG is very pleased with the memo and uses the Rotterdam case during his conversation with the Minister. The Minister is also pleased with the promising support from the Rotterdam report and decides to present the report to Parliament with an explaining letter. The uncertainty and change in costs will be looked into in more detail. Until then it has no real effect on the process, but it is monitored carefully. Also the developments in Barendrecht are followed with great interest.

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### “Through the looking-glass”

#### Entrepreneur

The choice for the location for the CCS demonstration project of the Company has been narrowed to Rotterdam and XY. The project team of the Company is preparing to file a request for proposals for the FEED study. The CEO receives the memo two days after the presentation of the report.

**Introduction** ... Rotterdam presented its 3rd annual report on CCS ... main issues: costs of capture technology validated and detailed and improved business case for pipelines.

**Assessment** ... this report and the preparation activities are very helpful in evaluating our location choice ... the capture data give an excellent view on where the other companies are and I think we are on the right track, our cost figures are on the low side of the spectrum ... another very good move of the RCI team is to organise third party validation of the data; the data have become credible and must be convincing enough for the main external financial supporters for the demonstration phase, the national government and the European Commission; very clever action ... the business case for the pipeline transport is now really solid; I have had some conversation with some persons involved in the development of the business case and this time they have done all the engineering as detailed as necessary to be within 20% accuracy; fair enough for this stage ... the downside is that the business case confirms the high end costs data of the less detailed study last year; the upside is that the costs have not gone up again, so there is some stability in results here ... what is also striking from the infrastructure case is that the tariff or the cost do not really decrease when the transport volume increases to high volumes ... I have had some conversations with our senior pipeline experts and they say that this could be true but at the same time they guess that when we would combine the development of the capture plant with own development of the infrastructure we would very likely come to a much cheaper solution... I have now added own infrastructure development to the tasks of the FEED study team.

#### **Opportunities for the Company (tactical; strategically) ...**

Rotterdam has proven again that they are a credible partner for CCS project initiators ... the support they give is relevant and useful ... this 3rd report shows that Rotterdam is the most advanced CCS region in the world; so the choice for the Company to go to Rotterdam with its demonstration project is very appropriate ... there is only one worry; the cooperation between E.ON and Electrabel (both strong competitors of the Company) and especially the extreme visibility of E.ON in this region could be an argument against choosing for this region; as are the sentiments around coal fired power stations in the Netherlands and Rotterdam and the recent turmoil around the Shell project for CO<sub>2</sub> storage in Barendrecht ... what we do not want is a public debate on the necessity of our power station and what we also do not want is to become part of a public “beauty contest” in which we have to prove that we are better and cleaner than for instance E.ON ... both types of

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### “Through the looking-glass”

THE ENTREPRENEUR (cont.)

interaction with the newspapers and TV do not help the case. **Financial Impact** ... the Rotterdam pipeline business case has confirmed the cost data for the common carrier pipeline that we already used for our project evaluation; it is also very similar to the costs in the other location XY; Rotterdam is however more advanced in its development and we are convinced that they can deliver what they promise; we do not have that some confidence yet with XY ... so the case for Rotterdam in a technical and economical sense has become very clear ... the RCNP is a complex project with high investments, but at this stage the business case looks promising. **Overall Company judgment** ... I think we can now really finalise the submission of the Rotterdam case to the Board ... the XY case needs some further development, especially from the side of the authorities in that region ... both proposals will be very similar with respect to technical and financial results ... the differences are in context and uncertainties ... Rotterdam offers more certainty but has for us a less favourable context ... XY has more uncertainties but less problems in the context ... as soon as our evaluation of the XY has advanced to our minimum demands for Board decisions, I will sketch the balance and offer my personal considerations to choose ... in any case this 3rd Rotterdam report is an excellent piece of work that makes CCS in Rotterdam even more credible and feasible.

The CEO has a short discussion with the project manager on the assessment of the Rotterdam location in the memo. They decide to go ahead with the preparation for both regions.

#### Network organiser

CCSWeb started early in 2009. The manager is now on the brink of completing the organisational arrangements and the working plan for the next three years. He writes this memo to his Board a day after the presentation of the report where he was present.

THE NETWORK ORGANISER

**Introduction** ... early this year we started CCSWeb ... Rotterdam is far ahead of us ... their 3rd annual report is very helpful to define our own approach ... I have enclosed hardcopies of the Executive Summary for each of you (they were available at the meeting) and a file of the total report.

**Assessment** ... the Executive Summary gives an overview of what the report contains but the best parts of the total report are the annexes ... the report starts with a reiteration on the Rotterdam CCS Roadmap; this Roadmap already dates from 2007 and in its overall approach it is still valid; such a Roadmap approach will be used in the plans for CCSWeb that I am finalising right now ... also the cooperation with the industry (who are called the “emitters”) is exemplary: it is hard to get industry one step further than a general promise to capture CO<sub>2</sub> when economically feasible and Rotterdam achieved to define such a step; they created the instrument of an Letter of Cooperation with promises on both sides; the



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industry promised to do a pre-feasibility study of their plans and Rotterdam promised to contract a third party evaluator (Forster Wheeler) ... this LoC approach had three obvious results: (1) the signing of the LoC with the high level officials was a showcase for publicity and outreach; (2) Rotterdam got validated data on the costs of capture and (3) industry got a third party check on their assumptions and could afterwards compare the results between the different industrial parties (because they all used the same method for calculating the costs) ... it is too early for a final decision but I will try to duplicate the LoC approach in the CCSWeb work plan as well; I am however not very sure whether there is enough willingness in our region to participate in such an approach ... the third piece of work was the business case for infrastructure and storage ... the Rotterdam case is similar to ours in the sense that they also have a lot of large CO<sub>2</sub> point sources in a confined area, but the difference is that we have older and more point sources with three times the emission as in Rotterdam and the distance between the emitters and the distance of the region to the nearest storage location is also more than three times the size that Rotterdam uses ... the practical approach of the business case can be used in our project as well; I have already had a good conversation with one of the founding fathers of the business case and I think we can come to some degree of cooperation with respect to our business case for the infrastructure ... during the presentation there were some questions on the cost figures; a couple of persons present did not believe that the costs would be that high; the representative of the business case team could convince the audience that the assessment they made was a valid and credible one ... the last pieces of work in the 3rd report is the exploration of the regulatory environment and the need for stronger government intervention for the long term ... very valuable thoughts but our partners are not ready for that discussion yet, as is our national government.

**Regional opportunities and threats** ... at this moment in time I only see opportunities ... Rotterdam has proven that a CCS cluster project can be defined in a credible and feasible way; that helps other Hub projects like CCSWeb to defend their case ... I have seen good opportunities to work together with Rotterdam to improve our approach and work plan ... I have already made some exploratory conversations which have led to an appointment with the RCI manager to elaborate on the cooperation.

**Organisational impact (manpower; time; finance)** ... my best guess for this moment is that cooperation with Rotterdam could improve the quality of our project and at the same time save money (less manpower needed and less contracts for expensive consultant or engineering firms).

**Impact on Network profile (communication)** ... close cooperation with Rotterdam could help both Rotterdam and CCSWeb help to defend their case; the least we can do is point at each other and say, “We are not alone and unrealistic” ... it also useful to share lessons learned in communication with Rotterdam (they have some experience in public opposition in their neighbourhood in Barendrecht). Overall Network judgment ... the 3rd report confirms the excellent

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### “Through the looking-glass”

#### THE NETWORK ORGANISER (cont.)

position of the Rotterdam CCS approach ... that alone is enough reason to cooperate more closely; their experience in organising the Hub is even more valuable to work together ... I ask permission of the Board to go ahead with my exploration on cooperation.

There was a short Board meeting in which the proposal for cooperation was discussed. They unanimously agreed with the CCSWeb manager to look for extended cooperation with Rotterdam.

#### 3.2.4. Funding Agreement with the Global CCS Institute (July 2010)

Conversations and negotiations of RCI and the Institute finally led to a Funding Agreement between both parties. In the Agreement RCI partners describe which activities they will carry out and Global CCS Institute promises to supply funds for certain deliverables. The three activities described are: (i) a pre-feasibility study of the Liquid Logistic Shipping Concept by Anthony Veder and VOPAK; (ii) the Independent Storage Assessment by TNO and (iii) the Case Study on Lessons Learnt from the Rotterdam CCS project (the current study).

The news about the Funding Agreement reached the public arena at the Global CCS Institute Members' Meeting in Kyoto in October 2010.

#### Politician

The development of the CCS demonstration project is well underway. The PPP team is now carrying out the FEED study. This also means that the Governor cannot really show progress to the media and to the regional parliament. The Governor got a memo a week after the Members' Meeting.

**Introduction** ... Rotterdam spread its network around the world ... three research projects funded by Global CCS Institute.

**Assessment** ... it is not clear to me what the drivers are to cooperate with the Global CCS Institute except funds ... maybe they see added value in being a partner of the Global CCS Institute ... but the additional value to me is hard to imagine, they already are well known in Europe and what can they gain of this additional global exposure ... this cooperation was also not mentioned in the European regional political exchange; so I assume that the political involvement was somewhat lean ... what was an excellent choice

was that the chairman of the Rotterdam Business association Deltalinqs presented the Rotterdam case in Kyoto; you might him as a politician, he formerly was the alderman of the city and he is member of the populist right wing party (Leefbaar Rotterdam) ... good politicians have a respectable track record in attractive presentations.

**Opportunities for our constituency** ... at this moment in time we do not need the funds of the Global CCS Institute ... there are also no politicians involved in the Global CCS Institute; politics in Australia are very

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### “Through the looking-glass”

#### THE POLITICIAN (cont.)

hesitant with regards to climate change at this moment (at this moment with a kind of minority government; although the prime minister is also socialist)... so, no added value to us at this moment. **Exposure (risks/opportunities)** ... when in due course there might be some need for additional funds ... we need to be aware of the impact such a collaboration might have ... the Global CCS Institute has its foundation in the Australian desire to export coal as long as possible and CCS can help to get coal a greener image ... connecting the CCS project too much to “coal” would do harm to your image and position and it could give our CCS project a less green image. **Overall Political judgment** ... no need for us to replicate the action of Rotterdam, yet.

No action results from this memo.

#### Policy-maker

At the end of 2009, the funding for the CCS policy plan in the Country had been arranged (at least 400 million Euros for the next 5 years). Main part of the budget will be spent in a tender scheme for the best project for the European subsidy scheme NER300. But the economic crisis has its impact and the Treasury is looking for budget cuts. At the moment the Minister has guarded the allocation very well, but the room to manoeuvre has become very small. It will be hard to get extra budget in case the best project of the tender needs additional support. The writer of the memo did have contact with some Rotterdam parties. The memo was delivered in the week after the Members’ Meeting.

#### THE POLICY-MAKER



**Introduction** ... Rotterdam has closed a nice deal with the Global CCS Institute.

**Assessment** ... Rotterdam seems to acknowledge that there is a need for extra funds and for cooperation outside Europe ... they have had discussions with the Global CCS Institute for support and in the end that resulted in a Funding Agreement with three projects enclosed ... I am pretty confident that all these projects could have been funded with Rotterdam funds only ... but somehow they saw an added value for cooperation and, of course, the proponents can sell this deal as having received 1,5 million Euros ... after some conversation with persons involved I learned that next to the funds they see added value in two ways ... (1) broadening of the Rotterdam CCS approach to the global level ... at this moment in time the European policy approach in member states as well as in Brussels seems to focus on the demonstration projects alone ... Rotterdam evaluates this focus as too single-minded ... one has to be more aware of the opportunities for the commercial phase (Europe could be front runner in technology and chain development) ... and in the best condition or circumstances to arrive at that position ... in short: CCS is only seen in Europe as a mitigation cost and not as an industrial opportunity ... that is why some Rotterdam parties are looking for global partnering ... and the Global CCS Institute offers a good

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platform ... (2) the case for knowledge sharing and consolidation is brought on a higher level ... one of the main problems for non-industrial entities like local and national authorities is: how to assess the business case of CCS proponents? ... we already discussed the use of external audit companies (a replication of an earlier Rotterdam example) ... but having an entity that is able to compare the confidential data of the majority of the CCS projects in the world ... such an entity in itself could be an attractive first examiner of business cases ... or in any case they can function as the fact finding institute for CCS and thus will be able to supply credible, relevant and up-to-date information ... some persons assess the viability and credibility of the Global CCS Institute to be very large already and that will steadily grow ... and the last thing I perceived in my contacts is that they not only want to become the CO<sub>2</sub> Hub for North West Europe but also they want to sell their concepts ... especially in Asia.

**Direct own policy opportunities and threats (innovation; energy security; climate change)** ... when we look at the deadlock in the current policy discussion in the Country due to the crisis ... partnership with the Global CCS Institute might help in several ways ... (1) it proves that we are not only focussing on national funds ... (2) it proves that other and respectable entities like the Global CCS Institute endorse our policy plan and judge it feasible and relevant ... (3) it proves that we fulfil the political wish to export our experience and try to make money with the support from tax payers' money ... it is worthwhile to examine the possibilities for cooperation with the Global CCS Institute.

**Support in Parliament** ... see above.

**Overall Policy judgment** ... the move of Rotterdam is a sensible one ... with this cooperation they accomplish two goals ... (1) broadening of the Rotterdam and European CCS approach to the global level ... (2) the case for knowledge sharing and consolidation is brought on a higher level ... for us: it will be helpful as well to have that kind of relation with the Global CCS Institute because of the negative attitude in the political arena nowadays ... we must try to have a same kind of agreement with the Global CCS Institute ... next step: organise a meeting with the General Manager for Europe of the Global CCS Institute.

THE POLICY-MAKER (cont.)

The DG asks his secretary to plan a meeting with General Manager for Europe of the Global CCS Institute.

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#### Entrepreneur

The location of the CCS Demonstration plant of the Company has been defined: XY (so the Rotterdam possibility was abandoned). The competing company E.ON is too visible in Rotterdam and the only thing the CEO does not want is to combine the realisation of such a difficult project with an added competition about who has the best image in the newspapers and on TV. XY also offered good support and the practical conditions are also very similar. The FEED study of the plant has just started. The Company is also member of the Global CCS Institute and the project leader of the CCS demonstration project was present in Kyoto. The CEO gets the memo two days after the members' meeting.

**Introduction** ... first members' meeting where the Company (=I) was present ... nice audience and interesting presentations ... no real highlights; except the impressive way Rotterdam presented itself.

**Assessment** ... these kinds of meetings are especially valuable when there is a lot of opportunity to pick information up somewhere in the corridors and to have private discussions in the breaks ... I managed to have that kind of interactions and I got interesting details from other project and other regions; so my presence was useful ...

Rotterdam presented its case with a superb presentation, or rather with a superb presenter from political origin ... Global CCS Institute and Rotterdam also presented that they closed a Funding Agreement ... next to the interesting projects that you will find described in the annex, this also gives a noteworthy signal from Rotterdam: they want to expand their remit to the whole world and they express their belief in the Global CCS Institute to be or become the world's leading authority in CCS facts and figures; and knowledge sharing (from my first experience with the Global CCS Institute I think they are right with respect to this point) ... I am a little bit intrigued by the expansion part of the Rotterdam; not sure whether I understand that issue.

**Opportunities for company (tactical; strategically)** ... I learned that it is not very difficult to arrive at a Funding Agreement with the Global CCS Institute ... looking at the choices of Rotterdam and the practical use of that Funding Agreement, it would be useful for the Company as well to close such an agreement ... one of the core demands of the Global CCS Institute in such an agreement is the exchange of knowledge and expertise, can be in a confidential way but there always needs to be some public disclosure of lessons learned ... that is fair as a balance for the funds and it is also feasible for our projects ... it is a pity that we already started the FEED study, otherwise we could have offered that study to be part of the agreement ... also the performance of an

Independent Storage **Assessment** sounds very promising. Maybe we can do one in the UK as well ... I will come with a proposal for cooperation with the Global CCS Institute before the next Board meeting.

**Overall Company judgment** ... interesting members' meeting ... fascinating move of Rotterdam in the cooperation with the Global CCS Institute ... a proposal for cooperation of the Company with the Global CCS Institute will be made soon.

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The CEO has a short conversation with the project manager and orders him to prepare the proposal.

#### **Network organiser**

Since the contacts between CCSWeb and Rotterdam after the 3rd CCS report was published, a close cooperation between both regions has started. The CCSWeb manager has recently finalised his first year report to the Board. The project is on schedule but there are worries about safeguarding the commitment of industry and politicians due to the crisis and the lack of attention for climate change. The manager has been to the Global CCS Institute Members' Meeting in Kyoto and had a detailed talk with the Rotterdam delegation. Nevertheless, the manager sends his memo to the Board two weeks after meeting due to other priorities.

**Introduction** ... report on the Global CCS Institute Members' Meeting.

**Assessment** ... first members' meeting where CCSWeb (=I) was present ... nice audience and interesting presentations; the presentation I delivered on the CCSWeb project was well received ... no real other highlights ... I had good follow-up discussion on our cooperation with the Rotterdam delegation and we also discussed their funding agreement with the Global CCS Institute ... in Rotterdam (like here in our region) there was also a lot of grumbling and murmuring about the impact of the economic crisis ... useful meeting even though the trip was long.

**Regional opportunities and threats** ... as a result of the discussion with Rotterdam, I perceive opportunities for CCSWeb to have an own funding agreement with the Global CCS Institute; maybe for a combined project with Rotterdam on infrastructure development and storage assessment ... from the noises in the corridors I have drawn the conclusion that we are not the only region that is burdened with distractions of the crisis; especially the project in an early stage of development (like CCSWeb) are more afraid of retreating movements from politicians (and captains of industry) with respect to investments in climate mitigations technologies like CCS, biomass, solar and wind ... the more advanced projects like Rotterdam have less fears because of the magnitude of the already existing financial commitments and the very likely impacts of the loss of face that cancellation of these projects would have: political damage as well as damage to the public license to operate of the companies ... we are not in that position thus there is a large risk for CCSWeb to be explored.

**Organisational impact (manpower; time; finance)** ... we need to explore two things ... (1) how to minimise the risks of the impacts of the crisis ... (2) how to achieve a funding agreement with the Global CCS Institute to help us implement the CCSWeb project ... the second can be of help for the first, it at least results in obtaining external funds and that is always a strong asset in times of crisis; it also could help to tackle some of the uncertainties and risks ... if the agreement with the Global CCS Institute could be in cooperation

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#### THE NETWORK ORGANISER (cont.)

with Rotterdam than this would enforce our status even more and help to minimise the risks ... the end result of both exploration is that the project team has to alter a little bit of his time towards two subjects that we did not yet foresee in our work plan.

**Overall Network judgment** ... there is an urgent need to explore the risks of the crisis and to achieve cooperation with the Global CCS Institute (in combination with Rotterdam).

In the meeting on the next day, the Board decides that the CCSWeb manager should do what he proposed to do.

#### 3.2.5. The EU NER300 application (February 2011)

The European Union decided to start a European tender procedure for CCS and renewable energy projects. The funds for that tender stem from the New Entrance Reserve (NER) for the European emission trading scheme. The NER contains CO<sub>2</sub> emissions allowances for new companies coming to the market in Europe. 300 million (tons) of these allowances have been set-aside for the tender. That is why the tender is called NER300. These allowances present a value of about 3 billion Euros with the current price of 10 Euro per ton of CO<sub>2</sub>. The application to the NER300 was phased into two steps: on 9 February 2011 project should apply to a Member State government and on 9 May 2011 these government should apply the projects that they want to support to the European Investment Bank, which will assess the project in commission of the European Commission. In Rotterdam two projects applied in the national tender: (1) Green Hydrogen initiated by Air Liquide and (2) Pegasus initiated by SEQ International.

#### Politician

The PPP Team of the CCS Demonstration project in the region of the Governor had some exchange sessions with the CCS team of the Rotterdam. There was mutual agreement on the positive effects of that exchange. The PPP Team did succeed in finishing its FEED study in time and get approval of all shareholders of the PPP to apply for NER300. The PPP team could finalise this application just in time. The Governor receives the memo on the NER300 results in other countries within 24 hours.

**Introduction** ... in Rotterdam two and in Groningen also two projects applied for the national tender ... in the UK there were nine applications ... in total 19 CCS projects applied.

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**Assessment** ... the projects in Rotterdam are very different from our project ... the most credible one can be described as an industrial project (hydrogen plant) with an international cross border component because the CO<sub>2</sub> will delivered at an oil field in the Danish part of the North Sea ... the other one is the further development of a rather new concept of the Zero Emission Power Plant ... the first one is far more advanced than our own, the second one is less advanced ... both are technically very different from our project ... rumour has it that there has been a lot of

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fuzz around who was willing or had to cooperate with whom ... no politically explicit actions known ... there were also two projects from the region of Groningen ... the only Dutch project with similarity to ours is the Vattenfall/Nuon project ... the UK competitors have more in common ... looking back: this has been a rather politically oriented procedure from the start but after the publication of the final call from the European Commission there was hardly any political activity to be seen on my radar screen ... I am very pleased with the application of our own project ... it surely has helped that the PPP Team exchanged experiences with Rotterdam.

**Opportunities for our constituency** ... from a practical point of view: inside the NER300 too many projects have applied ... makes competition for our project stronger ... but: when we will be on the final shortlist, this will mean that high ranking external parties have valued our project positively ... the outcome of such a selection process will deliver more support for the next phase of negotiations with the national government and more support from our own parliament.

**Exposure (risks/opportunities)** ... the next step for all and also for our project is to survive the national selection procedure ... nearly all projects made their application public ... so there might be some exposure in the newspapers or on TV ... but the sentiments are not very high at this moment (no negative attitudes observed in our region or our country, but fair enough also no independent positive attitudes to be seen either) ... national political signals are that they do not want high level political interference during the selection process ... they want to give the signal that the selection process was fair, unbiased and was only based on the content of the applications ... I would like to argue that advocacy towards national government and parliament should not take place; but I will stay in close and explicit contact with the tender manager on the national side, to be in time when something should need to happen in the national political arena.

**Overall Political judgment** ... the first step for application for the NER300 has shown that Europe has many potential CCS project ... direct contesters for our project are few ... easy to position our project in a positive way ... that is what we need to do right now: tell the story that our project is well defined, convincingly good and feasible.

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### “Through the looking-glass”

The Governor is pleased with the results of the NER300. She directly phones her socialist colleague in the Netherlands. They share their thoughts and approaches to the next steps. Afterwards, she orders her assistant to prepare the storyline to be told about the own project and to make a well-designed presentation to accompany that storyline. She wants to use those whenever she has the chance to.

#### **Policy-maker**

The CCS policy plan has progressed more or less in the same way as planned. The only thing that changed was the general attitude in the Country: “climate and energy” was no public and political priority any more. Part of the policy plan was the own tender procedure for the NER300. Only one project applied. The project was not a very feasible one, caused by the lack of a solid investor in the consortium. The DG received the memo the day after the national deadlines.

**Introduction** ... there is one CCS applicant for our own tender ... in total there were in Europe 19 applicants.

**Assessment** ... the European competitors give a mixed picture ... the industrial project from Rotterdam seems to be the most outstanding one ... the power applicants from the UK and Netherlands also seem pretty well designed ... there was a surprise from Romania with credible support ... the only project from our country is however worrisome ... you were present when they presented their case half a year ago ... at that time we already gave signals that they should have a better business case, meaning that the financial support paragraph should become at least credible to start with ... the current proposal does not give us confidence in the financial supporters.

**Direct own policy opportunities and threats (innovation; energy security; climate change)** ... this can become an awkward position for the Minister ... an open discussion in the public arena about this project will not be helpful for the implicit and not very positive support for CCS in the Country ... and since there is no alternative available it is also not very convincing when our Minister should present that there is no application going from the Country to Europe ... we need to find a way to improve the project proposal with outside help ... maybe Rotterdam can help the project owners since there might be benefit for both parties when the captured CO<sub>2</sub> can be shipped to Rotterdam and from there to the final storage.

**Support in Parliament** ... the next months will be crucial ... if the project does not survive the selection, there is a good chance that we will lose support from Parliament for our CCS plan ... there is a high need for additional budget cuts everywhere.

**Overall Policy judgment** ... the total European picture is all right ... it can help to support the further implementation of our own CCS policy plan ... the present application in the Country presents an uncomfortable position ... the top priority now is to stimulate the project initiators to come to a working agreement with Rotterdam.

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The DG plans an immediate internal meeting with all those involved in the CCS policy plan and with some of his strategic advisers. There is a long discussion on the legitimacy of the intervention, but finally they all agree that the DG has to push his equivalent DG in the Netherlands on the fact that parties in Rotterdam should seek cooperation with the only CCS project applicant of the Country. The DG phones his colleague directly after the meeting.

#### Entrepreneur

The Company had finished its FEED study in time and has applied for the NER300 in the UK, the country where XY is located. The CEO gets this memo from the CCS demonstration project leader the day after the deadline for the project application in the member states.

**Introduction** ... next to us 18 companies applied for NER300 support in Europe, two of them in Rotterdam.

**Assessment** ... the projects in Rotterdam are very different from our project but our first impression is that they have the same quality level as our proposal ... there are three really competing projects because they more or less have the same technology as we have: the Vattenfall/Nuon project in the northern part of the Netherlands and two in the UK ... I think this is a good result, not only for CCS in general but the prospects for our project are good.

**Opportunities for the Company (tactical; strategically)** ... I am not sure how the process is going to proceed; the terms and dates of the NER300 are pretty clear and I guess the UK is going to send all national applications to the European Commission; but what is not clear is the follow-up ... that is a strong point in the RCI, they chose a community approach, including both the government and the industry ... my main worry is the availability of storage (in time and in a commercial sense) and the long lead times for pipeline construction ... when the tender procedure is finished in 2012, the world and Europe can look different from today and I assume the European Commission gives us room to negotiate with respect to that conditions ... what we do need to influence in between is progress on the side of infrastructure and storage ... and there I see a large opportunity for the cooperation of XY and Rotterdam ... together they can achieve much more than both on their own and maybe they should explore a shared pipeline network on the North Sea already pretty soon ... due to our exploratory work in Rotterdam beforehand, we could offer to help build that bridge between XY and Rotterdam and also to support expertise to that cooperation.

**Financial considerations** ... the success of the application and its realisation not only depends on the selection procedure at the European Investment Bank, but also on the availability of matching funds on the side of the UK government ... I have confidence in the commitment and the willingness of the CCS team at the national government, but I do not think that the political leaders of this government see CCS as a very high priority and the variation of possible policy instruments coming up and

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leaving does not offer comfort ... matching finance from the UK government is still a battle to win and we need to define a strategy to tackle this issue without losing our face with respect to our commitment to CCS and sustainable business development.

**Impact on Company profile** ... the final negotiations around the project can have a negative end result: the project has to be cancelled; the reason will very likely be that we cannot balance the budget ... this will have some negative impact on the our personnel (the project team) but that will be healed by time ... but it can also have a negative impact on the Company image: (1) we can be blamed for over-asking without being able to defend ourselves because of the confidentiality of the tender and the negotiations and (2) the NGOs can use the result as a confirmation of their persistent argumentation in the last years that “the energy companies only use CCS as a means to distract the politicians from the real sustainable solutions and when it comes to the crunch of really doing CCS the same companies will only postpone and cancel” ... to prove that we are credible we must stimulate the commitment of all responsible stakeholders to go ahead; the only possible outcome in Europe should be that more than 2 large scale CCS demonstrations project will start before 2017 ... any other outcome will lead to lack of progress but most of all loss of credibility and trust.

**Support within Board** ... we must get approval from the Board to develop and carry out the following actions ... (1) a clear and explicit negotiation approach for achieving co-funding from the UK government; reason: we must be able to show and prove our commitment ... (2) a common and coordinated advocacy approach within industry to secure the realisation of at least three large scale CCS demonstrations projects in Europe (even if it is not our project) ... (3) a communication plan in case the project is cancelled by external factors (coupled to the first action).

**Overall Company judgment** ... the NER300 application process has led to good results, also from the perspective of the Company ... there are still much uncertainties that can affect the realisation of our project and the in the end also the public license to operate of the Company ... the Board should discuss the proposed actions as soon as possible.

The CEO urged the project leader to discuss the memo instantly. After that discussion the project leader gets the task to prepare the proposals for the Board and the CEO asks her secretary to organise a Board meeting as soon as possible.

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#### Network organiser

The CCSWeb manager is pretty disappointed. It has not been possible to mobilise the industrial partners in such a way that they framed one project eligible for the NER300. So no application from his region did occur. This is a serious blow for the CCSWeb project. The manager writes the following memo to his Board.

**Introduction** ... the first round for NER300 proposals has been closed yesterday ... 19 applications in Europe; 2 from our CCS partner Rotterdam ... no application from a CCSWeb partner has been made ... what should we do next?

**History** ... the CCSWeb team has been working hard since 2009 to stimulate all stakeholders in the region in an effort to get several, but at least one, CCS demonstration projects realised before 2020 ... the NER300 funding scheme was assessed by us as THE vehicle to get external finance for demonstrations inside our region ... three possible candidates emerged from our search process in 2010 and we helped them to develop and detail their business case ... one candidate was on the brink of deciding to do a FEED study; the others did not advance further than feasibility studies ... at the end of 2010 we tried to combine their efforts into one shared project but that did not succeed ... so the end result is that there is no project applicant from CCSWeb for the NER300.

**Assessment** ... I am not surprised that our CCS partner Rotterdam does have two applicants; they are more advanced in the process and the projects than we are; there was however one project (Pegasus) we were not aware of, although I have contacts with Rotterdam on a two-weekly basis; maybe they were surprised as well ... the RCI played an active role in supporting the NER-applicants with the administration of the application ... the quality of the project we knew (Green Hydrogen) is outstanding; we know of the efforts that my Rotterdam colleagues put into the issue of getting one combined project proposal which included some form of a common carrier pipeline in it; we are also aware of the fact that the tender criteria did not allow to apply with a cluster project; but the Green Hydrogen can be the one that is as close as they could get to a cluster project ... on our side we could not succeed in our effort to get one project to apply and thus also not a cluster project ... when I look back I must say that time was too short and we moved to quickly to forcing the industrial parties to work together ... we should have carried out a better assessment of what would be possible and not; together with the industrial partners; the

result of that assessment would probably have been: timing is not all right, prepare yourself for the second round of the NER300 tender ... because of that one-dimensional focus on getting one project application ready before the 9th of February 2011, we did not prepare ourselves to be ready for communicating the negative message of yesterday ... there is no communication plan ready for today's results ... and you have seen in today's newspapers that this does not lead to a well balanced reporting on the CCSWeb.

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**Regional opportunities and threats** ... the current situation can not be interpreted as an opportunity; it is a severe risk to the CCSWeb project ... as shown in the assessment we did not prepare the communication properly, with negative results for the public image of CCSWeb ... this adds to the current lack of priority in the region on the issues of climate change and energy security; both on the public side as on the industrial side; this can be caused by the economic crisis ... together these factors pose a serious threat for CCSWeb ... the option of cancelling the whole project is not out of the question anymore.

**Overall Network judgment** ... in the present situation there are ample arguments to stop the CCSWeb project ... continuation of the project needs at least reconfirmation of the commitment of all partners, public and private ... there is an opportunity in the second round of the NER300 tender but we need to be more aware of the risk of a second failure and prepare for that.

After long and considerate discussions in the Board, the decision was made to go on with the project and to come with a proposal to support applicants for the second round of the NER300. The Board also decided that the project team should employ an experienced communication officer that should work closely together with their CCS partner in Rotterdam (who seems to have a good track record in communication).

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#### 3.3. Showing the mirror

In this section, we pretend that we were able to have an interview with two of the voices introduced in the previous section: the Governor and the CEO of the Company. We supplied them with the written form of the storyline of the Rotterdam approach and asked them two questions:

1. What were in your perception the key events?
2. What were the strengths and weaknesses of the Rotterdam approach?

Below the excerpts of the virtual interviews are given that relate to these questions.

**Note** (again): all texts in the interviews are **pure fiction** and meant to be illustrative for the case. No citation can be attributed to real existing persons.

##### 3.3.1. Interview with the Governor of the region X (outside the Netherlands)

The Governor is interviewed in her office in Y, the capitol of X. The following texts are quotes from a much longer interview.

##### Key events

“In my view there were several events that were significant for the development of the Rotterdam case, but there is only one real key event. That key event is the meeting of the International Advisory Board (IAB) and of course not only the meeting but also the outcome. Mr Lubbers had really been able to get that board that really consisted of high-level representatives (especially from industry, to get that board unanimously behind a very high ambition for the Port of Rotterdam. To become the world capital of CO<sub>2</sub>-free energy (smart port and city of the future); connected to that general vision also a concrete goal of 50% emissions reduction, that really is ambitious. But Mr Lubbers and the Board presented this in such a way that everybody saw it as an evident vision and everybody perceived the goals to be credible and realistic. So not only the advice but also the form in which it was presented made the minds ready for an ambitious policy with a positive drive. I think that this was the reason why the Mayor of Rotterdam and the CEO of the Port Authority embraced the advice and more or less immediately incorporated the outcome in their strategy. For a politician like me,

this is a showcase of how a positive drive combined with the power and authority of appropriate persons (like Mr Lubbers and like the former CEO of Shell) can make a political difference, can have an impact on the day-to-day policy in a positive way. How such causal interactions work I cannot fully explain, but of course there is some form of coincidence in it; but the best politician, and I am sure in this case Mr Lubbers can be seen as an example, can more or less smell the opportunity and the feasibility in that context and they can combine that with their political

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skills of persuading others. So in this case there is that opportunity: everybody sees that the Port of Rotterdam wants to grow in economic terms but the limits to do that within acceptable social limits (sustainable) will be reached very soon; there is a sense of urgency on the climate change issue co-caused by the movie of Al Gore; and Rotterdam would not be Rotterdam if the entrepreneurs there did not see opportunities for new business in this carbon constraint or sustainable world; but those business opportunities mostly are either very vague or extremely diverse in kinds and quantities. Mr Lubbers (and presumably also his advisers) saw a way to connect these issues and make a credible story that fitted to the mind-set of a lot of decision makers in politics, industry and other relevant parties like the Port Authority. This is the key event. Without it, I guess, there would not have been a Rotterdam Climate Initiative, let alone a CCS project approach.

Of course, there are certainly from a political point of view other crucial events, but I see them as the political logical consequence of this first one. The first one is a very odd one, since it was so contingent and anecdotal, and I think a lot of politicians rewrite history by claiming that these types of meetings have been decisive and I guess a lot of them over-exaggerate their role. That first event after the IAB advice was the meeting the Mayor of Rotterdam had with Mr Clinton who was in the Netherlands for some other reasons. Since I was not present I have only heard second hand reports of it, but it seemed that both gentlemen had a good feel for each other; the Mayor mentioned the advice of the IAB; Clinton took it as a decided policy goal, was very impressed and urged the Mayor that Rotterdam should work together with his own foundation the Clinton Climate Initiative. Although I do not think this is a very true story, the setting and the outcome have been important from a political point of view: (i) the support of Clinton added to the credibility of the advice and (thus) accelerated the decision making in the Rotterdam executive council (mayor and aldermen) and the Rotterdam council and (ii) the cooperation with Clinton guided the search of the name of the Rotterdam Climate project and it made the RCI “world famous” right from the start. You cannot achieve a better way of positioning your political decisions than this one. The start of the RCI and the celebration of that event in the Clinton event in New York was great from a public and communication perspective; but from my perception that is just the normal political labour that follows an already chosen decision, it enforces your approach and you really have to do it; but it is not an essential event for decision making, it is a result of it.

THE POLITICIAN (cont.)

I have spent a lot of time on telling you my perception on the essential key event of the RCI and some of the follow-up events. I really think that from my perspective this is the central issue. The rest you could call normal political consequences of the decision to have the RCI ambition and to constitute the working program. What I would like to give as an advice is: do not underestimate that “normal political labour”. It takes a lot of time and effort (advocacy

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THE POLITICIAN (cont.)

is not as simple as people think it is) and you need to have a lot of commitment. From what I learned from the Rotterdam case is that it seems to be pretty well organised. Mr Lubbers stayed very close and was a kind of godfather to the RCI and in the first 4 years also to CCS. But also the Mayor and the responsible alderman were committed and took their political time; also in the periods in which there were downsides.”

#### **Strength and weaknesses**

“For me, the basic strength of the Rotterdam approach lies in the combination; the combination of the three parts: (i) sustained political commitment, (ii) the broad support within Rotterdam for the future vision of the local economy that sees sustainability as an opportunity and (iii) the local habit of really working together to improve the economy and the quality of life. For the RCI and the CCS approach, that strength is supported by having chosen a really well functioning programme organisation based at the HQ of the Rotterdam municipality but working closely together with the other three partners. That strict organisation combined with a very well organised communication and advocacy approach and closely connected to the Rotterdam executives like the Mayor and the alderman made the strength of Rotterdam visible to the outside world. That was (and still is as far as I am aware of it) a very strong combination of commitment, vision and organisation.”

Are there any weaknesses? Of course, there are. But they are not that visible or relevant at this moment. The main weakness of a project with such a high profile is that one gets used to success, that one starts suffering from vanity. I do not yet see such signs but I hear from others in Europe that they are a little bit fed up with the success story of Rotterdam. It is a warning. The best way to achieve things in the international arena is being proud on the one hand (on your project with credible arguments) and modest on the other (on your success). The other weakness is that Rotterdam does not seem to have a plan B, an alternative plan in case for instance the commercial phase of CCS will not be realised in Europe before 2030 or not at all. Do the local politicians have a story ready that is a plausible adaptation to the current story and tells a convincing political and social story of the future of Rotterdam and its industry in the port? When I look at the current economic crisis and when we take into account that the situation can very likely evolve in a worse direction it makes sense to have such a story available already right now.”

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#### 3.3.2. Interview with the CEO of the Company

The CEO is interviewed in her office in Z (a capital of a European country). The following texts are quotes from a much longer interview.

##### Key events

“I think the event that triggered most of my attention was the moment when the joint venture of E.ON and Electrabel (ROAD) got the undertaking of the European Commission of a substantial EU subsidy<sup>8</sup>. That was the moment were 6 European CCS projects together got 1 billion Euros. That was also the moment that I thought: this is real, this is going to be the beginning of a new business. I had the impression that this was the turning point. When I focus at Rotterdam then I have to say I was very amazed by the ambitions of Rotterdam in the beginning of 2007, but when they put the money where their mouth is and started the RCI with seed capital for 4 years of 50 million Euros; at that very moment I thought, this is really important for them and this kind of financial support expresses true commitment. That also made us eager to learn more of this location and we tried to find out whether in our case Rotterdam would also be a good starting point for our medium scale CCS project. And I still think it is a pity that we had to move to another location, but the balance of all costs and benefits were better in the other location (XY). The next key event for us is the decision of the European Commission on the funds of the NER300.”

##### Strength and weaknesses

“Rotterdam really showed that they take this development with CCS seriously. For companies like mine, one of the vital signs is allocation of own money to the development. Rotterdam was very generous to supply funds. I am not sure how much of the 50 million was spent on CCS, but I guess about 20% and that is truly much for a city of this (relatively small) size. The other part of their strength is that major companies in the port have joined the initiative and have told us in the past that the Rotterdam plans are real and important. Those companies see a lot of opportunities that can originate from the development of a CO<sub>2</sub> Hub in Rotterdam. Not really big business but solid business for a couple of decades. A couple of those companies in these years came with novel ideas and even made their own feasibility studies, like the one on the transport of CO<sub>2</sub> with ships. That combination of industrial commitment and practical moves made moving to Rotterdam even more attractive.

Also a strength but not very recognised is the fact that this region has an excellent environmental authority that has a good track record in constructive cooperation with industry right from the start of a project. In the CCS case, this authority was one of the first in the region that took this technology seriously and put it on the policy agenda.

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<sup>8</sup> Note from the authors: 180 million Euros.

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That happened in the same period when there was a debate on coal fired power plants and E.ON and Electrabel had to show to the public and the local politicians that their choice for coal fired power plants was a sensible choice. This discussion was focused on the public license to operate and the CCS option together with biomass functioned as a way out. That was a clever move. It can and will act as very likely obligation in the future. All these issues together show the real strength of the Rotterdam approach and make me confident that if it will happen anywhere it will happen in Rotterdam.

The biggest weakness of the Rotterdam approach is not located in Rotterdam but in The Hague. Since 2009 the uncertainties and risk of concrete CCS projects became more explicit and known. It became more and more clear that companies couldn't solve all those issues in their projects and on their own. The companies can solve some of them, and when they would join forces in a consortium they could even solve more but a couple of real issues still remained to be solved, like the financial consequences of the chosen liability scheme, the organisation of an infrastructure with minimal costs for the future and the market regime for the commercial phase of CCS. There are two possibilities in this case: the national government or the international authority will play its part and the cost can and will come down, also in the demonstration phase. Or, governments will not take the lead, companies address the issue themselves and the price for CCS also in the demonstration phase goes up; risks that can be managed badly will increase the cost more than any other factor. This issue occurs everywhere in the world. In the case of Rotterdam, we assessed what the weakest link was and that was the Dutch Government. At the moment of our choice of location (2010) we did not expect that this Government would be or become more active in this field. And my guess for now is that this has not changed since. Another but more simple weakness (but also a strength) is that the Rotterdam CCS approach is so flexible that we sometimes did not know whether there was anything organised at all. ”

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## 3.4. Discussion

In this section we will start by briefly giving you insight in the straight outcomes of our analytical work (§3.4.1). The second part of the discussion section is dedicated to achieving a general view on learning from using the approach with the four perspectives (§3.4.2). The last part consists of a first discussion of the approach of the analysis (§3.4.3).

### 3.4.1. Conclusions from our direct analysis<sup>9</sup>

Based on the interviews we carried out, we have also categorised the outcomes with regards to the perspectives used in this chapter, but then in a more general sense than in the previous sections (§§3.2-3.3). In the next table (Table 1) you can find the results of that categorisation in four levels: (1) key events, (2) strengths, (3) weaknesses and (4) overall assessment.

Based on Table 1 and all the other analyses we have drawn the following general conclusions on the way the Rotterdam cluster project was received:

- Rotterdam has a number of favourable conditions<sup>10</sup> that stimulate and simplify the development of the RCI and the development of the Rotterdam CCS approach. Next to those positive conditions, it also helped that there was a public debate on the necessity of the coal-fired power station. That debate also increased the willingness of the operators to implement CCS (and biomass). The RCI partners knew how to make use of those windows of opportunity in a positive and constructive way.
- Rotterdam had a vision on tackling the climate change issue and improving the economic future of the port at the same time. The logic of the location (much energy intensive industry) led to the focus on CCS. So CCS was a result of a broader vision. This meant that public support for CCS was easier to achieve.
- The mentality of working together and perceiving problems as opportunities for business is seen as a unique and positive added value of Rotterdam. The RCI appears to stimulate progress and innovation.
- The start of the Rotterdam CCS approach was fast and efficient. It was built on a (flexible) roadmap towards a long-term goal in 2025.
- There is strong consensus about that the Rotterdam CCS approach has developed in a positive way. The main drivers have been the ambitious goals, the commitment of the most important stakeholders in the port and the use of prominent personalities (or champions). Nearly all interviewees have a very positive appreciation of the use of those champions.
- The RCI team was a very good network organiser. They were very good in supporting the diffusion of knowledge and analysing together what the next steps for the CCS approach should be. They also had conversation with every party that wanted to be (come) involved and they tried very hard and effective to commit parties to the Rotterdam cluster project. And last but not least, the annual reports and the other analysis are assessed to be relevant and truthful.
- Rotterdam was also very good in organising support and advocating their

<sup>9</sup> See chapter 1 (introduction) for an overview on which analyses we have carried out.

<sup>10</sup> See also chapter 5 in the Interim Report [2] on factors of success and the unique selling point of Rotterdam. In chapter 4 of this report you will see a more generalised version of success factors (§4.1).

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case in the local, national and international arenas. Some interviewees mention their appreciation for the sensitivity and the timing of the RCI team in the case of support and advocacy; a characteristic of the RCI approach that could function because of the broad network of the members of the RCI team. The “branding” of RCI was seen as good and professional.

The following items were seen as the main risks:

- There is still a lot of progress needed to achieve full market development. Rotterdam and its industrial parties tried to put this issue both on the national as well as on the international agenda, but progress in this area is minimal.
- The interventions of national and international authorities with regard to the support of CCS are still not sufficient. That is a reality for all European parties, but Rotterdam as a front-runner might be the first where this will hurt.
- The most important single bottleneck that is mentioned for the short term is the lack of a consistent regulatory framework. Especially private companies are still reluctant to initiate CCS projects because it is not clear how issues like the liability of storage will be covered in national laws.
- The analyses confirmed some assumptions about the different perspectives: entrepreneurs and network organiser are focused on the development of the cluster project on micro scale, while politicians and policy-makers are more focused on the macro scale.

These results were the main source of inspiration for §3.2 and 3.3.

## Results of the interview analyses

Politician	Policy-maker	Entrepreneur	Network Organiser
<b>Key events</b>	<b>Key events</b>	<b>Key events</b>	<b>Key events</b>
meeting/report of the International Advisory Board	Annual reports of the RCI CCS	Rotterdam started the RCI and supplied substantial funds for it	Co-operation agreements (RCI, LoC's)
Getting the Dutch ministers and the European Commissioners involved (meetings)	dialogues between regional and national politicians and executives	Licence to operate was debatable: discussion on coal in the Rotterdam council	Organisation of effective advocacy and communication
meeting with Clinton	Implementation issues of European directives or support schemes	Decisions of other industrial parties (like FEED study of ROAD)	Achieving confidence in the approach by studies and dialogues
Public debate around Barendrecht	Funding decisions from national budget	Public discussion on climate change (especially when it leads to decreasing support for a policy direction)	Showing progress: the annual reports
EU decisions on CCS and EU-ETS	Debate in Barendrecht	Government or authorities put the money where the mouth is: EU finance scheme, Dutch subsidies, CATO2 finance decision, ...	
<b>Strengths</b>	<b>Strengths</b>	<b>Strengths</b>	<b>Strengths</b>
sustained political commitment	working together with national policy-makers	commitment from local authorities	commitment of all relevant parties
broad support for an attractive economic vision	working together with other CCS regions (in the Netherlands and the UK)	initiatives from other companies (signal for credibility)	combination of hard targets and a flexible short term approach. Suitable for adapting to circumstances.
the local habit of working together to solve problems	the analytical support for the approach became better and better and is now good enough for the next phases.	cooperative attitude in Rotterdam	analytical approach with consultation of external experts
use of political personalities	participation in the national research program CATO2	strong and competent EPA (DCMR)	constitution of the CCS business platform and other means of knowledge sharing activities
cooperation with Clinton Climate Initiative		use of personalities	
cooperation with European Climate Foundation			
<b>Weaknesses</b>	<b>Weaknesses</b>	<b>Weaknesses</b>	<b>Weaknesses</b>
national politician at too much distance	no clear blueprint or solid CCS project organisation	the approach sometimes is too flexible	the ad-hoc organisation of the CCS cluster project
national government very reluctant on CCS	not a very solid policy analysis	the ambivalent support of the national government	cooperation with other regions is too marginal
no plan B when CCS could be canceled		too much focus on consensus	
too much focused on the own success (vanity)			
<b>Assessment</b>	<b>Assessment</b>	<b>Assessment</b>	<b>Assessment</b>
The politicians focused on creating political and public support and national and international recognition for the project. The port of Rotterdam is of great economic value for the Netherlands and thus ensuring the future of the port is very important for national politicians as well. Politicians place more emphasis on the importance of a comprehensive approach (in which not only CCS is a part) of investing in the city itself. In discussions surrounding the CCS project within the RCI politicians did also focus on the benefits of offshore storage compared to onshore storage. They therefore see a danger in too much emphasis on the relation CCS and onshore storage. Regarding (inter) national reputation, the politicians did assess the coalition with the Clinton Climate Initiative to be very important, as is the use and commitment of personalities like Mr Lubbers and Mr Opstelten.	Policy-makers assess the Rotterdam mentality to be very important. They look at Rotterdam from the perspective of developing the technology, an industry or the Netherlands. The Rotterdam mentality indicates that in Rotterdam opportunities exist to develop CCS: this in itself provides support for the implementation of a national CCS policy. For the national policy it is important to encourage cooperation with Groningen. Cooperation between the two regions leads to strong lobbying the government and will give greater urgency for new policies. The policy-makers further note that additional legislation is needed to further develop CCS. They see that the attention from national government on these issues has weakened and that little initiative is currently (2011) shown by the government.	Entrepreneurs find it important to be part of the RCI because of the shared goals and the political momentum that was created. The main players in the port of Rotterdam support RCI: that commitment inspires confidence. The facilitating role of the RCI is important for entrepreneurs and provides them with benefits, including assistance with grant applications, bringing together parties and initiating collaboration. At the same time the entrepreneur perceives this kind of support activities as slow and delaying. One of the important added values for entrepreneurs is that the RCI has conducted an extensive advocacy in the Netherlands and in Europe. Mr Lubbers and Mr Opstelten conducted this advocacy and those names have raised confidence of the entrepreneurs. The main reason for entrepreneurs to join the RCI is to tap new business opportunities. Issues that are directly related to that are even more important, such as the development of various parts of the chain (in this study mainly infrastructure), the availability of studies, grants for conducting studies and demonstrations and the presence of laws and regulations.	For the network organiser, the activities aimed at organising cooperation and creating a clear message are the most important ones. These activities include primarily the activities aimed at convincing the industry to participate in the RCI and the role that the business association Deltalinqs has played in this respect. The organisation of the business platform to come up with concrete projects is one of the prominent examples mentioned. Furthermore, the manifestation (image and branding) of the RCI was seen as an important and powerful part of the organisation. Especially the use of personalities and the advocacy has been very important to fulfill that role.

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#### 3.4.2. Lessons from the perspectives

We assume that the intended audience will be stimulated to learn their own lessons from the text in §§3.2-3.3. We think the format chosen could be attractive but this is the first time we have done such an exercise and we did not try it on a larger audience. Bringing this to the public is the next step, but not part of this case study.

What do we hope that this analysis could bring for the intended audience? We at least put in the following elements:

1. A more multifaceted view on a CCS cluster project and on the Rotterdam CCS project in particular.
2. An improved understanding of the different roles that persons have in such projects
3. Insight in the fact that it is EVIDENT that (1) your perception of interests and motivations of others is generally incomplete and incorrect; and (2) their position is as dynamic, ad-hoc and circumstantial as yours.
4. An improved insight in the fact that CCS cluster projects or more general the CCS Innovation system is something that is NOT NORMAL in the sense of a continuation of other technical domains BUT NEW AND DIFFERENT in the sense that it bring together technologies, experience and parties that were never together before.
5. Insight in the way you can improve your own project by adjusting the approach to better fit all the interests and perceptions in your own local environment.

We are very confident that the current phrasing of the analysis already would bring items 1-4 to a high level of understanding (let us say the score is 4 on the scale of 1-5; or a B in the American grade system). We are less confident on the score for item 5. Maybe that would score 3 or C.

What is the practical added value of a certain perspective? We think that the voices of the politician and the entrepreneur have had the biggest added value for the analysis. That conclusion is probably also caused by our background (which covers academia, policy-making and the network organiser) and the fact that those two voices were the least known to us. Some highlights on what we learned from the perspective analysis and the interviews were:

- Politicians primarily look at personal relations and the role of power, authority, persuasion, conclusiveness, strength and decisiveness in those relations. They want to be able to tell a credible and convincing story not only a bundle of arguments. The key words are personal relations, persuasive power and convincing stories. As soon as you fully understand that characteristics of this voice, you also begin to understand their position and why they act the way they do. You can then sometimes even predict what they think is important and how they want activities organised. In short: when you are not a politician this could help to improve your project in their eyes. And that could be very valuable to achieve support from the politicians. Support that is essential in this phase of the development of CCS.
- Entrepreneurs have a strong focus on finance. Not only for their own activities where they are eager on achieving good business cases and look for funds for CCS demonstration projects, but also (and in the CCS

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case we think: especially) with regard to the funding of the government. Funding of the EU or of the national government is not only assessed for its use for their own project, but especially as a signal for commitment. The question the entrepreneurs ask is: does the government put the money where the mouth is? From their point of view the current European approach seems to be convincing, the amount the city of Rotterdam put in the RCI was also rather convincing but they are not that positive about the Dutch government. The other thing we learned is that entrepreneurs are very sensitive to what their colleagues (competitors) do. In the case of Rotterdam where they see a group of companies working closely together, they assess that as commitment of industry and have a wish of being part of that. The same behaviour occurs when they see that other companies see business opportunities: they do assess the context where that happens as favourable for them as well. The last thing that is important for entrepreneurs nowadays, especially for large multinational companies, is the image and their licence to operate. In the current crisis being green is maybe somewhat less important than a few years ago, but they still want to do a lot to improve or save the image.

#### 3.4.3. Discussion of the multi-perspective analysis

The analysis in this chapter was meant to give a multifaceted assessment of the Rotterdam CCS approach. We used the voice of four archetypical parties to arrive at that assessment.

In §3.2 we have supplied the assessment of five key-events from all four perspectives. This was a first of a kind analysis, never done before and certainly not in this context. We have drawn the input for the memos very heavily on our own impressions during the interviews we have had and the own experience we have had in earlier experiences. At the end of the day, we think this form of assessment is very attractive and useful: not only to put or get yourself into the shoes of another and differing person, but also because it can help yourself as a project organiser to assess the SWOT<sup>11</sup> of your project in a more complete way. We also wanted to give you an impression on the (practical) problems of achieving a complete picture from a chosen perspective. Not only because it is not easy to put yourself into someone's shoe but we have experienced in the interviews that a lot of those shoe carriers themselves were pre-occupied with certain details and with their day-to-day priorities<sup>12</sup> and could themselves not give a bird's eye view of the whole scene or a complete picture; also the combination of all interviewees together left a lot of white spots. Some of them we tried to fill in by getting into their shoes (see the fictitious memos) but there are still some blank in this analysis.

At the same time we think this approach can be improved and that is what we will do in the next year (2012) by personally checking whether the descriptions given are truthful and credible. In this case that would mean

<sup>11</sup> SWOT is an abbreviation of Strengths, Weaknesses, Opportunities and Threats.

<sup>12</sup> That is why we have chosen to give a practical context to each voice in which we show you what is on their mind at that very moment. Those priorities we have experienced also have an impact on the perceptions and assessment they have at that very moment. A conclusion that is probably very familiar to those who are psychological experts.

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check in interviews with real persons that fit the description of all of the four voices (separately).

The analysis given in §3.3 has resemblance to a very familiar activity: an interview. Although fictitious, the idea was to give a more general assessment of the key events and the strengths and weaknesses of the Rotterdam CCS approach, but with a personal flavour and from two chosen perspectives that are the most unfamiliar to the authors (and to most of the CCS community we meet at conference and meetings). We think that the interview excerpts are typical for these two voices/perspectives and give a good flavour of what a politician or an entrepreneur would say in such an interview. Maybe from an analytical point of view wrong, but we did not want to cover all subjects in those excerpts. If we would have done that, the interview would have become too impersonal or too faceless and, thus, incredible.

In §3.4.1 we have given you some of the more analytical background data. We have tried to phrase those results in a more attractive format but the end result were mostly endless lists of plusses and minuses and some connecting texts. Not very attractive, rather boring. We will use that kind of text for the article(s) we will write on this subject in the near future, but not for this audience.

In §3.4.2 we have summarised what we think that you could have learned at least from this chapter. We assess the overall result to be positive. Hopefully our future work on this subject will prove we were right. We are confident it does.

On the balance we are more than satisfied and comfortable with the results and the format of the present chapter. We think it is an approach with a high added value. This chapter already has substantial value. The checks and the subsequent (causal) improvements in the future can lead to a more easy-to-use multifaceted analytical approach that can be of value for all kinds of assessments and evaluations.

# 4

## CHAPTER

### What can you learn from it?

## 4. What can you learn from it?

In the interim report we have analysed the storyline of the Rotterdam CCS approach and have drawn lessons on what had helped in Rotterdam to positively arrive at the current global position as being mentioned to be one of the CCS clusters or CO<sub>2</sub> hubs with the best opportunities. With this knowledge we want to help you, the reader and stakeholder in a cluster or hub project elsewhere in the world. We would like to give you our best answers based on the case study we carried out on one of your burning questions: “How should I organise my project?” “Whom should I cooperate with?” “What can I do to improve the chances of success for my project?” etc. Or in more formal language: in this chapter we will give general guidelines for comparable projects. This chapter is organised 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 action that you can carry out to achieve your goal.

We have framed the following guidelines for a CCS cluster project. The word cluster project is the word that we will use in the guidelines. This does not mean, however, that initiators of somewhat simpler CCS projects are not intended to read these guidelines: there might be a lot of valuable information in it for them as well. We do not want to make the text too nuanced and have chosen for the word cluster project, but in more than 80% of the cases you can also read CCS project. The intended reader is the manager of a cluster project, whom we will call the Network Organiser in the rest of this chapter.

The chapter starts with the general part of the guidelines that we have called “Preparing for success” (§4.1). As a new Network Organiser you should start here. In that same section the choice of the issues for the rest of the chapter is explained (§4.1.3).

### 4.1. Preparing for success

#### 4.1.1. Commitment, commitment and commitment

The single most important factor for success is commitment: national and regional authorities should have ambitious goals to tackle climate change and to strengthen the economy at the same time. Industrial and political executives should broadly support this goal. And there should be a broad and common understanding that CCS is essential to reach the targets. Solid commitment is decisive at the moments of practical and essential decisions on CCS projects (like FID for a common carrier pipeline of a demonstration capture plant). Commitment can be build by small successful steps.

In Rotterdam commitment was created by the combination of economy and environment. RCI created not only a climate driven program. The support from Deltalinqs and the Port Authority of Rotterdam can be explained by the vision developed: Rotterdam Energy Port. The port of Rotterdam is a fossil fuel port with a lot of coal and oil storage and 5 refineries. To maintain the

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dominant position in the longer term and to attract new investments it is needed to develop renewable energy, biomass and a clean chemical industry. This transition is needed to attract new investments in the future. CCS infrastructure will facilitate the energy intensive industry because CO<sub>2</sub> can be removed at a stable and potentially lower price than the CO<sub>2</sub> emission trading price in the long term. This argument was the main reason why the Port and DeltaInqs became RCI partner and justify the ambitious climate goals to their members and industry partners. This is also one of the reasons why so many partners from industry were interested.

Below you see some ingredients and actions to build a CCS network with maximum commitment.

#### 4.1.2. Ingredients

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

- CO<sub>2</sub> Density – What is the density of medium and large-scale CO<sub>2</sub> emitters? The higher the density the easier. 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 considerations much easier. And does shipment of CO<sub>2</sub> 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.
- Stakeholders – At the end of the day, the industrial stakeholders are the ones that have to do the work and make investment decisions. Other stakeholders like politicians and key public persons are also needed to get broad commitment. It is your role to know which stakeholders will be beneficial for your case. Who are the main players in the area that could be interested in CCS? Are there logical combinations or possible drivers? What is the corporate position or strategy on CCS from the different stakeholders? Are there existing platforms where they already come together?
- Experience – Experience in infrastructure development and shipment of gases is certainly an advantage. Also the availability of existing infrastructure for CO<sub>2</sub> 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: (i) the cooperative origin of all parties involved and (ii) the attitude towards the “problems”. When parties are used to working together you will have an easier job than when parties are used to fighting each other. In the case of existing cooperation, you

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mostly also 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 start 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 we are used to speak less and act earlier. But that is not the only way to react sensibly on 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 truer when you are in a start-up period where every distraction or disagreement can become a showstopper. So, when exploring the possibilities of a cluster project, you must have an idea on the ins and outs of the local mentality.

- (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 funds will act as seed money and will trigger much more 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 4 years. Of that amount about 7 million Euros were spent to organise and speed up the CCS cluster approach. At this moment in time (end 2011) the multiplication factor is estimated to be about 10-20, meaning that in the meantime more than 70 million Euros have been spent by private parties. And that factor will increase to more than 50 when the FID for the large-scale demonstration will be made.

#### **Example**

When your project is in a heavily industrialised area in the neighbourhood of a seaport, then your starting position is already pretty high. 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 have the habit to act together instead of quarrelling who is to blame and who should start the action.

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#### 4.1.3. Actions

We looked at the Rotterdam case and assessed what helped most to arrive from the starting position (which was already pretty positive) to the current and positive situation. Based on those outcomes we think that the following aspects are the key issues that you have to address to increase the impact and the realisation of your project (all of the issues will have a concrete elaboration in the next sections):

- Vision approach – organise the vision see §4.2
- Focus on the future – organise the focus. see §4.2
- Working together – organise the cooperation. see §4.2
- Companies take responsibility – support industrial actions. see §4.2
- Storage as a common interest – organise availability of storage (§4.3)
- Image and Public Relations – organise communication and support (§4.4)

#### 4.2. Organising a cluster project

A CCS cluster project is a project that will lead to a final situation in which multiple CO<sub>2</sub> sources will capture CO<sub>2</sub>; the CO<sub>2</sub> is collected in a common transport infrastructure; and the collected CO<sub>2</sub> will then be delivered to end-users or stored in deep geological formations. A cluster project is a project with a lot of different parties involved, on the industrial side as well as on the support side (financial, regulatory, local authorities, etc.). And the reader is supposed to be the manager of this cluster (the network organiser). In this section we will give a first guideline on how to organise a cluster project in the most effective way. This guideline consists of two parts:  
(i) The ingredients – what are the necessary elements of a cluster project;  
(ii) The actions – what actions can the network organiser carry out to achieve the final goal of a functioning and effective CCS cluster.

##### 4.2.1. Ingredients

Below a list of necessary ingredients is given. The order is somehow a priority order for new cluster projects like yours, not really in the exact sense of the word that you can only go to the next level if you have completed this one, but in the sense that the first items are more important for you than the later ones.

What do you need for a CCS cluster project?

- **Commitment** – The key issue (see previous §4.1.1). Commitment can mean commitment from local/regional authorities and politicians, from local/regional captains of industry, from social organisations (like environmental NGO's) and from companies active in CCS development. It is very helpful to combine climate goals with economic development. Such a combination can be a crucial ingredient for organizing commitment
- **A solid broad vision with long-term goals** – Clear ambitions for a certain year in the future should be phrased. Also connected to this long-term goal you need a planning over multiple years. The long-term

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target should preferably be fixed, the short term more flexible. It is not very helpful to have a narrow vision, a vision that is only dedicated to CCS or even worse “clean coal”. If you want to be in a position that has the least chance on public opposition, you need a vision that tackles the whole problem at least of energy and climate change, but an even broader vision on (local) economy and sustainability is better. See §4.4 for additional arguments for such a vision.

- **Personalities** – Persons that have authority in the region and especially also outside the region. These persons are mostly (also) politically engaged, they know their way in the political arena and can talk the political language. Personalities that talk 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 CO<sub>2</sub> to the CO<sub>2</sub> 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 organisation of the cluster.
- **Business cases (for infrastructure and storage)** – Especially for the infrastructure and storage part it is necessary to intensify your knowledge. The data normally used for these issues in the literature are very academic and can be very different from a real world case for pipelines and storage sites. It is necessary for every cluster project 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 CO<sub>2</sub> 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 one in 2008 and a more detailed one in 2009. The last one is still a good source of reference for the project that will start today.
- **Network organiser** – The network organiser is the entity that is responsible for the organisation of a CCS cluster project. The network organiser could be one person but should preferably be a team of persons. The main task of the network organiser is 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 in the external world (advocacy, regulatory issues, etc.). This organising responsibility is supplemental to the practical responsibility for investment of the companies involved in the cluster project.
- **Platforms for sharing knowledge (and experience)** – The diversity of parties involved in a cluster project 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 CO<sub>2</sub> in the common carrier.

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- **Mentality** – It helps to develop a cluster project when the mentality in your region has the basic element of cooperation in it, and that industry and authority have an attitude of working together to solve social problems. It also helps when you have the general attitude of flexibility. Especially in the case of a CCS cluster project this is important because of the large uncertainties at the start of the project and the many adaptations you will have to do during the course of the project. It does not help if the general attitude is to want to have a detailed blueprint and stick to that approach whatever happens.
- **Adequate policy framework** – It certainly helps when a policy framework exists in which the project can be fully developed. But for the policy framework we see the same characteristics of the development as for the cluster project: it is new, not yet invented and certainly not here at your location. So this policy framework has to co-develop with your cluster project.

#### 4.2.2. Actions

In this section we will give you some guidance on the actions that can help you fulfil your task.

##### **Organise the vision**

It helps to have a broad vision with a hard goal and a soft approach and to act accordingly. What do we mean with that?

**Hard goal** – You need to have a hard target or solid goal for a future year. In Rotterdam they have a common goal of 50% emission reduction in 2025 including a large share of CCS. That target is hard; no one questions that goal or denies it. Although this sounds easy, it is not. You need to organise the commitment for such a target. In chapter 3, you could read on how Rotterdam was able to get that commitment (§3.2.1). Basic ingredient for achieving that kind of support for ambitious long term targets are: a solid and relevant analysis of problems and solutions related to energy and climate change issues; develop several scenario's with which you can tackle the problems in the long term; connect these scenario's to other ideas on the development of your region (what is the economic vision of different political and industrial parties? What other visions have been developed by authorities in your region? What could be a connection of the development of your region in certain directions with plans or visions at national scale or in the European case at the level of the European Commission? Etc.); it is nearly imperative to get influential personalities involved who can connect to your project and who can become attractive spokespersons; and finally develop the vision as a combined activity of the spokespersons, the relevant politicians and their high level policy-makers, relevant executives from regional or local authorities and several positively engaged captains of industry. This will very likely be a time consuming activity but it is the best way to come to a wide-ranging vision with extensive commitment. The vision and the analysis should conclude that a CCS cluster project is a necessary ingredient to accomplish the vision. If not, the bucket stops here, in the current situation it is not prudent to start a CCS cluster project without a rational and analytical legitimation. If it does have that conclusion that result is the starting point of your vision or storyline. Whatever you do

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you will connect your activities to that common result of the general vision (for further communication guidelines see §4.4).

**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 solid target for the long-term. How do you do that? You need to be sensible to the current situation: you have to listen to all relevant parties and their changes in approach and desires; you have to be flexible to changing conditions like the change in possible external funding or the economic crisis; etc. This reflective and listening attitude also needs to be organised: people of the project team must have regular conversations with all relevant stakeholders; an exchange platform of the stakeholders can be helpful etc. The soft side can mean that the approach sometimes has a strong temporary character. External and internal parties could perceive those temporary adaptations as a somewhat “aimless” or hesitant attitude. You need to know that these perceptions can occur and you therefore at least need to be transparent in your internal and external communications (see also further on in §4.4) on what you do and why.

**Act accordingly** – in all activities you should be firm on the long term and sensitive for the short term. That is an attitude that you have to practice, especially difficult for technically trained persons who tend to be firm for the short-term actions. And the other part of it is: be open on what you do and why you do it. It helps the parties to understand what is going on. Because not only for you, but also for them it is a new ball game with a lot of unknown uncertainties.

#### **Focus on the future**

It helps to stay focused on the future and its opportunities. Why? In the first place: the future has more common opportunities than the short term (where competitors compete and politicians have to allocate restricted budgets). A vision on the future is thus more attracting and unifying than a short-term blueprint. In the Rotterdam case, they coupled the vision on the existence of the port and the role of CCS. In the second place: for CCS is it very relevant to also focus on the phase after the demonstrations. There is a need for real (commercial or regulatory) incentives for CO<sub>2</sub> emission reductions; there is a need for a national or international superintendent for infrastructure and storage locations. If you combine these 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? The first part is already given by the work on your long-term vision. The second part is by reflecting again and again on what are the risks and opportunities after the next 5-10 years and what has to happen to minimise the risks and maximise the opportunities.

#### **Make the vision tangible by developing business cases**

For a network organiser like you, it is one thing to obtain commitment from industry (emitters) but the main other thing is to organise credibility of the transport and storage part. Rotterdam has learned that you cannot start too early with developing this credibility and the best thing to do is make a

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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) and try to define a real practical case from a couple of emitting companies to one or more storage facilities and define some real world transport routes in between. This will form the backbone of the approach and will raise potential problems. When done in an early stage, the problems can be tackled easily.

#### **Work together and stimulate companies to take responsibility**

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 but 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 at a set of persons 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? We do not know how to advise that, but in Rotterdam the constitution of the CCS Business Platform under the management of the business association Deltalinqs did function pretty effective and efficient. Such a platform stimulates the 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 have persons there (local personalities are preferred) that talk their (industry) language and can answer questions and think along. What Rotterdam also did was: for every problem they wanted to solve they posted a message for attendance in their email list of the platform. That led to several ad-hoc meetings in which a lot of relevant industrial parties were present.

It is very effective to formalise collaborations with industrial partners that are interested by closing Letters of cooperation (LoCs) or Memorandums of Understanding (MoUs). This gives the network organiser 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 also need seed money to get industry in action. This helps to get private investments of a larger size carried out. The seed money of the city of Rotterdam of about 7 million Euros is already enlarged with a factor of at least 10 by company investments and will very likely be enlarged even more by the coming investments by the industry in demonstration projects.

Your (cluster) project is connected in one way or the other to national or federal/international activities. It is beneficial for your project when you participate in some if not most of these activities; especially when they could have a strategic outcome. In the Rotterdam case they for instance participated with two general storage assessment studies of NOGEP (the Dutch business association for oil and gas exploration and production). Such

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participation serves two direct goals: you are in the front seat when the data become available and you can connect your business case to the scope of the assessment. An indirect benefit is that you create trust and goodwill between the association, the members of the association and your project team and your partners. In the Rotterdam case, this participation led to one of the building blocks (=storage) for the business case infrastructure and storage (2nd version of 2009).

#### **Organise communication and advocacy**

For this issue we refer to the last section of the chapter: §4.4.

### 4.3. Getting Storage available

#### 4.3.1. Storage: the global challenge

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 has appeared to be the (unexpected) showstopper. What did not help those unfortunate projects was a combination of the following factors:

- Long development time (especially for saline aquifers).
- Lack of available expertise (human resources) and integrated tools.
- No harmonised or standardised data acquisition and assessment.
- Uncertainty on financial and legal liability leads to increasing sales prices for storage.
- Public opposition.
- No natural driver to develop storage locations
- No interest from the oil and gas sector to invest in development of CO<sub>2</sub> storage
- Development cost are very high

Finally those factors led either to cost prediction that were too large to cover, or a decision that the risks and uncertainties at this moment were too large to go ahead.

Is that situation improving? What is happening worldwide? We observe the following developments with regards to CO<sub>2</sub> storage:

- **Capacity estimates are becoming better** – There is more experience in carrying out global and regional screening assessments. Standards (e.g. classification system) are being developed. There is a high degree of convergence in estimating the capacity of hydrocarbon fields, and some improvement in estimating saline aquifers capacity.
- **Cost of storage** – The screening of storage locations is affordable (about 100-500k\$ per region). The characterisation and development of a single reservoir can be pretty expensive (>10M\$ onshore; >50M\$ offshore; depends strongly on the quality of the reservoir). The data on the O&M costs during operation are not yet conclusive enough. A great challenge also in terms of costs is liability (financial security). Decreasing the risk and uncertainties around liability will also drive the cost of storage down.
- **Public appreciation of (onshore) storage is low** – There has been a multiplier effect with regards to opposition due to the positive impact of opposition in certain cases (like in the Netherlands Barendrecht and the

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locations in the Northern part of the country). This multiplier has stopped due to the lack of onshore plans. On the other hand the current, decreasing, sense of urgency in the public arena of climate change problem does not help to get CCS and CO<sub>2</sub> storage on the agenda as a necessary technology. For other aspects on support and communication: see §4.4. What we would like to add in this section is: it is a real challenge for a geologist to speak clearly on the subject to a lay audience.

- **More storages locations are being used or developed** – In North America: mostly EOR; Europe: depleted gas field, saline aquifers and maybe EOR; Australia: mostly saline aquifers and some hydrocarbon fields.
- **Legal support** – The European has finalised its CO<sub>2</sub> storage directive in 2009, but only a few countries have implemented the directive. In North America and Australia also some steps have been taken to come to a more complete legislation of CO<sub>2</sub> storage. Outstanding issue: liability for the short and the long term; monitoring the permanence. Some countries, like Canada, have started a standardisation process for CO<sub>2</sub> storage.
- **Skills and experience** – Tools for the characterisation and development of individual reservoirs are in development, but the stage is far from mature. Everywhere we hear people say that there is a lack of capable persons, already right now. Not only to do the technical development, but also on the regulators side and on the side of the financiers. So, there is a real need for human capacity to be expanded; preferably in all directions like finance, legislation and technical occupation (extra education; new curricula; new university disciplines or vocational training schools). Some schools have started recently (e.g. Edinburgh) but more is needed. The current pull on human capacity for shale gas recovery is not in favour of the availability of CO<sub>2</sub> storage experts, now and in the future.
- **Cultural differences between Esector and O&G sector**

This overview of what is happening is not strange, not unexpected; it is rather very typical for the development phase of a starting technology; and CO<sub>2</sub> storage is such a starting technology. Starting technologies need a lot of additional support to become more mature and in the present case the signs are in the good direction, but a lot of challenges need to be tackled in the coming years. Some of them can be started locally; some of them should be addressed more globally.

#### 4.3.2. What can you do to get storage available?

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 and thus the uncertainties can be larger, 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

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feasible, so we stick to one basic rule: **integration and parallel timing of capture, transport and storage is essential**. This gives an explanation of the bottom line. 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 that have to deliver CO<sub>2</sub> capture are focused on capture and all of its problems, it is the responsibility of the cluster developer or the CCS network organiser to achieve and maintain a focus on transport and storage. For the transport issue we refer to §4.2; in this section we will focus on storage. From the argumentation above you can also conclude that the main task of the network organiser is to develop a portfolio of storage “prospects” (plural!!) right from the start. And next to that main task, the organiser has to influence the environment<sup>13</sup> to become more active on supporting storage. We will give suggestions to improve your performance for both types of activities.

#### **Achieving a portfolio of storage prospects<sup>14</sup>**

- The network organiser 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 in your region 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 best way to choose them is by connection to other developments and opportunities. The question here is whether an emitter of a storage provider (an E&P operator) needs to have the lead to do the detailed analysis or that the network organiser will take this part of the work. See the text box in this section to connect to our 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, the network organiser will play the role of initiator, booster or supporter of this process, but the core of the decision-making (and the implementation in reality) should be done by the private parties that are developing their (part of the) CCS business case.

<sup>13</sup> 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.

<sup>14</sup> An even more detailed method to carry out the first steps to come to a storage portfolio is given in reference [10].

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#### 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 we brought together parties from both sides: emitters and storage operators. This resulted in carrying out the ISA (Independent Storage Assessment) study (see reference [9]). This study was carried out with financial support from the Institute and personal support from the Clinton Climate Initiative (CCI). Replicating the ISA approach for your own region can be very helpful. In reference [10] the methodology to do so is explained extensively.

Some practical things we 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 costs about 1 million Euros in our 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.

#### Influences the supporting environment

What is important to support the development of storage sites? We think the following aspects are the most important:

- **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<sub>2</sub>. The Network Organiser 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 following discussion and advocated their case accordingly.
- **International Strategy** – In the regions around the North Sea, but maybe also elsewhere in the world, CO<sub>2</sub> 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<sub>2</sub>. How to organise the infrastructure that you plan to connect storage locations today in such a way that

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it helps to come to those future reservoirs as well? In such a case, there is a strong need for a common approach and strategy and one may need a European 'superintendent' to manage storage availability on the North Sea. What can a Network Organiser do in such a case where international coordination seems necessary? He can work together with network organisers in similar regions and active private project developers and try to come to agreement with them on what the common priorities for developing a transnational storage and infrastructure network are. Such cross-border regional cooperation can influence national government, and in the European case the European Commission to act in a coordinated manner. Rotterdam was for instance founding member of the EU CCS Regions Network; a collaborative group of CCS regions that have a mission to exchange experience and to influence the decision 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<sub>2</sub> Storage Directive). The Network organiser can help these authorities by supplying the experience and knowledge he has gathered in his organisation and by his partners. In most cases that is the kind of practical knowledge that the authorities or regulators themselves are missing and we 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<sub>2</sub> storage experts. We 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<sub>2</sub> storage as much as possible. In our case we could also make use of the outreach and study opportunities of the national CCS research program (CATO2); try to find such opportunities in your region or country as well. The exchange of all issues around CCS is necessary (see also §4.2 about constituting a business platform) 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 across the national borders.

## 4.4. Communication and support

### 4.4.1. Public awareness: the current context

Public awareness has received a lot of attention the last year, mainly caused by the "sudden appearance" of evident public opposition against a couple of CO<sub>2</sub> storage projects onshore. We first describe what we think are the highlights of the current context with relation to public awareness, perception and support.

#### **General public and attitude towards CCS**

From experience and scientific research we know that uninformed opinions are contingent: they are easily influenced and not stable. The general public has very little knowledge of climate change and energy problems and even less on the technical aspects of energy technologies. So their opinion about these issues is, nearly by definition, contingent; a simple opinion poll on CCS

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is thus useless. From communication theory we also know that the “recipients” of messages mostly do not process information unless they are very motivated. When they are not motivated they assess information by using simple schemes (cues): Do I like or trust the sender? Is the information brief? How many arguments do they use (the more the better)? Is a celebrity involved? Does he or she look like an expert? Etc. But there is more knowledge: CCS is unknown in most parts of the world. And when a person learns from it he or she does not rank it high. So (lay) persons in general are not very motivated to process information on CCS and they will use cues to assess the information. This attitude can change when they are faced with a CCS activity in their vicinity.

#### **Lessons from the Barendrecht CO<sub>2</sub> storage project**

The main thing we learned is that not only the residents are not ready to discuss and receive a CCS project, but also the CCS community itself is also not ready to start a dialogue on a project.

**Residents** – For the residents this was and is a project that is new, unknown, never done before. They were also not aware of what CCS is and what it signifies and they do not have a clue on why CCS could benefit them or the Netherlands or Europe. This combination of unfamiliarity and lack of benefits can trigger any audience into opposition, not much is needed for that trigger. A couple of “mishaps” in the process combined with the unpreparedness of the proponents were more than enough to indeed trigger the opposition.

**CCS Community** – The CCS community was also not ready to start a dialogue:

- They did not really appreciate and assess the fact that the general public is unfamiliar with all aspects of CCS. It does not make sense to communicate on CCS when there is not a broad public knowledge on or familiarity with the social issues it relates to (energy availability and security; climate change). CCS cannot be understood if you do not have a clue on solving the energy and climate change problems.
- They did not really contemplate and reflect on the fact that this project was a demonstration project and THUS should have corresponding risk assessments. Especially on the local side, no specific risk assessment was made: What is the local situation and what problems do residents and authorities face at this moment? Is there a value proposition possible? How do the residents perceive the credibility of the national government or Shell? Also no risks assessment was made by the national government to fit the desired plans for onshore storage into the broad development needs for CCS as a whole. The simple question “What is the risk that this project does trigger such a large opposition that we need to cancel the project?” was never asked. The common view in the CCS community was that onshore storage was the logic next step and worries of residents were perceived to be futile. Even if the necessity of CCS could have been made clear, you have to take into consideration that local persons perceive a balance of cost and benefits. In the Barendrecht case, they only perceived costs. Achieving a more balanced outcome is essential. And when that is not a possible outcome, you have to take that as an added risk for failure.

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- The third part that was not ready was the communication approach itself. Not the main bottleneck, but still it did have its impact. One unique aspect was that Shell started the communication whilst the (confidential) tender process was still going on. Shell thus placed the national government in the role of not really being able to participate in the communication process. A more general aspect was that the role of (the lack of) confidence and trust towards the different stakeholders was somewhat underestimated.

What can we learn from this? At first that it does not make sense to start a dialogue on a CCS project when there is no common ground for the need and necessity of CCS in general. Second, that it is necessary to make proper risk assessments: (i) of the intended policy option and the intended projects, (ii) of the local situation and (iii) of the communication or dialogue context. And that is necessary to act accordingly, also when that results in postponing the project to a later date or cancel it.

#### **Present situation on public support**

In many countries there is no public consensus on the need and necessity of CCS. The knowledge situation on CCS is very diverse: peer reviewed analyses can be found but 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 NGOs is not always very constructive and a possible lack of mutual trust is not the most obvious starting position. What we do know is that if that relation was good and if they would cooperate and develop a shared information supply (consistent message) this would lead to more confidence and trust by the public and would make CCS a more technology. What we do observe that there is a flavour of success for opposition: in Barendrecht, in Germany, in the USA and the Northern part of the Netherlands (all onshore). This gives hope for opposing parties. What also can be observed is an increase in the distrust in certain parties (industry and public authorities). And since these two parties are the most likely ones that start, initiate or support a CCS project, this certainly does not ease the challenge. At this moment in time people confronted with a local storage project will be triggered to look for and find information that helps them to oppose. The current situation, therefore, does not favour CCS projects.

#### **4.4.2. What can you do to improve communication and support?<sup>15</sup>**

There is also some positive news. Since 2007, Rotterdam has succeeded in sending the message in such a way that the media presented the Rotterdam CCS activities with a positive attitude. The communication strategy of Rotterdam thus had the intended positive effects. What did we assess as the positive elements of our communication and advocacy approach? We call it the mix of credibility and visibility.

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<sup>15</sup> We will give you here suggestions for improvement based on our Rotterdam experience. More suggestions, experience and guidelines for communication can be found on the Internet, see reference [13].

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#### **Credibility: explain your vision, show what you do and collaborate with all relevant stakeholders**

- Start with a general local or regional vision and goal towards energy and climate change. Analyse what you need to achieve to reach that goal. Only when that analysis is reliable and the outcome is that in your situation 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 reduction for CO<sub>2</sub> in 2025. The scenario analysis showed that our industry is such that we cannot reach such a target without substantial use of CCS.
- Make CCS part of all general means of communication (website, presentations, annual reports), along with energy efficiency and renewable energy. CCS is 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 more focused on single issues than on the broader backgrounds.
- 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 relation with the media with a positive image. The credibility of the report and of the RCI has been highly increased by a consultation of Dutch CCS experts (report 2008) and the external verification of Foster Wheeler and Climate Change Capital (report 2009).
- 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 reflexive information (like strengths and weaknesses from their perception) and you can keep them updated on your progress and ask you direct questions on that right away. It is even better if they can become part of the consortium that develops the cluster project, but it is not necessary. You can also try to write a (newspaper) article with them.

#### Visibility: developing an effective communication and advocacy plan

- 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.
  - Make basic storylines on CCS, incorporated in the broader context, such as energy efficiency and renewable energy.
  - The main messages that everybody has to use when to communicate 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, etc.
  - A communication and advocacy agenda for the next year.
  - Scan the media on (at least) a weekly basis, so that you know about changes in issues and opinions.

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## CHAPTER

### What can you learn from it?

- An analysis of the likely events of next semester and the opportunity and necessity to combine those events with a communication or advocacy action.
- Q&A's: 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 4 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 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.

You may think that is a lot, and it certainly needs some attention but the main analyses you only have to do once. Nevertheless, the environment continues to move and you have to update yourself, your messages and your approach. In Rotterdam we have used this approach and it sure helps.

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## Discussion

### 5. Discussion

The aim of the case study was to assess the development of the Rotterdam cluster project (=RCP) between 2006 and 2011. The case study should give insight in what worked well, what did not work and how it can be approved. Therefore, the study should not only result in a storyline, but also an in-depth analysis of how these events had shaped the RCP. Furthermore, we wanted to give insights in how people with different backgrounds or mandates (i.e. perspectives) judged the developments. What is important for them? Understanding these different perspectives will help to apprehend opinions and actions of other stakeholders and raise common awareness on how to develop these kinds of projects.

In this chapter we reflect on the case study and the case study approach. We will start with a discussion on the theoretical concepts we used and their application in the case study (§5.1). In the next section we will discuss the results of the case study: are they truthful, relevant and intelligible (§5.2)? The question of intelligibility or clear and understandable language is an aspect that we tried to cover in the workshops that were part of the case study. In §5.3 we will reflect on these activities and also draw conclusions for knowledge sharing in general. We will complete the chapter with two sets of recommendations: one on the method and one on (the follow-up of) the present case study (§5.4).

#### 5.1. On the theory and method used and its application

Key in such extensive case studies like the current one is the availability of information. The first source of information is newspapers articles. The assumption is that these articles at least describe the most important events in the development of the RCP and therefore provide a good starting point for the general frame of the evaluation. The second source is the archive of the DCMR<sup>16</sup>, which contains all formal and informal documents related to all activities of DCMR. The DCMR is involved in the RCI since the very beginning and has a lot of documentation on this. Next to the documents, the “organisational memory” of the DCMR (embedded in persons still working there) is very helpful in getting the information that was not documented. The third information source is the outcome of interviews with person involved in the various aspects of the RCP. The main purpose of the interviews was to obtain a personal view of the interviewees on the process of the RCP, and its strengths and weaknesses. In addition, some of the interviews were also used to validate the storyline or to fill gaps in the storyline.

For every source of information an analysis has been performed: a media analysis (for the newspaper articles), a document analysis (for the internal DCMR documents) and an interview analysis. These analyses were not only focussed on general judgements or strengths and weaknesses but also on the evaluation of the development of the RCP within the chosen theoretical

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<sup>16</sup> As you may already know, the DCMR is the EPA of the city of Rotterdam and its surrounding municipalities. The DCMR is one of the four partners of the RCI.

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framework. That last part of the analysis we call the assessment of the functional development of the RCP<sup>17</sup>. We will assess the outcome and the performance of each of the three analytical methods in the section below.

### 5.1.1. Media analysis

In the media analysis national newspapers were searched on information on the developments of CCS in the Rotterdam area. Only the articles that referred to RCI or RCP were included in the analysis. The media analysis resulted in two deliverables: a narrative describing the most important events and an analysis of the functional development of the project.

The media analysis gives insight on the topics and events that were broadcasted on a national level. This attracts attention and also discussion on the national level. Most of the articles were in the form of interviews with RCI delegates, politicians, experts and NGOs concerning the development of the RCP. These articles fed the discussions around CCS on the contribution to national CO<sub>2</sub> reducing targets, economical potential and safety. The newspapers extensively covered the unrest around the CCS project in Barendrecht. In that same period hardly any information on the progress in the RCP was reported. Although the Barendrecht project is not officially part of the RCP, it was included in the media analysis. We also discovered to our surprise that the (mainly negative) media attention for Barendrecht did not affect the assessment in the newspapers of the RCP (which was and is mainly neutral to positive).

The media analysis is an important part of the current case study as it gives a very specific view on what is regarded (by the newspaper editors) as the most important issues around the RCP development. There is also a downside to focus on newspaper articles in a case study and that is that a lot of events regarding the case were not found newsworthy. This means that the media analysis alone will not give a complete picture on the developments of the RCP.

#### **Performance**

The media analysis included all newspaper articles between 2004 and 2010 that were found with different search queries. From these articles, events were selected and categorized in one of the seven functions of the theoretical framework. The categorization in functions is difficult, since there are no sharp-defined boundaries between the seven functions. The perception of the analyser can therefore influence the outcomes of the analysis. The same person, therefore, checked the analyses (both media and document) to guarantee consistency.

The execution of the analysis itself was internally assessed to be good (adequate and relevant). The outcome of the analysis was also judged to be good and useful.

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<sup>17</sup> For more information on the theoretical framework: see the research plan (ref. [1]). We called that framework the Innovation Management approach. The core assumption of that framework is that every technological innovations system consists of 7 essential functions. The quality and the mutual relations of those functions define the success of such a system.

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### 5.1.2. Document analysis

The document analysis included all DCMR documents that concerned CCS within the RCI. These documents varied from e-mails and minutes of meetings to strategic documents. More than more than 1800 documents were found and scanned on usefulness. Eventually about 300 documents were analysed resulting in over 600 events. The document analysis resulted in two deliverables: a narrative describing the most important events and an analysis of the functional development of the project.

The document analysis is a very important part of this evaluation. Almost all information that is relevant was included in the analysis (except for confidential documents of third parties or non-documented personal communication). The document analysis would be the best way of getting insights on what happened, what was important and what actions were taken. Besides that, it also could show how strategies on advocacy are developed and how the communication around the Barendrecht-project should be handled.

#### **Performance**

The document analysis is essentially performed in the same way as the media analysis: the documents that include information on the development of the RCP were included, scanned on events and these events were included in the analysis. As mentioned above, there were a lot of documents available and much of them included information on the RCP. It was clear very soon after the start of this analysis that including all documents would take simply too much time. Therefore, the project team decided to focus on the minutes of team meetings first and from there expand the number of documents if more information was needed. Still, this was a lot of work. Two persons were appointed to scan and select the documents, filter the events and categorize them into the functions. Also here unclear definition of the functions gave some problems in the categorization of the events. Quality control at the end of the assessment ensured a consistent categorization in the document analysis (similar to the media analysis). Other issues that had an influence on this analysis were that not all documents were available (e.g. minutes) and that some documents were incomplete or non-comprehensible.

The initially budgeted hours for the document analysis were by far not enough to complete the analysis. Therefore it was decided to focus only on distillation of the narrative functional development in the document analysis and not on the functional development. Although the functional analysis was not the most important part of the project, it could have given very interesting insights in the development of the RCP but that part of the research could not be completed with sufficient confidence in the results.

The execution of the analysis itself was internally assessed to be poor: the documents found were relevant and adequate, but the categorisation and the functional analysis could not be completed with sufficient confidence. And next to that there was a large overspending of the budget for this piece of work. The outcome of the analysis was, however, judged to be good and useful. The added value of the current outcome of the analysis was large

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enough to be able to obtain a much better storyline and a better appreciation of the development of the RCP. For the future: one should develop a more effective way to operationalize document analyses for these types of case studies. There is a lot to improve here.

### 5.1.3. Interview analysis

After performing the media and document analysis a large part of the analysis was completed. Still, as mentioned in the document analysis, not all the relevant information seemed to be captured in the documents. Therefore interviews with different people from various organisations were carried out.

Interviews with involved people are very important to give the analysis the right focus and increase understanding of choices and developments. Interviews were also very important to complete and validate the narrative. Furthermore, the interviews were important to obtain insights in the perspectives. The interviewees were chosen and categorized based on their role during the development of the RCP.

#### **Performance**

The interviews were divided in three groups. The first group included people that were involved in the development of the RCP since the initial phase. Their contribution was mainly to fill the gaps in the narrative after the media and document analysis. The second group consisted of people that were involved in the development of the RCP but not part of the RCI. This group was asked to give their view on the development of the RCP. The third group consists of some high-level people that were involved directly in the RCI. They were also asked to give their view of the development the RCP and to check the constructed narrative. All targeted people / organizations did cooperate in the interviews without any hesitation.

The analysis of the interviews gave a good understanding of the different perspectives of the interviewed persons.

### 5.1.4. Reflection

Despite some difficulties in the performance, the results of the three analyses were satisfying. The main purpose of the case study was to construct a narrative of the RCP developments and to get insight in the different perspectives depending on a person's function in the process. An extra dimension could have been achieved if the functional analysis on the document database could have been completed with sufficient confidence. The database itself had been constructed, but there was not enough time to do an extensive evaluation of the quality of the data. In §5.4 recommendations will be given for further research.

During the performance of the media and document analysis it occurred that each analyst had his own idea on categorising events into functions. This has increased the amount of time spent on these analyses. It is therefore important to set rules for the categorisation of the events into functions. This could result in a codebook or a manual so that different persons will get the same result.

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The interviews that were held mostly took an hour or even longer. This time was needed to obtain as much information from the interviews. As the elaboration of these interviews took a lot of time, the project team outsourced this part. Unfortunately, that did not always work. As the interviews were full of jargon and specific information on projects, it was very difficult to have the interviews elaborated by persons that are not active in the CCS field.

## 5.2. On the results of the present case study

In the previous section we have explained what did and what did not function from a more methodological perspective. This section is dedicated to discussing the value of the results. In this respect we want to divide this discussion in the following parts: (i) truthfulness or credibility, (ii) relevancy for RCI, (iii) relevancy for other CCS (cluster) project initiators, and (iv) formatting of results into text in normal Dutch and English. There are probably also other aspects of the results of the case study to be discussed but we think these four are the most important ones for now and they more or less describe our main struggles in this project<sup>18</sup>.

### 5.2.1. Truthfulness or credibility

It is one thing to study newspapers, TV broadcasts and internal documents of one of the participating parties in the Rotterdam CCS project. It is another thing to draw truthful or credible conclusions. The persons doing that part of the study were not personally involved in the Rotterdam project. They drew causal relations from the events they studied; that even was their assignment. But they very often drew relations that did not occur in reality. That seems to be normal in this kind of studies: the basic idea is how to establish checks and balances to obtain a truthful description of the events and the causal relation between the events (if any). At the start, we thought that the combination of embedding the project team in the CCS team of DCMR and the use of interviews as additions and checks to the analysis would be good enough. But the analysis of the interviews and the exploration with the four perspectives (see chapter 3) taught us that there are far more possible perceptions on the events and their causal relations. At least the view of the own RCI partners had to be included to give a more accurate account of the intentions of all RCI partners. This addition was established by assessment interviews of the members of the RCI Steering Committee. These interviews were carried out in October 2011. Their input has been accounted for in this report. All together this means that the current phrasing of the storyline and the lessons learnt are truthful from the point of view of all the RCI partners. What we do not know with enough certainty to come to a more complete evaluation is whether external parties with a close link to the Rotterdam project assess the results as truthful. In §5.4.2 we will describe what you could do to address that issue. This learned us at least: (i) creating a sensible and accurate storyline is very time consuming and complex and (ii) the supporters of the Learning History approach are right at least with respect to the construction of a storyline that has to be in their terms a common product of all involved.

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<sup>18</sup> For other elements: see the section on recommendations in this chapter, §5.4.

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Does this mean that the results of the present case study are not credible or relevant? We do not think so. In the next two sections we will cover the issue of relevancy. In this paragraph we would like to state that there might be some differences in the valuation of some parts of the history of the Rotterdam case. But, the overall outcome on lessons learnt proved to be very solid. We got growing confidence in those lessons during the workshops (see §5.3), they were confirmed in our interviews and there were again confirmed in the most recent interviews with the members of the RCI CCS Steering Committee.

### 5.2.2. Relevancy for RCI

The relevancy for the RCI was twofold: Rotterdam wanted their experience to help others and it also wanted to learn how to improve the current approach. The first part was successful and thus satisfied the needs of Rotterdam. The second part is somewhat lagging behind, as it always does. In case you want to carry out a sensible and relevant evaluation, you need some time to agree together on the facts, the method and the results. Due to the surplus of time the case study already took we were not in a position to do that part of the evaluation in parallel with the analysis. This project should have a follow-up with respect to the evaluation of the Rotterdam approach (see §5.4.2 for a concrete proposal).

### 5.2.3. Relevancy for other CCS (cluster) project initiators

When we assess the outcomes of the workshops (see §5.3) and value the different contacts we have and have had during the last year: there is a real value for others. What we also have learned is that although this text could be the most perfect one with all lessons as a step-by-step cookbook (which it is not!), even then others will only use it when they will properly be “led by the hand”: they must be aware of the report, they must be aware of the value of the report and they must see that certain steps could help in their context. That will not happen naturally, in most normal cases this report will end up as most reports: on the heap or on the shelf.

So, we assume the report is relevant or very relevant to CCS project initiators. But we also have experienced that you need some person to person contact before the “recipient” will be amenable to use it and even more contact before he or she can use it properly. In short, you need on site outreach (or what we would call tailor made workshops).

### 5.2.4. Formatting of results into sensible and compact texts in normal Dutch or English

The first two months of the research were spent mainly with gathering the relevant information and categorising them. That was the diverging stage in which the numbers of data grow, sometimes exponentially. From a theoretical perspective the converging phase was not very difficult as long as you could attribute events to functions. The “only”<sup>19</sup> thing you had to do is count to come to results. The translation of the analytical results back to normal

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<sup>19</sup> See §5.1 to know that this is an overly simplified statement.

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language was not easy. The first step seemed easy: choosing the key events. This was easy if you only wanted to have for instance the five events that had the most impact on other events (in such a case the media analysis probably is more than sufficient). But if you wanted to dig one level deeper it became clear that the definition of a theoretical event and a causal relation between them is somewhat else than an event or a cause in normal language. And then we do not even mention the translation of the other theoretical concept (like functions of the innovation system) into normal language. To keep the explanation short: it took us much time to translate the results of the analysis into stories and explanation that interested CCS project participants could read. What helped much was doing this kind of translations in parallel with interviews and workshops (so you are able to test whether some results can be understood).

### 5.3. On the workshops and on knowledge sharing

The main function of the current case study for the Institute was and is that the results will support one of the main goals of the Institute and thus help the development of CCS (cluster) projects elsewhere. The project team of the case study (=we) took that challenge serious right from the start. We wanted to draw lessons from the Rotterdam case study that are useful for other CCS project developers. Already in the research plan we tried to incorporate that goal of usefulness. We also assessed that in order to be useful, that the messages or lessons must be understood by the “other” and must be relevant for him or her. That is why we incorporated exchange workshops into the project, already during the research<sup>20</sup>. We will describe below what we learned from these workshops and what these lessons can imply for improving knowledge sharing.

#### 5.3.1. Workshops and lessons from them

We had a first workshop in Leeds in February 2011 with the main persons involved in CCS in CO<sub>2</sub>Sense. This workshop was a good test case for the other workshops to follow and it proved both relevant and understandable for the audience. And more than we had expected, there was a lot of interaction and we also learned a lot from their CCS approach. We had four additional workshops in April 2011: in Melbourne and in Perth in Australia, in Seoul in South Korea, and in Tokyo in Japan.

What did we learn from those workshops? In a more general sense we can say that the guidelines in chapter 4 of this report have been formed for about 50% in the research and thus the other half stems directly from the interaction with the CCS people in the workshops. Without the workshops, the lessons learned and the guidelines would not have become this clear and relevant. We think that part of the workshop approach had a much better result than we expected one year ago.

We also learned that the best suitable format for such kind of exchange workshops very much depends on three factor: (i) the knowledge, experience and background of the audience; (ii) the stage of development of the CCS

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<sup>20</sup> See reference [1] for a more complete description of how we wanted to organise this part of the project.

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project in that region and their current needs and (iii) the cultural and local habits. These factors might seem obvious but most conferences, symposia or workshops that we have attended do not really take these factors into account. We explain what we did with respect to these three factors.

### **Audience**

If, for instance, the audience has a very heterogeneous background, you need a different approach and content than when the audience exists of purely reservoir engineers. Our approach here was:

1. Split between an informative part in the morning and an interactive part in the afternoon
2. The audience of the morning could be as large and diverse as the host wanted: the messages in that part should be clear for all.
3. The audience of the interactive part should be small (10-20 persons) and the number of subjects limited to a maximum of three. The audience should preferably have hands on experience with developing a cluster approach or a CCS project.

From the evaluation forms we conclude that this approach led to successful and relevant workshops that connected to the needs of the participants and that the format of the workshops was relatively well chosen to serve the different audiences. In the separate team assessment, we observed a difference in the level of interaction between the different workshops. Those host regions that were closest in development to Rotterdam (Leeds and Perth) had the most lively and pertinent discussion. And, although the evaluation scores were pretty high, we still think that there can be improvement with respect to enhanced connection to the audience. A lesson we also learned is that you need to focus even more on the composition of the audience and on the quantity of persons when you want to have a good interaction and workshop on a single issue.

### **Current needs of the host audience**

In our workshops, we also focused on the present need of the recipients, the host regions. We asked the host in advance to choose subjects from a menu list: lessons learnt from Rotterdam we thought were relevant for others. In that sense the content of the workshop was tailor made in interaction with the host. After the workshops we have had much explicit appreciations with respect to

What did the host audience choose? Their choice indicates their assumptions on the attractive lessons from Rotterdam and thus gives an idea on the perception one has of the strengths of the Rotterdam approach. We conclude from the expectations of the host audience that Rotterdam is excellent in three issues: (1) organising a hub, (2) mobilisation of financial and other means and (3) getting storage available. And that Rotterdam is “well-known” about another one (public perception), due to the media attention and the cancellation of the Barendrecht CO<sub>2</sub> storage project. We guess that the audience also expects that these are major activities in Rotterdam with large practical experience and that the audience could learn a lot from Rotterdam on these subjects. In the workshops we could feel that they expected a lot of output for these subjects. The evaluation forms proved that they were satisfied. We also assessed the appreciation on the effectiveness of the workshops subjects: what subjects and approaches did the audience find most useful? If we look at the evaluation forms, we see a

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variety of opinions, none of them negative however. But there is no clear favourite subject with respect to relevance or the effectiveness of the interactive format. There is a slight preference per location. Leeds favoured the public perception issue; Melbourne the hub approach and Perth the general lessons learnt. When we combine that with our own reflection, we guess the preference is also partly due to fact that the audience-presenter relation in some way or the other was in better harmony. Overall the workshops were assessed to be useful to very useful. So in general you could conclude that the approach to connect the workshop to the needs of the audience was successful. It also helped to improve the focus of our project: we could more easily define what the audience expects to be relevant. The division in chapter 4 (on lessons learnt) is an exact copy of what is seen by our audiences in the workshops as the most relevant issues from the Rotterdam case.

### **Cultural and local habits**

At the start of the project we were rather sensitive on this issue: does it really make sense to phrase the lessons we learned from the Rotterdam case and tell it to someone with a totally different culture or local habits. The way we organise things in the Netherlands are different from the way they do it in Japan or even the United Kingdom. We wanted to write a discussion paper on this subject<sup>21</sup> and after a first start, we noticed that the literature on this subject was very vast. It was too vast and too complex for us and for our precious time in this project to be able to deal with that subject in a sensible way. After consulting our project principals, we have chosen the approach of trial and error: let us see how it works in practice. In retrospect, this was the best choice we could have made because we have not seen or heard any real barriers in this respect (the direct appreciations were very good; the follow-up on the contacts was also good and we did not notice any substantial cultural or local “translation” errors). We observed later in the follow-up contacts that some details were misunderstood. What we did learn was that:

1. You need to take your time to test whether the audience is on the same page, especially in the case of some central issues or lessons. That can mean that you ask further questions, or you summarise what you have seen or you ask somebody in the audience to summarise, or you ask the translator/interpreter to rephrase some content in the own language or in English.
2. Take your time to let the audience explain what they have done (and use an interpreter as much as possible; because when they tell in their own language the others of the audience understand better and can support or question the phrasing of the presenter in a better way).
3. In the workshops in Asia (Seoul and Tokyo) we have learned that when you stick to doing the first two lessons, interactive approaches are manageable, interesting and relevant.
4. It helps when you have a smaller group (10-20 persons), because it makes it easier for the moderator to observe whether everybody is connected. But that assumes a moderator with good empathic skills. Although not very well trained in that respect we were able to fulfil that function together with the moderating persons from the host and the Institute.

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21 See our research plan (ref [1], pp.26-28) on the subject of Translation.

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5. It helps to obtain a written report of the meeting from the side of the host organisation. With such a report you can check whether any “translation errors” did occur.

All in all, we think that the chosen approach was effective and that no special (theoretical) attention needs to be paid to cultural difference in knowledge sharing. It does, however, make sense that there will be more information available in the native languages of those that initiate CCS projects and that there is a good exchange process developed to fit that information to their needs. Our workshop approach can be used as a successful example of how to do that kind of exchange.

### 5.3.2. What can be improved in knowledge sharing?

The first things we would like to share with the CCS community and with the Institute are the following:

- Knowledge sharing is more fun when you do it in practice and is also more effective when you do that in a real dialogue with real people who have a similar task.
- Knowledge sharing is much more than exchanging information; it is more about sharing the experience on the process: how did you do it and what was the effect. Knowledge sharing in most cases has no relation whatsoever with intellectual property rights (IPR). So, do not be reluctant on sharing knowledge even in this nearly commercial phase of CCS.

What conclusions could you draw from our experience to even further increase the effectiveness of the knowledge sharing activities of the Institute?

- Written material should be completed with practical training sessions. A report is especially attractive to those who need it and know how to use it. From information processing theory you can learn that written material is never used without that kind of motivation. From our workshops and the enthusiasm of the audience and the project team you can observe that this kind of exchange really works, and also has had some follow up contacts and exchanges.
- Organise more meetings on relevant issues and combine that with a lot of “empty” time. There is no better way to exchange experience with people you know and trust. A lot of people in the CCS world do not really know each other and certainly they do not know the real expertise of the others. Our workshops, especially the ones with a dinner afterwards, have learnt that sensible meetings and some agreeable “empty” time make a lot of difference with regards to relation building and trust.

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### 5.4. Recommendations

Although the case study as described in the Funding Agreement with the Institute is now finished, we have seen a couple of opportunities to define a follow-up. They will be described below. The good news is that we also have found a way to organise and finance the follow up under the umbrella of the Dutch National Research Program CATO2. The first thing we will do in 2012 is to complete the research plan for that activity and the items mentioned below will be the core items of that plan.

#### 5.4.1. Method/theory

The used method gives a very extensive and detailed view on the developments of the RCP. Especially the document analysis has an important contribution to that. The interviews and the analysis on the different roles and perspectives of involved persons contributed to a better understanding of why the developments went this way.

The methodology can be used on other projects as well, especially CCS network projects that are comparable to the Rotterdam project. Gaining a better and deeper understanding of the developments enables learning and helps to renew focus on what needs to be done and how that should be approached. Especially in combination with the findings on the RCP as written down in this report can stimulate learning in other projects.

Using a methodology like the Theory of Innovation Systems is in our experience very useful when evaluating these kinds of complex projects. In this project entrepreneurial activities, policy and technology development all came together. Obtaining a clear view on what has happened in a certain period is then a difficult task. The Theory of Innovation Systems is then a helpful and powerful method to structure the analysis. The methodology provides a good structure and basis for the formulation of lessons learned and improvements. The main disadvantage of this theory is that it is not designed for these kinds of project analyses. Improvements, such as adaption of functions to the scope of projects (i.e. more suitable for micro analysis instead of macro analysis) and a clear code book on how to categorise events in functions would make the theory more useable for these kind of project analysis.

#### 5.4.2. Present case study

The results this far are, we think, more than suitable and attractive enough for the target group that the Institute wants to cover: CCS (cluster) project developers all over the world. But there is at least one party that is not served well enough: the RCI<sup>22</sup>. This entity will get a closer evaluation document in Q1 of 2012. We also need to have a closer assessment of the storyline by all those involved. Is every relevant detail in? And is the description that we have now truthful and clear from their perspective? Both actions will need some time and we intend to do some workshops with internal persons as well. Not only because we want a credible document, but also we want to have a firmer backing of the content and the conclusion by

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<sup>22</sup> For a more complete description: see §5.2.2.

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all the persons concerned in Rotterdam. We think that the process of interactive evaluation and the completion of the storyline need to be one package for internal consultation. In this process we will also test the truthfulness of the different outcomes of the present case study by interviewing external persons who had some links with the Rotterdam project.

As a co-result of the discussion on the method and the likelihood of the fact that a study on lessons learned from the CO<sub>2</sub> storage case in the northern part of the Netherlands will be carried out based on the method of Learning Histories (LH): we would like to take some time to have a detailed discussion with the project team of the LH Team. We hope that will deliver mutual benefits: we learn from their experience how to improve the research of the current case and they learn from our experience to use an even more effective method right from the start.

The last issue is the completion of the document analysis from the theoretical viewpoint. We now could conclude that the set of documents is complete enough, but the functional analysis has not been completed in a satisfying way (see above). So the next step we want to do is a re-assessment of the current set of documents based on a predefined codebook for the analysis. We assume that we now have, in retrospect, enough expertise to define an effective and relevant codebook. Two things must thus be realised in 2012: (i) elaboration and recording of the codebook and (ii) the re-assessment of the existing database of documents.

## References

### References

Some of the refereced documents have a direct link to their web address.

#### On the Case Study

- [1] Barend van Engelenburg, Rotterdam CCS Network Project - Case Study on 'Lessons learnt' - Deliverable 1: The methodology and plan of the research, DCMR, December 2010. [LINK](#)
  - [2] Barend van Engelenburg, Rotterdam CCS Network project – Case Study on 'Lessons learnt' – interim slide report, DCMR, August 2011. [LINK](#)
- To be found on the website: [www.globalccsinstitute.com](http://www.globalccsinstitute.com).

#### Rotterdam Climate Initiative (RCI)

- [3] RCI CCS Report no. 1, 2007, CO<sub>2</sub> capture and storage in Rotterdam (in Dutch only). An executive summary in English is available under the name "The route to large scale CO<sub>2</sub> Capture and Transport in the Rotterdam Harbour Industrial Complex".
- [4] RCI CCS Report no. 2, 2008, CO<sub>2</sub> capture, transport and storage in Rotterdam, Report 2008.
- [5] RCI CCS Report no. 3, 2009, CO<sub>2</sub> capture, transport and storage in Rotterdam, Report 2009. [LINK](#)
- [6] RCI CCS Report no. 4, 2010, CO<sub>2</sub> capture and storage in Rotterdam – A Network Approach. [LINK](#)
- [7] RCI CCS Report no. 5, 2011, CO<sub>2</sub> capture and storage in Rotterdam – A Network Approach, 2nd updated edition. [LINK](#)

To be found on the website: [www.rotterdamclimateinitiative.nl](http://www.rotterdamclimateinitiative.nl) or contact the author.

#### Recent reports related to Rotterdam CCS activities

- [8] VOPAK et al, 2011, Business Case on the Liquid Logistics Shipping Concept.
  - [9] TNO, 2011, Independent storage assessment of offshore CO<sub>2</sub> storage options for Rotterdam - Summary report.
  - [10] TNO et al, 2011, CO<sub>2</sub> storage capacity assessment methodology.
- To be found on the website: [www.globalccsinstitute.com](http://www.globalccsinstitute.com).

#### Other publications

- [11] Van Alphen, 2011, Accelerating the Development and Deployment of Carbon Capture and Storage Technologies – an Innovation System Perspective, PhD thesis, Utrecht University, March 2011 (for an overview of the Innovation Management Approach applied to the CCS Case).
- [12] Global CCS Institute, 2011, The Global Status of CCS: 2011 (for an overview of the development of CCS at this moment).
- [13] Various authors: reports and guidelines on public engagement at the website of the Global CCS Institute (under key topic Public Engagement, see Publication tab).

The project team has written down their results in interim documents and databases full with events. Please contact the project leader (see colophon) if you want to achieve more information.

## Abbreviations

<b>CINTRA</b>	CO <sub>2</sub> In Transport
<b>EEPR</b>	European Energy Programme for Recovery
<b>EOR</b>	Enhanced Oil Recovery
<b>EU</b>	European Union
<b>FEED study</b>	Front End Engineering Design study
<b>FID</b>	Final Investment Decision
<b>ISA</b>	Independent Storage Assessment
<b>LoC</b>	Letter of Cooperation
<b>NER300</b>	New Entrants Reserve 300 Package
<b>R3CP</b>	Rotterdam CO <sub>2</sub> Common Carrier Pipeline

## Companies and CCs projects

(in this report, in alphabetical order)

Abengoa, Air Liquide, Air Products, Anthony Veder, CINTRA, Electrabel, E.On, Gasunie, GdF Suez, Maersk, OCAP, Pegasus, ROAD, SEQ International, Shell, Stedin, TAQA, Vopak

## Colophon

### Rotterdam Climate Initiative

Improving the climate for the benefit of people, the environment and the economy; that is the challenge confronted by the collective initiators: Port of Rotterdam, the City of Rotterdam, port and industries' association Deltaliqqs and DCMR -Environmental Protection Agency Rijnmond. The Rotterdam Climate Initiative creates a movement in which government, organizations, companies, knowledge institutions and citizens collaborate to achieve a fifty per cent reduction of CO<sub>2</sub> emissions, adapt to climate change, and promote the economy in the Rotterdam region ([www.rotterdamclimateinitiative.nl](http://www.rotterdamclimateinitiative.nl))



### Publication

Rotterdam CCS Cluster Project  
Case Study on 'lessons learnt'  
Final Report

### Research

DCMR Environmental Protection Agency  
Centre for Environmental Expertise  
Office for Climate and Environmental Assessment  
P.O. Box 843  
3100 AV Schiedam  
[www.dcmr.nl/en/index.html](http://www.dcmr.nl/en/index.html)

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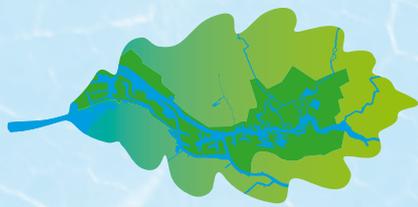
### Design and maps

BeeldinZicht (Rotterdam)

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