CCS: A Case of EU Multi-level Governance Failure?

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5.1. INTRODUCTION

Rotterdam's developing CO_2 hub is geared towards reducing emissions and making CO_2 a commodity to be traded on the market. The longer term vision is that CO_2 will be transported to Rotterdam (for example, using barges commuting to and from the Ruhr area on a regular basis) where it can be stored or traded as a product to be used in other industries. Broadly speaking, there are two ways to handle excess CO_2: it can be stored, or it can be used. Carbon Capture and Storage (CCS) entails the capture of waste CO_2 and storing it so that it does not enter the earth's atmosphere. Carbon Capture and Usage (CCU) uses up the gas instead, for example in the horticultural sector to stimulate plant growth or by embedding it in a product. In doing so, CCS and CCU can help to mitigate the contribution of fossil fuels to global warming, and therefore contribute positively to combating climate change. However, CCS is a very contentious issue in many countries, mostly due to citizens' fear of the technology's safety and the often used criticism that CCS enables large emitters to retain their methods of production instead of having to significantly change their processes. CCS is thus often seen as a palliative measure. While the main focus in this chapter lies with CCS, CCU will also be discussed where relevant as it is a new development with much ongoing research.

This chapter tells the CCS story in Rotterdam as part of Dutch and European efforts to mitigate CO_2 emissions. I start with an overview (§5.2) of the context within which CCS operates, introducing CCS and motivations for its application, examples of CCS projects

already underway and discussing milestones and other important developments. This part ends with a brief overview of recent developments and a summary of the policies applicable to CCS. In the next part (§5.3) I apply Piattoni's theory to the case, diving deeply into the governance of CCS, drawing extensively on interview data and desk research. Section §5.4 discusses the consequences of this case for the Port of Rotterdam and the role its authority can play. Section §5.5 discusses the theoretical and empirical conclusions for the governance of EU energy and climate policy based on this case.

5.2. CCS: WHAT, WHY AND WHEN?

What every reader must know before delving into this case study is that CO_2 essentially is a waste product of the combustion of fuels necessary for industrial activity and transport, which is why the greenhouse gas is emitted on a large scale. It is also part of the natural environment as we know it and necessary to ensure plant growth. However, too much CO_2 in the air (>10%) can also kill people (EEA, 2011:24). The impact of CO_2 and other GHGs on the climate is measured by looking at their Global Warming Potential (GWP), which indicates how long the gas remains in the earth's atmosphere, thereby heating it up[114]. Methane (CH_4), for example, is estimated to be 34 times as bad for the climate as CO_2 over a period of 100 years (IPCC, 2013:714). However, CO_2 is emitted in much higher amounts than methane, as visible in figure 5.1.

Of all these emissions, more than half comes from the energy sector (including all transportation other than maritime and aviation), and another ±13% is due to agriculture (EPA, 2014a). While North American and European CO_2 emissions have more or less stabilised or even decreased, Asian emissions have nearly doubled since 2002 (EPA, 2014b). Since industrial activity is paramount to humanity's current way of life, and because CO_2 emissions are harmful to the climate, methods for reducing emissions while ensuring industrial activity have been developed. According to the International Energy Agency, a key role in the decarbonisation process will be played by CCS (IEA, 2015b:5). Since the energy sector is by far the largest sector emitting CO_2, the remainder of this introduction will focus on the application of CCS within the energy sector.

CCS can be broken down into the three components that it is conceptually comprised of: carbon capture, carbon transport, and carbon storage. Each of these components will be discussed briefly to provide a basis for understanding of the case. Carbon capture — the most expensive component of CCS (IPCC, 2005:342) — entails the separation of CO_2

114 CO_2 is used as the reference gas upon which the GWPs of all other GHGs are based.

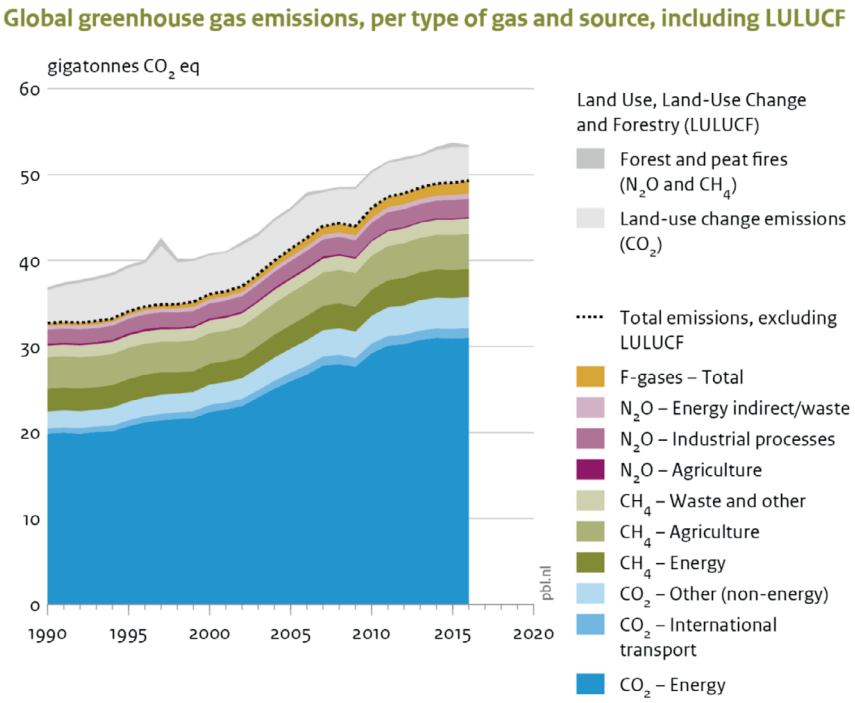

Figure 5.1. CO_2 emissions highest of all global GHG emissions
Source: PBL, 2017:9.

from fossil fuels or biomass. Carbon capture can be applied to coal-fired plants as well as natural gas plants. Co-firing of biomass also leaves the possibility to apply CCS. The capture technology[115] can be installed in new power plants or added to already existing power plants after they are remodelled. The latter can be very expensive, especially when the plant is far from the storage site[116]. An important consideration in the application of carbon capture technologies is the energy penalty associated with it; because the capture technology needs to be powered as well, a power plant will need more resources to generate the same amount of electricity than it would without the application of CCS. Consequently, non-CO_2 emissions from that power plant will increase if the plant continues to produce the same amount of electricity (EEA, 2011:6-14).

115 There are four technologies that can be used to capture CO2: post-combustion, pre-combustion, oxyfuel combustion, and by establishing it in industrial processes. For those interested in the technical aspects of these techniques I would like to refer to the EEA report (2011) on the 'Air pollution impact of CCS'.

116 The plant - storage site distance can prove especially problematic in countries where there are no (or few) adequate storage opportunities. Examples are Finland and Luxembourg. Refitting coal-fired power plants for CCS can be highly cost inefficient in such cases.

The transport of carbon dioxide can occur through a pipeline, using ships, trucks or trains, although pipelines and ships seem most promising due to possible volumes and the associated costs (EEA, 2011:18). One limitation to any plans concerning CO_2 hubs is the ban on transboundary CO_2 under Art. 6 of the London Protocol, which effectively means that countries are not allowed to trade CO_2 for dumping purposes, since it is considered a waste product (IEA, 2011:8-10). Cross boundary trade would be necessary for countries without suitable sequestration locations to be able to apply CCS. The 2008 amendment to the London Protocol[117] allowing for CO_2 trade for purposes of sequestration has not yet been ratified by enough parties to enter into force (IEAGHG, 6 January 2016). CO_2 trade for CCS activities is thus still forbidden.

Carbon storage — also called sequestration — is the step that makes CCS interesting for policymakers concerned with decarbonisation. It entails the storage of CO_2 in order to prevent its emission. CO_2 can be stored in deep geological media, in oceans, and through surface mineral carbonation. At present, of these three options the only viable option is storage in deep geological media, such as depleted oil or gas fields. The other two options are very costly and pose dangers to the environment. Furthermore, the EU's CCS Directive[118] prohibits sequestration in oceans (EEA, 2011:18-19). Aside from depleted oil and gas fields, other options for storage are in deep saline formations and in deep non-mineable coal seams. While deep saline formations are expected to allow for the largest amount of storage (*ibid.*:19), injection in oil and gas fields becomes especially interesting when the fields are not yet depleted. Injection of CO_2 can help with the extraction of the oil or gas, which is referred to as Enhanced Oil Recovery (EOR) and Enhanced Gas Recovery (EGR) respectively[119]. The irony of such practices is that it facilitates the continued use of fossil fuels — making it one of the main arguments of environmental NGOs arguing against CCS — but some argue that it may be the only way to get CCS going in the first place. The main concern with carbon storage is the potential of leakage, although the European Environment Agency reports that they consider the risk of carbon leakage "relatively small" (EEA, 2011:23). Since the storage capacity across the globe is estimated to be very large, and the retention time is very high (up to millions of years), carbon storage is seen as a promising tool to combat climate change (EEA, 2011:19).

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117 See Resolution LP.1(1) [http://www.imo.org/blast/blastDataHelper.asp?data_id=17614&filename=01.pdf] or IEA, 2011 [https://www.iea.org/publications/freepublications/publication/CCS_London_Protocol.pdf].

118 Directive 2009/31/EC, Art. 2 outlines the prohibition of CO_2 storage in oceans.

119 Legally speaking, however, EOR/EGR are not seen as CCS. For CCS a specific storage permit is needed under the EU's CCS Directive, whereas EOR/EGR activities require different permits. Furthermore, some people would argue that injecting CO_2 to extract more oil or gas to be burned later is not climate-friendly and therefore not a part of CCS.

Wide and quick application of large-scale CCS throughout the world is unlikely due to the lack of a comprehensive policy framework (Deetman et al., 2013:159), associated costs, the competition with renewable energy, the limits of storage, and the fact that CCS does not mitigate CO_2 production. These are significant hurdles for a further development of CCS. Furthermore, the aspect of safety has shown — as in the Dutch Barendrecht case — that a negative public opinion can block CCS projects entirely (Van Alphen et al., 2007:4369). Even so, certain steps have been made. The key developments influencing Rotterdam are summarised in the timeline in figure 5.2. The carbon price seems related to the ebb and flow of CCS projects, with projects being developed during high carbon price and stalled when the carbon price drops.

5.2.1. Historical Context and Recent Developments

5.2.1.1. 1970 - 1988: Carbon capture, injection and usage

None of the components of CCS are technologically 'new'. Carbonated drinks are an example of captured 'injected' CO_2, and the gas is often used for food packaging or made into solid form (also called 'dry ice') to aid in the wine making process. In The Netherlands, companies such as Air Liquide and Linde Gas have been selling CO_2 for years. This type of carbon capture has purely economic motives: the CO_2 is used in chemical, industrial or other processes to facilitate the manufacturing of products. These practices constitute small-scale activities, whereas the climate enthusiasts focus on large-scale CCS where much larger volumes are captured and processed. As such, carbon capture initially did not have any climate-oriented component.

The injection of CO_2 for Enhanced Oil Recovery also is not new. The oldest running EOR project is Val Verde in Texas, USA. Since 1972, CO_2 there has been captured in natural gas treating plants and transported through pipelines to oil fields. The second oldest project started in 1982, also concerns EOR and is situated in Oklahoma, USA, at the Enid Fertilizer plant. Captured CO_2 is used in depleted oil fields in the southern part of Oklahoma[120]. These early EOR projects were also fed by economic incentives, rather than concerns about the climate. It is the 'storage' component, binding capture and transport together into a single chain, that provides the novelty of CCS as a still pre-commercial technology even though its separate components have already proved themselves (Krahé, Heidug, Ward & Smale, 2013:754).

120 Source: Global CCS Institute, project view: [https://www.globalccsinstitute.com/projects/large-scale-ccs-projects#overview].

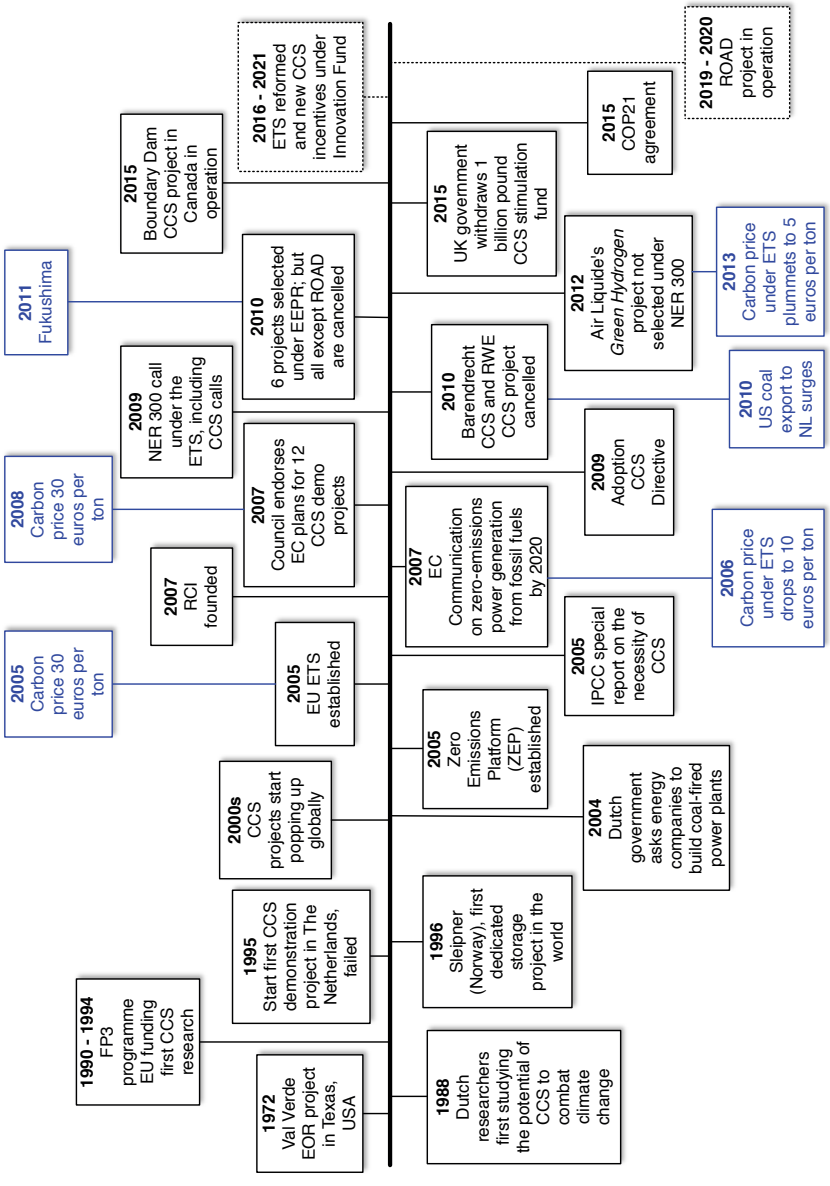

Figure 5.2. Timeline of CCS and related economic events
Source: author's own reconstruction.

5.2.1.2. 1988 - 2005: Thinking about CCS and the climate

Whereas academics have been concerned with anthropogenic climate change well before the 1990s, it was not until then that the debate shifted from whether we have enough fossil fuels left on this planet to how much we can still use before global climate disasters start to happen. CCS fits into this new debate, as experts and policy-makers began to think about other ways to get rid of excess CO_2. In 1992 the United Nations Framework Convention on Climate Change (UNFCCC) was established, underlining international concern for the climate (IPCC, 2005:20). Globally, power plants and the industry emit much more CO_2 than can realistically be used with current (and prospective) technologies (Styring, De Coninck, Reith & Armstrong, 2011:10). Finding a way to store carbon dioxide without letting it escape into the environment therefore became a priority. Underground storage of CO_2 makes no sense economically: there is no added value to storing the gas without the application of EOR. The addition of dedicated storage to carbon capture is therefore purely climate-oriented (Krahé et al., 2013:754; Nykvist, 2013:684). Dutch researchers at Utrecht University began looking into CCS in 1988 and in 1990 the SOP research programme (in Dutch: *Samenwerkend Onderzoeksprogramma*) was launched, which included CCS as a research topic (De Vos, 2014:35). In 1995 a first attempt was made to start a CCS demonstration project, but this failed due to low interest from the Dutch ministries of Economic Affairs and Finance (Van der Hoeven, 2008:40)[121]. Norway then took over and, in 1996, developed Sleipner, the first dedicated geological storage project in the world. Sleipner captures CO_2 during natural gas processing and directly injects it into a deep offshore location[122]. The Dutch continued their research on CCS, but there were no implementation attempts. However, when in 2004 the Dutch government feared electricity shortages, it asked the private sector to build coal-fired power plants to diversify the country's energy sources and secure affordable energy for its citizens. Two of the resulting power plants, Uniper's (formerly E.on) and Engie's (formerly GDF Suez) plants on Maasvlakte 2, were built with concrete plans to apply CCS as of 2013.

Simultaneously with Dutch activities the European Union undertook its first CCS research initiative under the third Framework Programme (FP3) between 1990 and 1994. However, it was not until 2005 that CCS started to appear on the political agenda of the EU (Martínez Arranz, 2015:249; Nykvist, 2013:683). By then, CCS projects had started to pop up globally and the IPCC had published its special report examining the potential of CCS to stabilise the climate (IPCC, 2005). The IPCC states that a combination of technologies is needed to bring

121 Also confirmed in interview 20. Then Dutch Minister of Finance Gerrit Zalm supposedly said that it is nonsense to put money underground (in Dutch: *het is onzin om geld onder de grond te stoppen)*. See also the article 'Dromen van verstoppertje in de broeikas' in Volkskrant, 25 February 2006.

122 See footnote 5.

about the required emissions reductions, but also stresses that "CCS has the potential to reduce overall mitigation costs and increase flexibility in achieving greenhouse gas emission reductions" (*ibid*.:3). The Zero Emissions Platform was then established by the EU, bringing together a variety of CCS stakeholders from the public and private sector, research institutes and NGOs and geared towards advising the European Commission on CCS issues (ZEP, 9 June 2016). The Commission also launched the Emissions Trading System (ETS) in 2005 as one of the tools to implement the Kyoto Protocol. The overarching vision was that ETS will help "promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner"[123].

5.2.1.3. 2005 - Today: CCS projects, or not?

Serious Dutch attention for CCS started with the establishment of the CATO programme in 2004, which had as objective to find out if CCS is a promising option for The Netherlands. The city of Rotterdam became interested in CCS and made it one of the main priorities of the Rotterdam Climate Initiative[124]. In 2008 the Public Task Force CCS was established, led by ex-prime minister Lubbers. Still, the Dutch government chose to leave the choice to the market, meaning there was no active push towards CCS development. Two notable onshore CCS projects were developing around this time: the Barendrecht project[125] in the province of South Holland and the Eemshaven project[126] in the northern part of The Netherlands. However, the political and public tide turned against storing CO_2 onshore and close to populated areas, not in the least due to failed communication regarding the specifics and safety of the project (Feenstra, Mikunda & Brunsting, 2010:28-30). The public's fears that the CO_2 would leak out of the reservoirs and pose a danger to public health trickled into the political debate. Shell and the Ministry of Economic Affairs undertook attempts to repair their communication towards citizens, but the Barendrecht project had become societally unacceptable[127]. Eventually, the minister of Economic Affairs decided to cancel Barendrecht and banned onshore CO_2 storage for the foreseeable future. Again, Dutch CCS developments seemed to come to a halt.

123 Art. 1 ETS Directive (2003/87/EC).

124 Launched in 2007 after Clinton (and the Clinton Climate Initiative) challenged Rotterdam to reduce its emissions.

125 Operated by Shell.

126 Operated by Essent (now part of RWE).

127 For further reading on what happened with the Barendrecht case, see Feenstra, Mikunda & Brunsting, 2010. Accessible from [http://www.globalccsinstitute.com/sites/www.globalccsinstitute.com/files/publications/8172/barendrecht-ccs-project-case-study.pdf].

As for the EU, CCS picked up speed in 2007 when the Commission published a Communication titled *Sustainable power generation from fossil fuels: aiming for near-zero emissions from coal after 2020*. The title reveals a goal which — we now know — will definitely not be attained by 2020, but it does mark the start of EU funding for CCS projects. The Zero Emissions Platform (ZEP) called for a CCS flagship program in order to ensure that CCS would be economically viable by 2020 (ZEP, 2007). The flagship program for CCS was launched under DG Climate's NER 300 programme. The *Green Hydrogen* project by Air Liquide attempted to get funding under that programme, but failed. Eventually just one CCS project was awarded funding under NER 300[128]. In 2008 the European Council called for a mechanism — to be created by the EC — to incentivise investments into CCS, specifically asking for the construction of twelve CCS demonstration projects by 2015[129]. Following the economic crisis, the European Energy Programme for Recovery (EEPR), led by DG Energy, was also launched. It contained the call for six CCS projects to be spread all across Europe and covering all possible aspects of CCS *together*. In The Netherlands, energy companies were considering the implications of CCS for their own operations. E.on (now Uniper) and Electrabel (now Engie) were doing research to try to obtain funding for a CCS project. EEPR would divide 1 billion euros equally among the winning projects. The rule was that only one project per country could be selected for the competition, so Dutch companies had to compete with one another. In total there were three Dutch projects: E.on, Electrabel, and Nuon (in the north). Since E.on's and Electrabel's plants were situated merely 1km apart, both companies thought it better to bundle forces and create a project together so as to increase their chances of being selected by the government. Their project, ROAD, received a positive EU funding decision in 2010. The Rotterdam region also applied for project funding for Air Liquide's CCS project under NER 300. The project was highly feasible; most of the steps were already part of common practice in the energy industry. The newer, most risky, part was the injection of CO_2 into the ground. This process was not part of Air Liquide's responsibility, but would be taken up by Danish Underground. However, Air Liquide could not vouch for the safety of the process, since it lacked knowledge on the topic. The official story is that the project was not awarded funding when the Dutch government could not guarantee a matching subsidy, which was a precondition for funding, and due to a wrongly ticked box on the application form. The unofficial story as told by people involved in and around the project is that DG Climate found an inventive way to kick CCS projects out of NER 300 because it favoured the development of renewable energy[130]. The truth is probably somewhere in the middle.

128 The project that did get funding commitment under NER 300 was the White Rose CCS project in the UK. However, since the project has been put on hold it has not received any of the funding (yet).

129 This led to Commission Decision 2010/670/EU of 3 November 2010.

130 This claim has not been verified.

The outlook for CCS seemed promising in 2009 with the demonstration plans under the EEPR and the adoption of the CCS Directive (2009/31/EC). The Directive outlines a framework within which the EU feels CCS should operate in Europe, thereby leaving considerable leeway for MS to implement the Directive in whichever way they want. It specifically calls CCS a "bridging technology that will contribute to mitigating climate change" and states that CCS "should not serve as an incentive to increase the share of fossil fuel power plants"[131]. However, CCS alone is foreseen to contribute to about 15% of CO_2 reductions by 2030. Whereas CCS appeared to have a bright future around the time the economic crisis started, that promise did not last long. Under the ETS the CO_2 price dropped from 25 euros per ton in 2008 to around 5 euros per ton in 2013. CCS projects suddenly became unattractive due to the financial hole created by the low CO_2 value. Of the 6 projects selected under EEPR, the projects died one by one until only one (ROAD) survived. The dramatically low price of CO_2 was the primary reason for premature CCS death across Europe, since businesses now faced a tremendous financial gap in their CCS business cases. Neither the EU nor national governments have renewed their efforts to financially incentivise CCS after 2010. In fact, in November 2015, the UK government decided to end its 3-year running 1 million pound CCS competition programme, which may lead to all of the proposed CCS projects there to be cancelled as well.

The Paris agreement (COP-21) of December 2015 represents global commitment to keep the temperature rise under 2°C, and preferably under 1,5°C, and came at a time when an important technology identified by the IPCC became difficult to develop in the EU. Near the end of 2015 the discussion regarding the legitimacy of coal-fired power plants flared up in The Netherlands, likely leading to a ban on unmitigated coal burning by 2030. Applying CCS may now be the only possible license to operate companies such as Engie and Uniper will have. While the exact consequences of this discussion are not yet known, it may very well be that they will get CCS going in The Netherlands.

5.2.1.4. Facts and market developments

Early in 2016, of the six projects selected in the EEPR program only the British and the Dutch projects were left, yet both were still not in operation. Overall, there seems to be issue competition between CO_2-reduction and renewables within the EC[132]. There are more member states developing renewable energy than CCS. With declining economic advantages,

131 Directive 2009/31/EC, 05-06-2009, preamble (4), p.1.

132 There is much literature on issue competition, linking the victory of certain issues over others to, for example, competing demands or the dominance of political parties or ideologies. See also Green-Pedersen & Mortensen (2010), Baumgartner, Jones & Wilkerson (2011) or Wolfe, Jones & Baumgartner (2013).

the EU's interest in developing CCS has waned. In the last EEPR round no CCS project was put forward, and the same seems to be happening in the current round.

The International Energy Agency (IEA) has identified CCS as a game changer in climate change and has stated that CCS is necessary to mitigate global warming. Due to American coal dumping in Europe, CCS would seem promising but is as yet undeveloped. Countries still relying on coal for their electricity supply, such as Poland, can benefit from CCS because it allows them to keep using coal while reducing carbon emissions. In this way CCS ties into energy security strategies as well as into sustainability.

According to the Global CCS Institute[133], there are 40 large-scale[134] CCS projects existing worldwide, of which 15 are operational, 7 under construction, 6 in a very advanced stage of development planning, and 12 in an earlier stage. There are six projects in Europe, although the only two operational projects are in Norway[135]. The UK has three projects[136] in the early stage of development and The Netherlands has one project (ROAD) with a planned operation date by 2020. All projects in Europe concern carbon storage in a dedicated geological site, whereas worldwide there is a fairly equal division between geological storage and EOR. By far the most popular form of carbon transportation is by pipeline. Outside the EU there is one notable project in the power generation sector: the Boundary Dam CCS Project in Canada, which is operational since 2014 and stores CO_2 by employing EOR[137]. Just like in the EU, CCS is only barely developed globally.

5.2.2. Policy Context

Any case study in this field should consider the political and legislative contexts it operates in. Chapter 4 discussed the relevant policies at length. This section acts as a brief summary and foregrounds key policies, goals and tools. As with other climate-related issues, EU

133 The information in this paragraph can be found on the website of the Global CCS Institute [https://www.globalccsinstitute.com/projects/large-scale-ccs-projects] and is offered in an interactive format. Last checked on July 15th, 2016.

134 A large-scale CCS project involves the capture, transport and storage of CO_2 of at least 800,000 tonnes annually (coal-fired power plant) or at least 400,000 tonnes annually for other emissions-intensive industrial facilities (Global CCS Institute, 7 January 2016).

135 Sleipner (1996) and Snøhvit (2008), both used for natural gas processing and not for electricity generation.

136 Don Valley (2020), Caledonia Clean Energy (2022) and Teesside (2020s), all in the power generation sector, although Teesside has a broader scope allowing for other industries to hook up as well.

137 Other notable projects that are already in operation are in the U.S. (since 1972), Canada (since 2000), Algeria (since 2004), Brazil (since 2013) and Saudi Arabia (since 2015).

involvement seems quite obvious. Transboundary problems require supranational action to set goals, although their implementation is done nationally or even locally. As discussed in chapter 4, CO_2 reductions are part of the 2020 Climate and Energy package, the 2030 Energy and Climate framework and the 2050 Roadmap. These documents provide a basis for EU involvement; if MS are to reduce their carbon emissions, the EU can help them develop CCS by funding research and pilot projects. However, options are kept open for MS, meaning that they do not necessarily have to invest in CCS. Under the current Emissions Trading System (ETS) it is cheaper to emit CO_2 than it is to store it.

Figure 5.3 shows the price of the carbon allowances (EUA) under the ETS between 2005 and 2015. At the time when CCS projects started popping up in Europe, the price was about 30 euros per ton CO_2. Most projects were cancelled between 2011 and 2013 when the carbon price dropped below 5 euros due to low prices in commodity markets, permit surpluses and subsidies given to renewables. Currently, a good business case for a CCS project in the power sector needs a carbon price of between 40-50 euros, which could drop to around 30-35 euros. For the industry a carbon price of 80-90 euros is needed[138]. It is clear that the EU ETS price is nowhere near a good CCS — or any other costly low-carbon technology — business case, and the price volatility does not help either. Many policy-makers, companies and politicians alike feel that this is part of the reason why ETS reform

Figure 5.3. Carbon price trends showing dramatic drop in CO2 price without recovery
Source: EEA, 2015:22.

138 Interviews 19, 27.

is needed. Furthermore, agriculture and horticulture are not included in the ETS, which means that they have no incentive to participate in reduction strategies such as CCU. One of the reasons why ETS reform is slow is because the competitiveness of European companies needs to be safeguarded as well; with a very strict ETS and absent a global ETS, European companies are at risk of losing competitiveness. Table 5.1 shows a brief summary of the CCS policy context.

Table 5.1. Governments want sustainability, but policy to support CCS lacking power

Level of government	Main policies	Goals	Policy instruments
EU	1. ETS Directive 2. CCS Directive 3. Energy 2020 4. 2030 Energy & Climate Framework 5. Energy Roadmap 2050 6. (National Emission Ceilings Directive) 7. (Industrial Emissions Directive)	• Ensure safety of CCS (for public and environment) • Drop of total emissions (43% in 2030) of ETS sectors • 80% total CO_2 reduction by 2050 • 30% energy efficiency • Majority of energy is renewable	• Funding (NER 300/400, EEPR, Horizon 2020/Era-net, Innovation Fund) • Emissions legislation and environmental law • Gives opinion on MS-proposed storage permit • No hard or soft targets (except for previous 12 demos by 2015 goal)
Dutch national government	1. Energieakkoord 2. Energierapport	• 80-95% CO_2 reduction in 2050 • 16% renewables in 2023 • CCS demonstration • Only use CCS if no other options are available	• Funding (for ROAD) • Coordination of Era-net for ROAD • Awarding storage permit • Prohibition on on-shore CCS demonstration • Energy policy (+ competence to introduce emission ceilings) • Green Deals
Province of South Holland	1. Energieagenda 2. Beleidsvisie Duurzaamheid en Milieu	• 20% energy saved in 2020 • 20% lower CO_2 emissions in 2020 • 14% renewables in 2020 • Stimulate re-use of waste (such as CO_2)	• No specific instrument to support CCS, but is in charge of environmental permits • Environmental and (sub-)surface legislation • Delegates tasks to DCMR • Participates in Green Deals
City of Rotterdam	1. Programma Duurzaam	• Cleanest port city in the world by 2030 • Re-use of waste (such as CO_2) • Stimulate CO_2 capture (first CCU, then CCS)	• Construction permits energy/ industry • Active through RCI • Mostly political pressure

Source: author's own composition based on desk research.

The Port of Rotterdam develops its CO_2 hub within the described policy context and therefore encounters multiple layers of government regarding different aspects of the hub. As becomes clear from table 5.1, the European level is responsible for long-term goals and short-term project funding. While the national authority is allowed to go beyond European goals, it currently chooses not to do so. Instead, it broadly adheres to EU goals and participates in CCS funding efforts and research. The decentralised levels of government have very specific tools needed for CCS, such as the permits. While they do have certain policy goals, they are not involved in actual policy-making regarding CCS. The city of Rotterdam did place a strong emphasis on the contribution of CCS to its sustainability, especially around the time Rotterdam Climate Initiative was created. In that sense, the city has been important for the Port of Rotterdam's ambitions regarding its potential hub-function for CCS.

5.3. BEHIND THE SCENES: THE GOVERNANCE OF CCS

The previous part of the chapter focused on the context of the CCS case. The second part of this chapter will focus on the governance dynamics driving the case. This section will thus introduce the empirical data collected through the interviews conducted with experts, desk research and observations made at the Port of Rotterdam Authority.

For the Port of Rotterdam, CCS is part of its plans to be a CO_2 hub; a hub for large-scale capture, trade and storage of CO_2. It is therefore very important to the PoR that the first demo project, ROAD (*Rotterdam Opslag en Afvang Demonstratieproject*, which literally means Rotterdam Storage and Capture Demonstration project), is realised. Furthermore, the hub function also spreads to the use of carbon in, for example, horticulture. Investments are made in pipelines to this sector as well as in infrastructure to make ROAD possible. ROAD is a project jointly led by Uniper and Engie. The project is a CCS demonstration project for offshore (25km) storage. Originally, the plan was to capture and store 1,1 million tonnes of CO_2 coming from Uniper's coal-based power plant on Maasvlakte 2 for a period of 5 years and starting in 2015. The Dutch government required a 5-year running period as basis for funding. This project received EU funding under the EEPR Program but is still struggling with a financial gap and a delayed final investment decision, leading to changes in its scope and running time. Mid-2016 the project runtime was revised to 2-3 years, starting in 2019 or 2020. For the further development of the Rotterdam CO_2 hub, the OCAP pipeline makes carbon streams through the port possible and both Shell and Abengoa supply regional greenhouses with their waste CO_2 this way. Efforts are being made to supply greenhouses with excess heat generated in the industry — thereby possibly increasing the transport of CO_2 as well — within the province of South Holland under a project called *Warmtenet*.

5.3.1. The 'CCS Network'

Who is actually involved in CCS in, or related to, the Rotterdam area? This question is an important one to answer if the impact of this case on European energy policy is to be considered. Figure 5.4 shows the involved actors in the multi-level context. A more detailed overview can be found in annex V.

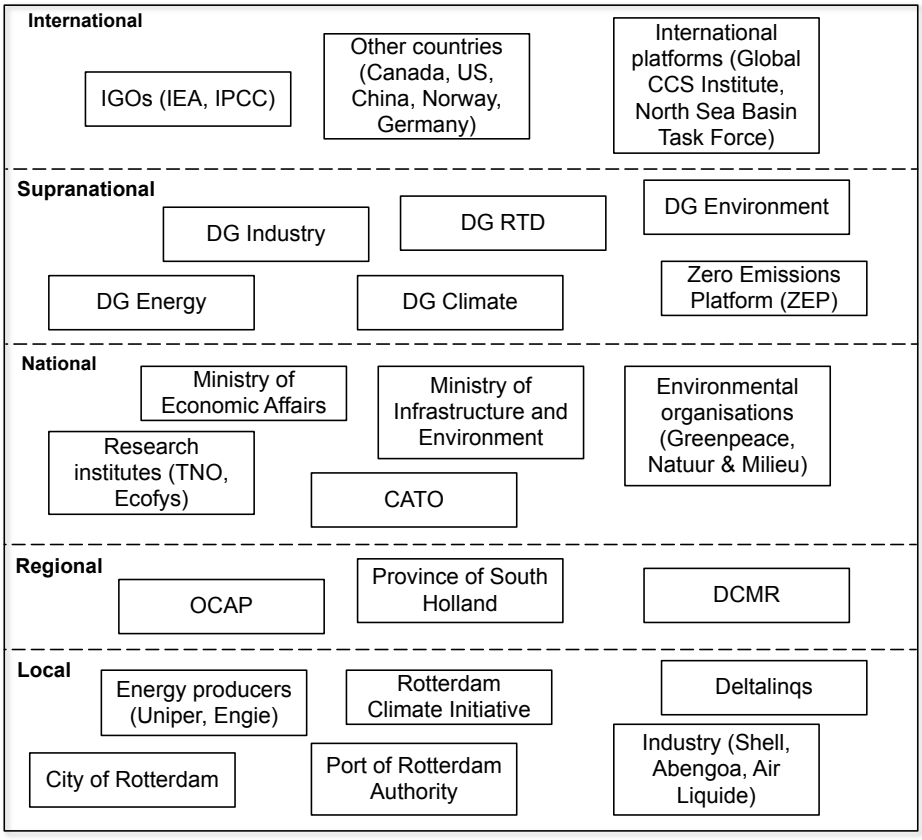

Figure 5.4. The CCS network in multi-level perspective
Source: author's own compilation based on fieldwork. Companies such as Shell are labelled local even though they operate on all levels and could be placed in multiple categories.

Not every actor can be considered in this dissertation. The ETS and CCS Directives are implemented by other EU member states as well, although The Netherlands and the UK presently are the only countries with a CCS project that might see daylight. Non-EU countries applying CCS have been discussed in section 5.1.2.4. and will be referred to when they contribute to the Dutch case. Multiple governmental and non-governmental organisations

have published on CCS and their data will be used throughout this chapter when relevant. Not all the actors in figure 5.4 are part of the CCS core network. The interviews probed how actors are related to each other in this case, specifically looking at whether they have specific governance ties with the purpose of delivering public goods. Figure 5.5 shows the ego network for the Port of Rotterdam Authority in the CCS case.

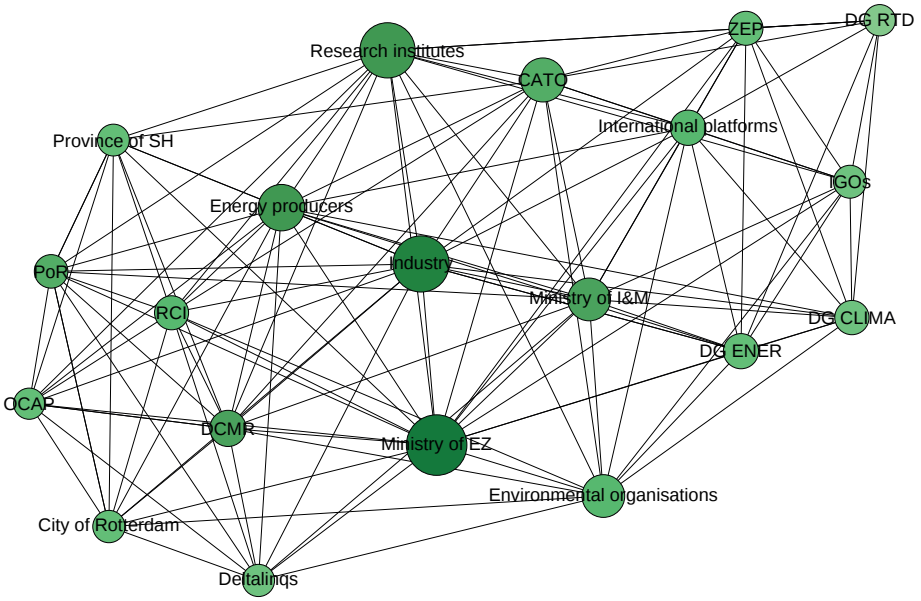

Figure 5.5. CCS ego network for the Port of Rotterdam Authority
Source: author's own composition based on fieldwork. The darker the node, the higher its degree. Minimum set edges per node is 10 (maximum is 20). The average degree is 12.4, the density is 0.653 and the modularity is 0.19, so there are no analytically meaningful communities in this network. Used software: Gephi (ver. 0.9.2).

A surprising finding of this study is that, in the PoR's small-scale CCS ego network, the PoR does not seem to have a pivotal place[139]. Its betweenness centrality is 1.35, meaning others would still be connected to each other if the PoR were removed. However, the PoR is also represented in RCI (the same goes for the city and DCMR), so RCI's connections should also be counted towards the PoR. Outliers are the Ministry of Economic Affairs (12.51), the industry (10.7) and research institutes (10.31). The Ministry can potentially be powerful, yet the question is whether it uses its power to advance or block the interests of others. As the qualitative analysis will show, EZ has actively tried to acquire more international funding for the ROAD project, though this study determines that EZ's own policy-making is rather passive. The industry is well-connected both at national and EU level, speaking to

139 In the minds of other actors, however, the PoR does play a large role. See section 5.3.4.1. for further discussion.

private sector actors, policy-makers and researchers alike. The pivotal role of academia has also been discussed earlier in this chapter so its centrality is unsurprising, though research institutes otherwise lack resources to really make deployment happen. Actors with the lowest betweenness centrality — potentially low influence — are DG RTD (0.4) and DG ENV (0.0). DG ENV watches CCS from the sidelines, while DG RTD has been important for CCS research but apparently does not offer many unique connections. Figure 5.5 provides justification for leaving other countries out of the analysis unless relevant on a micro-level.

5.3.2. Governance at EU Level - the Domestic — International Dimension

As discussed earlier in the historical overview, the connection between CCS and climate change mitigation was first made in academia. The Dutch government then officially began to consider the prospects of CCS, but no large-scale demonstration projects were carried out before the EU's CCS Directive (2009/31/EC) was launched. MLG hypothesises a shift from domestic to international coordination spurred by the necessity for supranational coordination due to international interdependencies which cannot be ignored. It is therefore expected that policy coordination — in increasing amounts — will take place at the European level (Piattoni, 2010) and that the PoR is also active at the international level since the required policy solutions cannot be provided by the national government alone. This section will look specifically at this first theoretical expectation and present its key concepts: the *interdependencies at international level* (with substantial cross-border connections between business, civil society and government) and the *level at which policy coordination occurs*. I will start with the latter and show where most of the relevant binding policy decisions are taken and whether the Dutch government actively refers to the necessity of EU decisions.

5.3.2.1. CCS as part of larger EU energy and climate policy coordination efforts

From the onset, CCS was seen as a way to drastically reduce CO_2 emissions in Europe. The European Commission deftly incorporated it into its efforts to coordinate climate mitigation policies across the EU by proposing the CCS Directive as part of a larger, first of its kind[140], climate and energy package in 2009. The Commission argued for its competence in this area by stressing that "in a world of global interdependence, energy policy necessarily has a European dimension" (European Commission, 2006:17). In other words, the EC was seeking harmonisation of energy policies across Europe. As discussed in chapter 4.2.2.2, it was aided by serendipitous circumstances: international climate negotiations. The EU's quest for a political victory led to domestic acceptance and upscaling of policies to the EU level.

140 An earlier (1991) effort to link climate and energy policies failed (Skjaerseth, 2016:512).

Box 5.1. When political victories lead to unwanted side-effects

The choice for CCS - the political narrative

COP15 was just around the corner in 2008. The financial crisis was in its early days, and the EU was recovering from a failed Lisbon Strategy and the rejection of the European Constitution. The European Commission needed a political victory. It set out to formulate the Climate & Energy package, heavily aided by German chancellor Merkel, who was able to secure unanimous support for the package. The technocratic Commission saw great potential in CCS technology to drastically reduce European emissions. A CCS Directive was included in the package. The European drive to present itself as the global climate leader during COP15 (2009) led to a swift adoption of all the legislative documents under the Climate & Energy package. Demonstrating low carbon technologies such as renewable power generation and CCS was linked to the EU ETS in an effort to spur them along. The EU showed climate leadership in Copenhagen, but the implementation of the packages was yet to come.

The choice for CCS - the industrial narrative

With the formulation of the CCS Directive in 2008 and the underlying financial instruments to get CCS demonstration going, the European power generation sector set out to define CCS demonstration projects. Spirits were high because there seemed to be political support and the carbon price under the EU ETS was at a good 30 euros per ton. As projects were being lined up, European member states began to implement the CCS Directive. Nearly all countries delayed proper implementation or made it difficult to get permits and additional financial instruments. Some countries invested heavily into renewables, granting large subsidies that pressed on the carbon price, which dropped by 50% in 2010. The CCS projects that had been approved by the EU in the meantime started to flounder. Without a functioning national legislative framework and the ability to make a business case, companies started cancelling their CCS projects one by one.

The EU's drive to be a global climate leader and its ability to gain support from its member states shows how international interdependencies reflect back onto the decision-making process at the domestic level. The climate and energy package lost its momentum after it was adopted, not in the least due to the economic crisis and the continuously dropping CO_2 price under the ETS. However, the implementation of the package also posed problems for some countries (Skjaerseth, 2016:521). As mentioned in box 5.1 and discussed in more detail in section 5.2.3, the implementation of the CCS Directive was delayed in many countries. A Commission representative showed the EC is aware of its lack of success and linked it to the original wish to be a global climate leader:

> *"If ROAD will be built, it will show that the EU's plans for CCS were only largely a failure instead of a complete failure. The plan was to have 12 plants operating by 2015. That plan was definitely not achieved. But having ROAD in operation would be a game changer, showing we do have a CCS plant in the EU."*[141]

141 Interview 29.

The quote above also helps explain why a lot of effort has been made by the Commission to get ROAD going. Yet, as box 5.1 shows, the larger picture remains unchanged: the EU attempted to coordinate the development of CCS, but in reality each MS retained its own CCS policy preferences.

5.3.2.2. A vicious cycle of policy coordination

After the adoption of the 2020 Climate and Energy package, expectations regarding CCS development in Europe were high, but the 12 CCS projects the EC and the Council hoped for did not come to fruition. In a televised debate on June 22nd, 2016[142], one of the DG CLIMA deputy heads, Tom van Ierland, stated that private investors mostly blame the low carbon price under the EU ETS for the lack of CCS projects. My interviews confirm that the EU ETS is often called the main driver for CCS, but that it is currently not driving it. Most actors are therefore calling for ETS reform, implicitly (sometimes explicitly) claiming that policy needs to be coordinated at a higher level than the national level. One employee from the Dutch government put it as follows:

> *"The incentive for companies to demonstrate CCS is low. The ETS does not help incentivise this, but The Netherlands cannot do much about this on its own. The national government is powerless in this respect. The Netherlands is also looking at what other countries are doing to maintain a level playing field. That is important because otherwise the industry could go elsewhere and that is a problem as well."*[143]

Just as judicial sentencing creates precedents, so does EU coordination. The EU's natural response to failing policy coordination seems to be more policy coordination, but using a slightly altered approach. In 2013 the European Parliament reviewed[144] the development and implementation of CCS and stressed again that the technology might have a big role to play in Europe's ambitions to decarbonise. The EP also stated that the member states who foresee a role for CCS in their future cannot expect the private sector to do everything on its own; a financing mechanism is necessary. Those MS who do not want CCS should consider their 2050 strategy in their National Action Plans (NAPs) and critically reflect on what they need to do to reach long-term climate targets. In other words, the previously adopted

142 The debate was organised by ViEUws and can be found at [http://www.vieuws.eu/live-panel-debate/cop21/paris-deliver-low-carbon-investment-signal-europe-needs-22-june-2016-live-panel-debate/].

143 Interview 22.

144 Procedure 2013/2079(INI).

technology-biased approach was traded in for a more technology-neutral approach, which befits the wishes of governments and businesses alike[145]. An official from the Commission made the following statement during an interview:

> *"Nowadays, the Commission's stance is starkly technology neutral. That was not the case in 2008/2009. Back then there were very specific targets. But targets are an indication of a certain preference. What is really needed is to achieve emission reductions in the cheapest possible way. That is also why the ETS was set. The market can then find the cheapest solutions."*[146]

Apparently, setting a regulatory framework with specific targets in place was not sufficient to spur development. The EU's approach therefore shifted from prescribing targets in directives to believing in market-based strategies and facilitating incentives through (co-) funding: covert coordination. Yet the carbon price under the EU ETS remained low, making it difficult to place trust in its effectiveness to stimulate decarbonisation. Lacking member state support for further ambitious climate and energy initiatives, the EU tried to coordinate in yet another way in 2015, when the European Commission (2015f:2-22) reviewed the state of the ETS and proposed the adoption of two financing mechanisms: the Modernisation Fund and the Innovation Fund. If adopted, the Modernisation Fund will be made up of 2% of the overall quantity of allowances and should help modernise the energy sector of low income countries, with a particular focus on small-scale installations. The Innovation Fund is basically an extension of the NER 300 programme and supports new low-carbon initiatives in the power sector as well as in the industry. The Directive has not yet been adopted as it is awaiting discussions in the EP's committees in December 2016. The EU's continued attempts to coordinate are linked to the concept of international interdependencies, which is discussed next.

5.3.2.3. International interdependencies cause counteracting forces

The previous two sections show that national governments have willingly created interdependencies at international level, both due to a global political context (COP-15) and in order to maintain a level playing field across countries. The Dutch were one of the early advocates of CCS — which is also visible in the CCS research conducted since the early '90s — yet some interviewees have stated that politically CCS was never a done deal at the national level

145 See also [http://ec.europa.eu/energy/en/consultations/consultation-future-clean-coal-technologies-and-carbon-capture-and-storage-ccs]. Confirmed in my interviews with EC officials and business representatives.

146 Interview 28.

either. Between and within ministries, opinions on CCS differed[147]. Barendrecht failed due to opposition from the general public (see also box 5.2), but offshore CCS remains an option. CCS is called an *end of pipe* solution, which means that unwanted substances are still created but are being prevented from being emitted: the artificial cleaning of a polluting stream[148]. An interviewee from the private sector aptly summarised the feeling of unease that surrounds CCS:

> *"It is sort of crazy to put new gas under the ground in the most highly populated country of the world."*[149]

Piattoni claims that international interdependencies are also created by actors such as NGOs, sub-national authorities and business. Let's review these actors for the CCS case, starting with NGOs. An NGO such as Greenpeace has actively campaigned against CCS, arguing that it prolongs the life of fossil fuels, though the potential of CCS for heavy industries such as the steel and cement industry is being considered. However, Greenpeace has actively chosen not to participate in joint public - private discussions for fear of being misrepresented as being supportive of CCS merely by showing up. It does speak privately with the national government and provides input for the *Energieakkoord*[150]. Another Dutch environmental organisation, Natuur & Milieu (in English: Nature & Environment), does participate in public - private discussions and sees potential in CCS when applied to gas-fired power plants (in the transition phase to renewables) and heavy industry[151]. Yet the best examples of agenda-setting and subsequent creation of awareness for international coordination have been the IPCC, IEA, and ZEP (IGOs). Hedging CCS technology as a potential 'climate saviour' and arguing for a global carbon price stuck in the minds of many domestic policy-makers; some using it as a reason to push forward with CCS, others using it as a way to excuse themselves from domestic initiatives whilst letting the EU struggle to adopt legislation. ZEP is the only platform specifically new for CCS; the other channels are long established.

Second, and in contrast to Piattoni's model, my interviews did not confirm any particular importance of sub-national authorities in propelling international coordination. The Rotterdam Climate Initiative locally is a well-known initiative and strong coalition of the municipal government, DCMR, Deltalinqs, and the Port of Rotterdam Authority. RCI acknowledged the necessity of the application of CCS in the Rotterdam region, but none of the Commission

147 Interview 31, 37, field work reports N, Q.

148 It fits the Dutch idiom '*dweilen met de kraan open*', which hints at the pointless activity of fighting symptoms but not the disease.

149 Interview 24.

150 Interview 38.

151 Interview 39.

experts I interviewed had heard of it even though RCI actively advocated CCS. The German *Länder* (provinces) actually counteract EU coordination with most of them banning on-shore CCS in their implementation of the CCS Directive. Section 5.3.3 will investigate whether SNAs are empowered domestically, but in international policy-making they seem to have played a marginal role and have certainly not created cross-border linkages. The PoR, in turn, also advocated the ROAD project together with the project partners and received much traction at national level and even among friendly Commission officials. Its *Havenvisie 2030* vision is well-known to them and policy-makers listen eagerly to the PoR's vision on a potential transnational CO_2 hub, especially in light of its potential to store the CO_2 emitted by industries in Germany. The potential international significance of the ROAD project — partly advocated by the PoR — is the reason why The Netherlands, Germany, Norway and the EC have been developing a separate funding mechanism for ROAD under Era-net[152].

Third, business mechanics have played an important role in this case *not* because of the existence of CCS business networks but rather through policy-makers' fear of potential carbon leakage if climate policies (and measures such as carbon taxation) spanned too little territory, which was readily confirmed by potentially affected industries (using their traditional umbrella organisation channels). Their rationale is that if individual countries, or even just the EU, adopt too stringent climate measures, the industry will just pack up and leave for greener pastures elsewhere where the climate is not regulated too strictly. Losing chemical industry and heavy industries could hurt the European economy severely and therefore the incentive to subject these industries to stringent targets has been small. Most of these industries are exempted from the EU ETS or get free allowances, causing them no worries in their production process. The power generation sector is often tied to national governments or infrastructure and is therefore not easily subjected to carbon leakage, which is why it made sense in the minds of policy-makers to start demonstrating CCS in that sector. However, companies called for financial support to demonstrate the technology in order to kickstart its upscaling, which caused political unease due to discussions surrounding government support of fossil fuels and the public's negative perception of the safety of CCS. Box 5.2 shows how differing opinions in the industry were eventually politically outmatched by public opinion.

To summarise this first section, most of CCS activity went through already established channels, creating very few new cross-border linkages and maintaining policy coordination in domestic hands rather than subjecting to the EC's attempts at supranational coordination. The call for coordination on the international level implies a shift away from the domestic level, yet the power remaining in the hands of national governments cannot be ignored. It is up to them to decide whether there is a place for CCS in their energy mix and climate

152 Interviews 28 and 31.

Box 5.2. When public opinion outweighs differentiated industrial opinions

Deploying CCS - the political narrative

The Dutch national government has tried to develop CCS projects since the '90s. A key demonstration project would have been Shell's Barendrecht project, though the public's negative opinion of the safety of CCS and their fear of suffocating if the gas escaped underground reservoirs caused the government to pull the plug out of the project and ban on-shore carbon storage for the foreseeable future. Looking toward off-shore storage, the government decided to support the ROAD project. National realisation of EU climate targets for 2020 were in large part dependent on the success of ROAD. The public did not seem as negative about ROAD because the CO_2 would be stored in the sea and not on land, lowering its perceived threat. However, a political discussion regarding the legitimacy of subsidising CCS for coal-fired power plants flared up, and public opinion turned against 'prolonging coal'. The government could no longer legitimately show open support for ROAD by increasing its funding, yet also found itself in a difficult position due to making its climate mitigation success dependent on CCS. Behind the scenes, it began helping ROAD to secure more financing through the EU and other national governments.

Deploying CCS - the industrial narrative

Shell severely burned their fingers on the Barendrecht project and decided in its aftermath to move their CCS operations to the United Kingdom. Engie and Uniper, as the main partners behind the ROAD project, knew they had to decrease their CO_2 emissions under a functioning EU ETS and saw a potential license to operate their coal-fired power plants provided they implemented CCS. While CCS was used widely on a small-scale and for EOR purposes, its large-scale use for dedicated storage purposes needed more demonstration, also to show the public that it is a safe technology. A further decline of the carbon price increased the need for additional funding to support a failing business case, but would help The Netherlands reach its climate targets and hopefully turn the tide of public opinion. Yet the support for CCS in the power generation sector was not matched by support from other industries, who warned policy-makers about potential carbon leakage if climate measures would go too far. They had no interest in being subjected to EU ETS. Differentiated interests in the private sector made it difficult to advocate CCS effectively.

mitigation strategy. Multi-level governance illuminates the complex intertwinement of the domestic and the supranational level. The CCS case shows a symbolic shift to the supranational level, to be filled with the activity of national governments or further hollowed out by them. The PoR has actively tried to use the EU's support to elicit domestic change.

5.3.3. Governance at National Level - the Centre — Periphery Dimension

5.3.3.1. One directive, 28 implementations

Before delving into the centre - periphery dimension, this paragraph provides international context to how domestic actors in The Netherlands have behaved. Whereas the adoption of the CCS Directive went quite flawlessly, its implementation is an entirely different matter. Only Spain had transposed the Directive to the Commission's satisfaction within the set time

limit[153]. Poland and Croatia[154] were the last two countries to report full transposition of the Directive (Shogenova et al., 2014:6663). Some countries still prohibit CO_2 storage while others allow it and have laid down laws to facilitate it[155]. The significant leeway this directive gives to national authorities in terms of its transposition has therefore not led to a harmonised CCS policy framework across the EU. By the time the directive was implemented, the CCS projects proposed under NER 300[156] and EEPR had started to disintegrate. Most of the newly accessed member states noticed that the issues linked at EU level in the 2020 package did not work that well at the domestic level, which is a perfect illustration of the tension between domestic and supranational agendas. Poland, for example, voted in favour of the package due to high hopes for ETS revenues, CCS and renewables. But the trade-off between investments into low-carbon technologies and carbon price market mechanisms thwarted their plans (Skjaerseth, 2016:519). The first grand energy - climate package of its kind was a sour lesson learned. Table 5.2 summarises the six main EEPR projects and their reason for cancellation.

Interestingly, Spain, which completed the transposition of the CCS Directive first, was also where the first pilot project under the EEPR took place. While it was ultimately cancelled for the scale up phase, it did fulfil its obligations under the EEPR programme. The other projects suffered from a combination of lacking national regulatory frameworks and a financial gap, which makes it difficult for businesses to legitimise positive investment decisions. The German, Polish and Italian projects have been cancelled due to problems with their respective governments, ranging from the lack of transposition of the CCS Directive to problems regarding permits. The Don Valley (formerly *Hatfield*) project has changed ownership and scope since 2009 but is officially still scheduled for 2020[157]. Its transport and storage infrastructure were being developed in tandem with the White Rose project,

153 Art. 39 of the Directive requires its transposition, and the notification thereof, by national authorities by June 25th, 2011. The EC sent letters of formal notice for non-communication to the other 26 states and reported satisfaction with the Directive's transposition for 20 of the 28 countries by the end of 2013; more than two years overdue.

154 Poland was initially opposed to the 2020 Energy and Climate package and even threatened to veto it (cf. Skjaerseth, 2016). Croatia only entered the EU in July 2013 and immediately transposed the CCS Directive upon entry.

155 CO_2 storage prohibited in Finland, Luxembourg, Austria, Estonia, Ireland, Latvia, Slovenia, Sweden, and the Brussels capital region of Belgium. CO_2 storage restricted in Czech Republic and Germany. CO_2 storage allowed in the remaining countries (European Commission, 2014a:3). Whilst the countries themselves are in charge of the permitting process, Art. 10 of the CCS Directive requires national authorities to send draft storage permits to the Commission for an opinion. The Netherlands was the first country to submit a draft permit and received an opinion in 2012 (European Commission, 2014a:4). Since then only the UK submitted another draft permit meant for Shell's Peterhead project (European Commission, 2016b:2).

156 NER 300 only awarded a positive funding decision to one project: White Rose in the UK, which was cancelled in 2016 due to the UK's withdrawal of its Competition Fund.

157 The project has had a bumpy ride being denied both NER 300 funding and being excluded from the — now cancelled — 1 billion pound CCS fund of the British government.

Table 5.2. The six CCS projects under EEPR

Project (country)	Reason for delay/cancellation	Year delayed/ cancelled
Don Valley (UK)*	Financial gap; sold to a Norwegian company at the end of 2014 which changed the scope of the project	Now scheduled to start in 2020
ROAD (Netherlands)	Financial gap	FID delayed until end of 2016
Jänschwalde (Germany)*	Cancelled due to delayed transposition of CCS Directive into German law	December 2011
Bełchatów (Poland)*	Financial gap, technical risks and lack of transposition of CCS Directive	May 2013
Porto Tolle (Italy)	Permitting problems (resistance from environmental groups and local industry) and financial gap	August 2013
Compostilla (Spain)	Pilot study completed in 2012, then decision not to commence full scale demonstration by the company	2013

Sources: European Commission, 2013e, 2015; MIT, 2016.* These projects also applied for NER 300 funding but were not selected.

which did receive NER 300 funding (European Commission, 2015d:5) but has since been cancelled. The Dutch ROAD project remains on hold, with current prospects for a financial investment decision to be taken at the end of 2016[158]. This project also experienced a change in scope, reducing transport and storage costs so as to decrease the financial gap (*ibid.*:6)[159].

5.3.3.2. CCS as an issue for decentralised levels of government

The domestic - international shift was shown to be mostly symbolic: there is EU coordination because member states desire EU funding for expensive CCS projects, yet new cross-border connections are hardly established and coordination is mostly national. What does this mean for peripheral activity? After nearly all CCS projects under the EEPR were cancelled, Rotterdam suddenly became very important for DG ENER's CCS ambitions. However, involving sub-national authorities at the European level does not necessarily mean they are influential. It is important to look at whether the pull exerted by decentralised governments can be reflected in the *level at which the coordination of activities* takes place and the *level of empowerment of local actors*, which make up the key concepts of the second theoretical expectation posing that regional coordination is more efficient than national coordination and

158 Well after the period of data collection for this case study ended, it was announced that ROAD has been cancelled entirely. In this text, however, it is treated as being in the FID phase.

159 The EEPR's success regarding CCS is largely absent, but the programme as a whole also covered gas and electricity infrastructure and offshore wind projects. Of the total EEPR programme, 34 out of 59 projects were fully completed by June 2015 (European Commission, 2015d:2).

that this efficiency strengthens local policy actors. The PoR and the city of Rotterdam could thus potentially be empowered. Table 5.3 reviews CCS activities at each level of governance.

Table 5.3. The ambivalence of coordination of CCS activities

Level of governance	Activity
EU	Funding, coordination and monitoring, policy papers, plus organisation of platforms such as ZEP
National	Funding (also for research), expected to coordinate and formulate a vision, but currently lacking
Regional	Active when competent (permits) but otherwise more passive, mostly monitoring emissions
Local	Lot of activity through RCI, yet currently no clear role in CCS goals or ambitions from the city of Rotterdam, however there is lots of local activity within the private sector and the PoR

Source: author's own composition based on fieldwork.

The previous section showed that the EU as centre of policy coordination has spurred little direct peripheral policy activity. Rather, nation states have retained their gatekeeping role. Yet Rotterdam has not been passive. The most prominent example of CCS being taken up by a local government is RCI's focus on the technology. CCS was part of the ambitious Energy Port goal to reduce CO_2 emissions by 50% in 2025[160] in the port-industrial complex. Without CCS, no RCI goals would be achieved[161]. The start was to be made in the power sector, which amounted to 30% of port-related CO_2 emissions in 2005. Infrastructure would be developed and Deltalinqs — an RCI partner — would seek businesses willing to sign five letters of cooperation for CCS projects in the near future (RCI, 2009:21-25). Of the 3,5 million euros available RCI funds (for 2009) for developing the Energy Port, nearly 2 million was earmarked[162] for CCS purposes. A year later 1,7 million euros were earmarked for CCS (*ibid.*:13). As such, serious effort was made in Rotterdam to stimulate CCS.

Early CCS development in Rotterdam is a perfect illustration of how triple helix cooperation can be effective. During and after the Barendrecht debacle — which was also discussed in the city council[163] — new environmental alderwoman Van Huffelen introduced the ROAD project and the city kept stressing the project's importance for the achievement of RCI goals. The city's *Programma Duurzaam* (sustainability policy programme) of 2011 adopted

160 Base year 1990.

161 Notulen raadsvergadering 20 december 2007. Accessible at the Rotterdam city archives [www.ris.rotterdam.nl]. To provide a full picture of the positions, D66 and PvdA expressed doubts but were not necessarily negative.

162 Almost half of those funds were accounted for by DCMR, which had extensive responsibilities under the RCI programme.

163 See, for example, the meeting notes of the December 3, 2009 Council meeting and the alderman Grashoff's letter dated 01-02-2010. Available in the city archives.

CCS as a policy goal and roughly 1,6 million euros was to be spent on CCS activities such as developing ROAD, helping the Green Hydrogen project prepare for its NER 300 subsidy application, activities under the CCS Platform, and contributions to the national CATO2 research programme[164]. A year later, CCS was losing its momentum. Box 5.3 shows how the ROAD partners and the city drifted apart due to their different means of assessing a project's desirability. By November 2014, ROAD was perceived dead by the Council and RCI's budget was to be reduced and its goals changed[165]. It can be concluded that the city of Rotterdam tried to get CCS going by (financially) supporting partnerships between governmental agencies and businesses and cementing these efforts in the RCI programme, but its physical effects have been minor. Rotterdam might not realise a large-scale CCS demonstration, and the city's squabbles with the ROAD partners and the province hurt its image[166].

Box 5.3. When investment logic does not match politics

Political promise or business case? - the political narrative

In 2004, the Dutch government asked the electricity sector to build coal-fired power plants, fearing future electricity shortages. Engie and Uniper commenced the building of their plants on the Maasvlakte. At the same time, much to the appreciation of the city of Rotterdam, the province of South Holland and the Port of Rotterdam Authority, they launched the ROAD CCS project. The companies held many discussions with city representatives, saying they would deploy CCS to capture part of their carbon emissions and thereby contribute heavily to the city's climate programme. The municipality viewed this as a political promise. Their RCI programme was heavily dependent on ROAD; political careers were on the line. When the ROAD partners began backing out of the project due to a large financial gap, the city's environmental alderwoman angrily reminded them of their promise. Rotterdam tried to add an obligation to deploy CCS to the plants' permit, but the province declined their plea, arguing that the promise had no legal stature.

Political promise or business case? - the industrial narrative

When the ROAD partners launched their CCS project, the carbon price was high and both the EU and the Dutch government had funding available to cover part of the project. Demonstrating CCS would give the companies a longer term license to operate and be good for their PR. In their discussions with the city of Rotterdam the ROAD partners indicated their willingness to demonstrate CCS, thereby securing political support for their investment plans. When the carbon price unexpectedly declined to a dramatic low it could not seem to recover from, the CCS business case dissipated quickly. Together with the Dutch government, Engie and Uniper began looking for additional funding. They delayed their FID awaiting the result. In their eyes, they did not promise to deploy CCS and going forward with the project without the proper finances would hurt their financial stability.

164 See letter to the Economy, Port, Environment and Transport Commission by Van Huffelen on July 28th, 2011. Accessible through the city archives [www.ris.rotterdam.nl].

165 See meeting notes of the November 6 and 11, 2014 Council meetings in the city archives. Also confirmed in field work report M.

166 Interview 23, 31 and 32. Field work report O.

5.3.3.3. The quest for local empowerment

As the previous paragraph shows, sub-national mobilisation seemed very effective in 2007 - 2009, and later it declined. However, whether this decline is a consequence of the domestic - international shift or other factors (politics, EU ETS failure) is hard to tell. My interviews and analysis of the city archives[167] give an impression that most battles are fought locally — between the public and private sector — while the coordination of funding and policy comes from higher up. This discrepancy makes sense due to the local nature of CO_2 storage projects. Furthermore, the concept of a CO_2 hub is by definition a local affair, since it involves the creation of a cluster. Even though the projects have a local nature, at present they cannot exist without national and supranational (financial) support. I have shown that during and after the conclusion of the centralised policy-making process, peripheral activity was high but *without success*. Theoretically, Rotterdam would still be an ideal place to create a CO_2 hub, which would strengthen the region's economy and make it an important player in Dutch emissions reduction activities. Furthermore, the longer-term possibilities of a CO_2 hub would allow Germany and Belgium to transport their CO_2 to storage fields through the Port of Rotterdam. In a situation where industries could share and easily dispose of their waste products (such as CO_2) in an environmentally responsible way, a CO_2 hub could provide an attractive investment climate. These arguments are also used to advocate Port of Rotterdam Authority activity:

> *"[T]hey could be a catalyst. They should unify opinions because they have access to different industries with different interests and different views, and they can mediate between them to make the business case for CCS possible. Finding synergies is important, so that every stakeholder can find a reason to participate and engage in the CCS story. If they don't have a reason to participate, they won't. That is a challenging task, but a public authority can also keep in mind the common interest."*[168]

The synergy argument — for both companies and as a way to link to other policy sectors such as employment — comes up in other interviews and field work as well[169] and is often well-received at the EU level[170]. Box 5.4 illustrates this argument. A hub would arguably empower the Rotterdam region, but at present this hub does not exist. Neither the city nor the PoR have thus far succeeded in developing the hub — though their advocacy of

167 101 separate CCS-related documents found between 2007 and March 2016.

168 Interview 19.

169 Interviews 22, 29, 31, 33, 34, and field work report M.

170 An emphasis on synergies, after all, was how the 2020 Climate & Energy package got adopted in the first place.

Box 5.4. The hub narrative

The attractiveness of hubs - the political narrative

The European Commission is set up to be a neutral, EU-minded organ. It therefore is a great proponent of cross-border projects and any developments that benefit a larger European region or the EU as a whole. Ports, and especially seaports, cater for a larger region by nature. In the EU's efforts to combat climate change and get its members to agree to meet certain climate targets, the Commission welcomes any ideas that have the potential to make climate mitigation easier across borders. The Port of Rotterdam's CO_2 hub fits perfectly into this mindset, for it not only helps reduce Dutch emissions but can potentially store German and Belgian CO_2 as well if the right infrastructure is in place. As such, placing CO_2 infrastructure can be a catalyst for CCS development in multiple EU member states, making the Commission eager to support it.

The attractiveness of hubs - the industrial narrative

The Port of Rotterdam Authority does not own large chimneys through which CO_2 enters the atmosphere. It is therefore not the most likely partner for CCS projects, but its role as infrastructure provider is crucial: the ROAD project benefited greatly from the PoR's willingness to invest into the needed infrastructure to transport CO_2. Having this infrastructure in place makes the port of Rotterdam attractive to other businesses, since they would be able to plug into the infrastructure and deploy CCS more cheaply. If climate targets continue to get more strict, a CO_2 hub will make for an increasingly attractive investment climate. Because of the potential to aid not just Dutch industry but also German and Belgian industry, the PoR's economic reasoning to develop this hub matches the EU's mindset perfectly. It therefore makes sense to develop the infrastructure even if the ROAD project does not come to fruition.

it makes great sense — nor have they led a CCS project to see daylight. One interviewee went as far as to state that

> *"If the ROAD project eventually does happen, it will solely be due to the efforts made by the EU. They have made a lot of subsidy available and have consequently put programs on it. Multiple Commissioners have really made an effort as well. So if negotiations succeed now, it will really be due to the perseverance of the EU."*[171]

This quote represents an extreme opinion, but it does show the limits of local (semi-) governmental power and provides a good example of the fickleness of politics. Whereas it can be argued that, per Piattoni's MLG, there is a lot of potential for local empowerment and efficiency, the local level currently mostly looks like a battlefield and its empowerment seems limited due to external factors such as political and public battles over the desirability and safety of CCS, differentiated MS interests, and a low carbon price. In the CCS case, the periphery can only be empowered when the context is right. This finding adds a very useful (temporal) nuance to the centre - periphery dimension.

171 Interview 18.

5.3.4. Coordination with Third Parties - the State — Society Dimension

We have arrived at the third theoretical expectation focusing on the cross-linkages between the public and private sectors leading to a blurring of state and society. National governments still have considerable autonomy when it comes to CCS, yet if projects face local battles and difficult circumstances due to other agreements at supranational level, what then is the consequence of EU CCS initiatives for the coordination with third parties, such as the Port of Rotterdam Authority[172] and businesses in the port area? Piattoni (2010) identifies a state — society shift in which cross-linkages between the public and private sector with joint goal-setting and a blurring of state and society comprise key elements of governance structures. She also defends the notion that government needs society to govern effectively. A discussion of these *cross-linkages* and the *blurring of state and society* shows that the EU is an enabler of public-private cooperation, yet that this mostly happens along traditional lines.

5.3.4.1. Cross-linkages are enabled by the Port of Rotterdam and the EU

I have operationalised the cross-linkages as the extent to which there is resource interdependency and if the public and private sector jointly set goals. Figure 5.5 showed that the PoR does not have a high betweenness centrality in the CCS case. Theoretically, without the PoR other actors would still be connected to each other. Yet such analyses can lack important qualitative nuances: the companies are dependent on the PoR as their landlord to lease them their land. With it come requirements, which makes the PoR an important actor in the network. It is often said to be able to act as a catalyst and facilitator because it has good connections to both governments and the private sector. The CCS Directive itself had no direct impact on the Port of Rotterdam Authority and ports were not part of the deliberations at EU level. However, the larger 2020 Climate and Energy package the directive was part of contains commitments to reduce GHG emissions. As such, the ambitions the Dutch government ascribed to have a direct impact on the business conducted in the port area. As one of the main partners in RCI, the PoR was already active in climate policy before the adoption of the European package. RCI also responded on behalf of its partners to the 2013 Commission consultation regarding the future of CCS. RCI outlines the potential strength of the North Sea region for CCS application and calls for additional mechanisms atop EU ETS, since the low carbon price does not incentivise much needed CCS demonstration[173]. Implicitly, the port wants the EU — not the Dutch government! — to

172 It can be argued that the PoR is not a 3rd party in the sense that companies such as, for example, Engie and Uniper are because of its semi-public nature, yet it is not involved in CCS policy-making and its company-like characteristics allow for some leniency in this regard.

173 All responses to the consultation can be found at [http://ec.europa.eu/energy/en/consultations/consultation-future-clean-coal-technologies-and-carbon-capture-and-storage-ccs].

prioritise the Rotterdam region (as part of the North Sea area) and offer financial support to demonstrate CCS and develop its CO_2 hub.

CCS features in the *2030 Port Compass*, though it is noted that it is up to the port-based companies to develop it. Whereas the port authority itself cannot implement CCS, it is seen as a catalyst by governments and companies alike. In the words of an EC representative:

> *"If someone like the Port of Rotterdam is in, it keeps others on board too. They have a facilitating role. They also are able to keep the city of Rotterdam on board."*[174]

In other words, the PoR facilitates cooperation between public and private parties. And a representative from the Dutch government stated:

> *"The influence of the Port Authority on the way of thinking within Rotterdam is large. People listen to the opinion of the CEO of the Port Authority. They also have a lot of money they can invest."*[175]

Including the influential PoR in the ambitious RCI is logical, yet what is it that the port authority does? The PoR aims to develop its 'Rotterdam Coal Port' with respect to the climate, yet with an eye for economic opportunities[176]. As such, CCS and CCU are part of the PoR's ambitions, alongside biomass use (which can be burned in appropriately fitted coal-fired power plants) and re-use of waste heat (PoR, 2015:2)[177]. The PoR also shows its commitment to developing a CO_2 hub by investing 9 million euros in a pipeline for the ROAD project. Even though the PoR itself cannot apply CCS, it can invest into basic conditions that make CCS possible. It could also lobby for CCS and add CCS requirements to the contracts it signs with port-based businesses, although at present this is not being done[178]. Over the years, the port authority seems to have become more ambivalent to CCS. The PoR's capabilities in

174 Interview 29.

175 Interview 31.

176 In other words, even if Dutch power plants stop burning coal, the German industry is still likely to need it and therefore the PoR will continue to facilitate the transshipment of coal.

177 Interview 36. Keeping the newly built Uniper and Engie coal-fired power plants in business is in line with the policy priorities of the PoR, provided they keep their emissions in check. The PoR sees opportunities for the plants in both areas of biomass and use of waste heat. The plants can make connections to other industrial actors in the larger port complex, and even be part of a chain of heating and CO_2 distribution in the whole province. OCAP is already operating in the port area and providing a pipeline to distribute CO_2 to greenhouses in the western part of the country. Its current suppliers are Shell (oil refinery) and Abengoa (biofuel factory). Together they supply 0,5 million ton CO_2 to greenhouses, but demand is higher than that.

178 Interview 27.

this case do not stretch far beyond 'soft' power, and continuous disappointments regarding ROAD's future may have contributed to the PoR's attitude. Nevertheless, the port authority is an integral part of the CCS network by virtue of having a system overview and potentially advocating on behalf of a region instead of a single company.

In multi-level governance, mutual interdependencies lead to the sharing of resources in networks. These resource interdependencies are indeed present in the CCS case. There is an abundance of resource flows between the public and private sector in the area of CCS. In the 1990s and early 2000s most capital resource flows went from the public to the private sector to fund research on CCS. The knowledge gained was then sluiced back to the government. Now, when most policy-makers and businesses agree that projects are needed, the public and private sector seem caught in a funding deadlock: the private sector wants subsidies from the government to cover the high costs of CCS (and offset the uncertainty regarding longer-term policy priorities), but the public sector is hesitant to invest due to a history of public opposition to CCS and the lack of a clear vision on the role CCS should play in the (near) future. As one interviewee from the private sector put it:

> *"As long as governments do not think about their future energy mix thoroughly they will have no place for CCS either."*[179]

With the current price under ETS, it seems very unlikely that projects will happen without a capital flow from the public to the private sector. The advent of more EU attempts at coordinating CCS is an enabler for state - society cooperation (EU funding needs domestic support), though in The Netherlands such cooperation was definitely also present before EEPR and NER.

Knowledge and expertise still mostly lie with the private sector, although the heavy investments into past research have made experts out of knowledge institutes as well. The policy-making capacity lies with all levels of government, which has been discussed in section 5.2.2. While the EU is responsible for overall emissions reduction targets, it is entirely up to the national government whether to stimulate CCS or not, through either additional policy or funding instruments. As such, the government can require new coal-fired power plants to be 'capture ready', and it can also set emission performance standards or provide tax incentives to stimulate the price of CO_2. There is therefore a whole arsenal of policy instruments available to the national government, but it is not being used at present. As the permitting process for power plants goes through regional and local governments as well, they have agency in spatial planning and environmental requirements. In general, it

179 Interview 33.

seems that the existence of ETS is being used as an argument by governments to not set further CO_2 standards and by the private sector to not implement CCS, which leads to the situation where everyone is waiting for the EU to make a move[180].

Resource flows, as identified in table 5.4, can indicate cooperation between actors. The most crucial resources for CCS are policy-making capacity and capital. Both resources mainly reside with the public sector, although the private sector has significant own investment capacity which it does not use to develop CCS. In turn, the public sector needs information and expertise in order to make policy, but it can call on both the private sector and civil society (in a broad sense) to provide it. Research institutes and environmental NGOs are more than happy to share their CCS knowledge with governments. If the crucial resources lie with the public sector, and there are many cross-linkages, then is there also a blurring of state and society?

Table 5.4. Resource flows between state and society crucial in CCS

Resource	Summary	Direction of flow
Knowledge	Mostly embedded in the private sector and research institutes, shared with public sector through networks, meetings and research	Private —> public Civil society —> public
Policy-making capacity	Public sector prerogative, sets the framework in which the private sector operates	Public —> private
Personnel	Relatively low FTE capacity in public sector, private sector has also reduced FTEs for CCS, advocacy through several well-known people	None
Capital	Investment capacity relies on both public and private investments because of the high costs of doing CCS	Public —> private (+ private sector's own investment capacity)

Source: author's own field work and interviews.

5.3.4.2. Cross-linkages do not necessarily lead to a blurring of state and society

Piattoni refers to a blurring of state and society; a situation in which the public and private sector perform activities or tasks traditionally associated with the opposing sector[181]. The CCS case could potentially be the best case to show a blurring of state and society since no money can be made with it. CCS is an end of pipe solution; there is no end user buying the product. There is also a matter of risk sharing between the private and public sector (see box 5.5). Therefore if CCS is deployed, it must mean state and society cooperated in

180 Interviews 22, 24, 26, 27, 28, 29, 37, and 38. Also discussed in previous sections.

181 Please note that this is a very far-reaching interpretation of blurring of state and society. It is an extreme version of the cross-linkages between the public and private sector, which is the more traditional interpretation of blurring.

Box 5.5. Narratives of risk sharing

Risk sharing - the political narrative

The CO_2 that is captured can be stored in (nearly) depleted offshore oil and gas fields. Companies that 'work' these fields have permits to do so, and need a separate permit for CCS. The purpose of storing CO_2 in these fields is to contain it on a very long term: in principle, the gas should be stored underground permanently. However, storage operators and insurers face potential risks of residual leakage. While these risks are unknown, it is difficult for them to take them on especially since the long-term price of carbon is uncertain. Governments are asked to take on part of these risks to make CO_2 storage less of a liability. Furthermore, the field is transferred back into the government's hands when the field is full, as no profit-oriented company has an interest in monitoring the field on the long term. Governments are hesitant to take such assets back, fearing future leakages and societal costs.

Risk sharing - the industrial narrative

The company capturing CO_2 is not necessarily the company operating the storage site for the gas. Storage operators and capture operators run risks that are not easily extrapolated for and therefore difficult to insure. These uncertainties are not necessarily easy to bear for companies that depend on profit and the opinion of their shareholders. Since storage is essentially performed on lands owned by governmental authorities, it makes sense for the private sector to ask governments to share some of the risks. The private sector also does not want to have to keep monitoring a field after it has been filled up, since it does not provide them with any revenue. The CCS Directive prescribes the adoption of transferral times in national frameworks. In effect, many governmental authorities have several chosen decades before a field is transferred back to them. These additional risks make calculating a business case difficult.

providing a *public good*. However, as discussed earlier in this chapter, even though projects have been proposed there has not been real progress in the CCS field in the EU for years.

The clearest example of blurring at EU level is the widespread inclusion of business and civil society in consultations preceding proposals. In The Netherlands blurring is visible in the formulation of the Dutch *Energieakkoord*, which functions as the country's main energy policy document. Representing the wishes of the private sector in a policy document supposedly makes it easier to carry out the policy, but it does place the private sector in the chair of the policymaker.

One would expect governmental authorities to lobby for CCS toward either other governmental bodies or the private sector. Especially the Dutch national government has lobbied and tried to support CCS projects at the EU level. National government support (and funding) is a requirement for obtaining EU funding under NER 300 and the EEPR, so this support is to be expected to some degree. More unique are the efforts made by the Dutch national government to secure additional funding for the ROAD projects from other national governments. To this end, the EU's Era-net programme could soon facilitate extra funding for ROAD from the German and Norwegian governments. Additionally, the

Commission will add 50 cents to every euro spent by these governments, up to a maximum of 20 million euros. In this way, ROAD could benefit from an additional 60 million euros funded partly by other countries and with help from the Dutch government[182]. This is quite an interesting move which only makes sense if the Dutch government has significant interest in making ROAD successful. The demonstration of CCS — be it in the power sector or in industry — and extensive deliberations between state and society can be taken up in public-private partnerships, blurring the traditional areas of responsibility. Already there are government representatives lobbying for ROAD at the EU level, and private companies advising governments on the possible future role of CCS. The PoR is also seen to step in to coordinate and facilitate public-private connections. Extending these activities therefore shows promise, but it is not without risk.

As per Dutch tradition, many interactions between the public and private sector result in a measure of joint goal-setting. While most mentions by interviewees were positive, some also hinted at conflicts. The most visible conflict pitted the city of Rotterdam and the ROAD partners against each other, since the city maintained that a CCS promise had been made to them when applying for construction permits for the coal-fired power plants, while Engie and Uniper stated they shared the city's wish to reduce carbon emissions through CCS but that they had never made a binding promise to the local government to do so. The conflict escalated, receiving a lot of media attention and eventually led to appeasement efforts undertaken by mayor Aboutaleb[183]. Many interviewees underline the importance of public-private cooperation, especially since emissions reductions can be seen as a public good, but the emission sources (ie. the private sector) are the ones who need to implement emission reductions. In the present situation the financial picture for CCS does not give much hope, and the national government's lax attitude coupled with the EU's now mostly soft coordination keeps progress at bay. To conclude, while there is much activity between state and societal actors as predicted, when push comes to shove CCS is too contentious and everyone prefers to stay in their own corner. The expected far-reaching blurring of state and society does not seem present. The PoR, while able to bridge the gap between public and private actors, is also too dependent on both sectors to be able to make a difference on their own.

5.3.5. Discussion of the Three Theoretical Dimensions

CCS could be one of the solutions to the problem of climate change. It is tackled through the adoption and implementation of climate and energy policy at EU level and within nation

182 Interview 23, 28, 31 and 34.

183 Interview 31.

states. Three shifts were explored in this chapter: the state - society shift, the domestic - international shift, and the centre - periphery shift. These shifts are connected to each other through the dynamics that occur within them. MLG focuses on contestation along these three dimensions, since it does not assume that there is complete coherence between them (Piattoni, 2010:87-88). The three shifts, along with areas where they clash, will be reviewed now (see table 5.5).

Table 5.5. Results of CCS case per key concept of MLG

Dimension of MLG	Key concepts	Results of CCS case
Domestic - international dimension	Interdependencies at international level	1. Hardly new cross-border networks created 2. Representation in international organisation or associations along traditional lines
	Policy coordination at the X level of government	1. EU attempts to coordinate policy, but mostly in national hands 2. National policy documents do refer to the necessity for EU decisions as excuse to do nothing (level playing-field)
Centre - periphery dimension	Coordination of activities	Many local attempts at coordination, first through effective triple helix cooperation and then characterised by conflict
	Local empowerment	1. Many attempts at local coordination 2. PoR perceived as important locally but potential empowerment of local actors blocked by external factors
State - society dimension	Cross-linkages between public and private actors	1. Many resource flows between public and private actors, capital and policy-making capacity are crucial 2. Joint goal/target setting present but not without debate
	Blurring of state and society	1. CCS potentially perfect example of blurring through risk sharing but currently not happening 2. Dutch government lobbies other governments for funding for ROAD project. Other than that hardly any blurring of state and society

Source: author's own composition based on case study.

In terms of the state - society shift it becomes obvious that neither the (supra)national government's aim to reduce carbon emissions nor the PoR's wish to become a CO_2 hub can be realised without participation of the private sector. The governance of CCS is therefore not a government affair, but a *governance* affair, ie., non-governmental actors are indeed needed to govern climate and energy policies effectively, which lends credibility to the newer, more horizontally oriented reconceptualisation of MLG. However, this study shows that the hierarchical dimension remains important as well. Lacking a clear long-term signal regarding the future of CCS in governmental policies, and facing poor business cases due to the low CO_2 price under the EU ETS, companies are reluctant to invest in carbon capture

and storage. They call for governmental authorities to provide stable guidance using the resources they have at hand: capital and policy-making capacity. A representative from the European Commission argues why stability is key:

> *"CCS is a long-term investment, so one cannot play around with investors and support CCS one year and not another year. They need a predictable framework so that they know what they are committing to. Changing the rules in the middle makes them run away, and that is what's going on right now."*[184]

National governments are either criticised by the EU or the private sector for their lack of a long-term energy and climate strategy, or they are dependent on each other to instigate changes at EU level. A reform of the ETS, for example, has to go through the regular EU decision-making procedure and will take time. This dependency on the international dimension (or, the shift away from the domestic level) is used by the Dutch government to legitimise inaction. In addition, the national government seems unwilling to set emission performance standards or to implement a CO_2 ceiling[185], which would spur the private sector into action. Wanting to ensure a level playing-field enables the national government to push responsibility over to the EU level or even the global level. Paradoxically, EU funding schemes rely on financial support from national governments (in for example NER 300 and EEPR, but also in the newly established Era-net/ACT)[186], which means that national governments are forced to think about their position with regards to CCS and whether they are willing to fund it. The long timeframe of CCS demonstration and implementation necessitates a long-term vision from national governments, which is lacking. As such the shift from domestic governance to international governance was first initiated, and then slowed by national governments. Applying MLG uncovered these tensions in this case quite well.

The unintended effects of political debates, supranational policy-making and the adoption of the 2020 package also had its consequences for the centre - periphery dimension. While the decision-making regarding the legal framework for CCS was centralised, the periphery was very active in its application. In fact, precisely because CCS has a local impact it makes sense to look for concrete developments at that level. RCI tried very hard to enable CCS in Rotterdam: CCS alone would contribute 60% to the city's decarbonisation goals. Its ambitious policy goals could not be realised because of the constantly declining business case for CCS. The EU ETS did not work as intended and even hampered investments into

184 Interview 19.

185 Leaving aside whether such a ceiling would be advisable or not, as opinions differ on this matter.

186 For more information, see [http://www.act-ccs.eu/news/].

low-carbon technologies. In Rotterdam, this problem led to a clash between the city and the ROAD partners. Eventually, local politicians turned against the technology as well and the city lost its drive to make CCS happen. There is high potential for a strong CO_2 cluster in Rotterdam, which is also acknowledged by the EU, but this potential has not been realised (yet). The Port of Rotterdam is committed to CCS and is willing to invest in the necessary infrastructure, but it has not been able to achieve more than that. The port authority is seen as a catalyst and mediator between public and private parties, but it lacks 'hard' power. This study adds more nuance to MLG by showing that the local level is potentially efficient, but cannot be empowered without the right framework in place. *The international (EU) dimension is therefore a leading factor* in the CCS case, both in terms of its policy frameworks backfiring and in the minds of domestic actors who are waiting for the EU to change. Future policy-making and implementation of CCS may thus be extremely difficult.

5.3.6. Secondary findings; the Role of Power and Uncertainty

Two concepts were often mentioned in my interviews, though the questions did not explicitly probe for them[187]: the role of power on the one hand, and uncertainty on the other. Both will be discussed in this section. MLG has long been criticised for its lack of a good conceptualisation of power (see chapter two for a discussion). However, power, and especially politics, seems to play an important role in the CCS case. In the brief words of someone from the private sector:

> *"Energy is politics and CCS is extremely so."*[188]

Two issues regarding power are of particular interest: public opinion and member state sovereignty. First, it is clear that during the initial phase of the CCS Directive, the EU expected member states to jump into any financing gap and help the private sector kickstart investments into CCS. The EU was willing to stimulate such developments both financially and through the CCS Directive, but expected national government activity. When that did not happen the EU first called upon the governments' responsibility to think through long-term energy and climate strategies. This effort did not get the expected results either. The EU's current, officially technology-neutral, approach is to again give financial support to promising projects hoping to get CCS going in this way. Specifically for the ROAD project increased coordination is being organised through the Eranet-ACT co-fund and a possible

187 Their importance became apparent during the coding of the interviews when many statements could be attributed to either power or uncertainty.

188 Interview 24.

Horizon 2020 call[189]. Furthermore, CCS continues to be mentioned in the 2030 Climate and Energy framework and the 2050 Roadmap but both documents offer fewer strict climate targets and implicitly favour the economics of energy policy, reflecting a move back to the pre-2009 situation where EU targets were mostly soft and non-binding (Skjaerseth, 2016:512). While this continuous cycle of policy coordination seems supported by national and private sector actors as well, activity is as yet not guaranteed. Policy coordination, as one interviewee states, might not be sufficient to bring about change:

> *"The real breakthrough will eventually have to come from Europe. But everything starts with wanting to do something. We first need to want it."*[190]

This simple statement is of crucial importance in the CCS case. When asked about the discrepancy between official documents stating the necessity of CCS and actual non-existence of CCS projects across Europe, almost all respondents replied that there is indeed a feeling of unease surrounding the technology. Polarisation runs rampant in debates. Words such as 'absurd' and 'crazy' are not uncommon, whereas CCS enthusiasts see it as the rational way to decarbonise an economy they know will be driven by fossil fuels for some time to come. Perhaps not in all of the EU, but definitely in still developing countries. Public opinion is generally against CCS, which makes governmental financial support difficult. A previous study shows that even citizens are more inclined to be convinced by economic arguments than climate-oriented arguments, which runs counter to the primary goal of CCS (Broecks et al., 2016:64-65). One of the results of the 2013 review of the future of CCS shows that

> "39% of all respondents (most citizens) consider that successful CCS demonstration has been prevented by its own absurdity and harmful effects" (European Commission, 2013h:10).

Both the supporters and adversaries are probably right to some degree, and as long as it is unclear which direction governments take, the private sector faces risky investments into a technology that is not guaranteed to provide a return on their initial investment.

Second, EU members retain considerable sovereignty in their climate mitigation efforts and energy policies, even though the EU is perhaps better at formulating a long-term vision than national governments. Especially the private sector is waiting for concrete changes at the EU

189 Interview 23, 28, 31 and 34.

190 Field work report O.

level (for example ETS reform)[191]. Now, the Commission will probably not receive support to tweak its CCS policy although most national governments are unlikely to decline any financial incentives from the EU. The national government seems fine with that because it allows them to justify inaction that way. In the words of a Commission official:

> *"In climate, energy and environmental files there is a lot of divergence between Member States in terms of how readily they accept the proposed goals. Some are much more hesitant to push for these goals. It is already a big fight to set the GHG reduction targets. For these targets efforts need to be shared. But for the renewables target, for example, it's an EU-level target which needs to be reached by Member States individually. It is unknown if they will actually reach the target, and it's a big question what the Commission can do to ensure they reach the targets […]. The trade-off made when agreeing on the 2030 targets was the consent to a 40% GHG emissions reduction target and 27% renewables, but leaving a lot of leeway for Member States in deciding how to reach these targets."*[192]

Paradoxically, a lot is left to national governments whereas at the same time nearly everyone agrees that supranational targets are necessary when it comes to decarbonising the economy. In an analysis of the decision making process preceding the package, Skjaerseth (2016:514) found that significant respect for member state autonomy was necessary to get them to agree to the package. However, in the process of negotiations heavy emphasis was placed on climate and energy synergies, whereas potential trade-offs were ignored. CCS was linked to the EU ETS to accommodate heavy-industry friendly member states (such as Germany) during the negotiations of the 2020 package. Wanting quick adoption of the package to show international climate leadership in Copenhagen (COP-15), the EU did its best to sell the package by linking issues that provided an advantage and offering side payments through, for example, NER 300. Now, the Commission is restrained by lack of member state support and ever since national governments experienced the trade-offs of the ambitious 2020 package, no highly ambitious package has been adopted. Instead, many member states are now underlining their sovereignty and resisting further binding climate and energy targets at the EU level. Both CCS and renewable energy projects have suffered from these developments (Skjaerseth, 2016:516-518)[193]. Multi-level governance might face conceptual challenges

191 Interview 24, 30, 33, 37, 38, and field work report O.

192 Interview 35.

193 As part of a side payment to heavy-industry friendly countries (with Germany in the lead), 300 million allowances under EU ETS were auctioned off to finance CCS and renewable projects. They suffered from a drop in carbon price,

explaining these mechanisms due to its underlying belief that Europeanisation will lead to ever greater coordination and restrict the power of national governments. This assumption does not hold when the majority of European states turns against further EU coordination.

Policy uncertainty was also found to have explanatory value in the CCS case. Investments into CCS are expensive, future carbon prices are uncertain and national governments are hesitant to support CCS. When a government does not try to enforce its policy goals by either legislation or financial incentives, the market faces uncertainty in the actual longer term policy priorities of the government. Box 5.6 illustrates how this uncertainty is a major hurdle to get projects going which only pay themselves off in the long run. Furthermore, companies also invest based on the perceived costs and benefits of their investments. According to Barradale (2014:521-531), investors make their decisions not so much based on the (expected) carbon price, but on what the author calls 'payment probability'. The probability of having to pay for carbon-intensive investment rises if governments adopt carbon policies, if no exemptions (also called *grandfathering*) are provided by governments

Box 5.6. Narratives of uncertainty

Waiting for policy choices - the political narrative

CCS development was linked to the EU ETS at EU level when the NER 300 financial mechanism was set up which was tied to the carbon price. The consequence of a low carbon price is that NER 300 grants became lower than intended, and CCS projects faced ever increasing financial gaps. The Dutch government has always stated it wants the ROAD project to happen. In order to help cover the financial gap, the Dutch government has an array of possible instruments: it could, among others, provide the project with more funding, institute a national carbon tax, lobby the EU for a revised EU ETS, or obtain funding from other countries. Thus far, the government has been unwilling (and perhaps politically unable) to tinker with the finances at national level, and has therefore advocated an EU ETS revision and tried to secure funding from other countries. To the private sector it has given one message: we cannot do anything on our own, we need to wait for EU action.

Waiting for policy choices - the industrial narrative

The ROAD project is looking less and less likely to reach a positive FID phase. Linking CCS to the EU ETS has led to unwanted and unpredicted side-effects. Uniper and Engie are unwilling to invest in the project if the financial gap remains large. Since CCS seems to play a large role in Dutch ambitions to reach European climate targets, the ROAD partners turn to the Dutch government for a solution. Given that demonstrating CCS has value in itself and could help kickstart further CCS development in the port of Rotterdam, they hope the government is willing to help bridge the financial gap. They are happy to hear that the government is trying to secure funding through Era-net, but policy-wise not many changes are on the horizon. A revision of EU ETS will take years. The companies have no choice but to invest more themselves, or wait for governmental authorities to take action.

lowering actual funding and creating financial gaps for CCS projects.

and if the costs cannot easily be passed on to someone else (for example, the tax payer). Therefore, if

> "people in the industry anticipate various possibilities for investors to avoid paying the price of carbon […] then policy impact is weakened" (Barradale, 2014:531).

If governments implement lax policy or easily give permits lengthening the life of carbon-intensive investments, investors may not have any incentive to pay for expensive technologies such as CCS since they will not have to pay for their carbon emissions anyway. Public opposition to CCS further shows that, without support from non-governmental actors, governments may not be able to govern the energy and climate domain effectively. Table 5.6 summarises the hurdles most often mentioned by interviewees.

Table 5.6. Which factors prevent CCS from seeing daylight?

Politics/policy	Finance	Technology
Political will lacking / it feels wrong	CCS is expensive	Benefits are unclear and not demonstrated
No long-term vision and CCS is not needed to reach short-term goals	Low carbon price under EU ETS	Safety concerns
Fossil fuel lock-in fears	Funding problems at national and EU level	
Lobby against CCS and unfavourable public opinion	Level playing field lacking	

Source: interviews, each hurdle has been mentioned by at least four people and is commonly found in evaluative documents. Ranging from most to least mentioned in this table.

On the politics and policy side the lack of political will and a long-term vision causes uncertainty for investors because they do not know how governments see the future of CCS and it is therefore very difficult to calculate the real costs of it. This uncertainty contributes to companies asking for public funding for their CCS projects, which can be seen as a proxy for approval of the technology in future policy. In the words of Shell:

> "CCS also suffers from the lack of a long-term signal that it will play a key role in EU decarbonisation efforts. CCS has a huge potential to support EU decarbonisation goals. Low carbon technologies have historically succeeded by policy makers giving a clear indication that they will play a role and by setting appropriate milestones for their development and deployment. In addition to a long-term signal, CCS projects have suffered from a lack of capital support. [Shell] notes the need for an effective demonstration fund, potentially linked to the ETS, which improves on the experience of the NER300 and delivers much needed investment support to CCS projects." (Shell, 2013)

This position is supported by umbrella organisation Eurelectric, which also calls on the EC to make better use of its soft powers by stimulating cross-sectoral CCS discussions (Eurelectric, 2013). All these hurdles create uncertainty for those involved in CCS; be it in the public sector or the private sector. The Port of Rotterdam Authority as facilitator and catalyst lacks formal mandates and cannot solve these problems on its own, since power is spread across actors in all level of governance.

5.4. CONSEQUENCES FOR THE PORT OF ROTTERDAM

How much can the port authority do on its own? It is clear that the PoR wants to develop a CO_2 hub, but that it is dependent on many other parties to make it happen. The PoR is often seen as a strong ally able to keep others on board and mitigate between public and private parties. However, it has its own preferences and interests as well. Since CCS projects have chiefly been cancelled due to delayed transposition of the CCS Directive (now solved) and financial gaps caused by the low carbon price under the EU ETS (as yet unsolved), the PoR has to take into account that its vision for the CO_2 hub is currently constrained by forces operating at EU level. The Dutch government seems reluctant to set its own carbon pricing or follow in the footsteps of pro-active countries such as Germany and the UK, so it is likely that only changes at the EU level will turn things around for the PoR. In the meantime, what the PoR can do — and is doing — is keep local parties on board and continue preparations for CCS, for example by laying out a CO_2 infrastructure. Especially with a view towards a possible future where the industry might have to apply the technology, the PoR has the tools in hand to think ahead and formulate a CCS strategy.

Solving long-term problems such as climate change requires long-term solutions. Such solutions can be problematic for national governments due to their inclination to not look far beyond their governing period. The Port of Rotterdam Authority, although facing the uncertainty of governmental policy-making as well, can make long-term visions more easily. At the very least it should be able to give (potential) investors in the port area clear policy signals for the future by expressing the direction in which it wants to go. If activities for the construction of CO_2 infrastructure are planned or underway, it might attract companies to the port. The PoR's network is established well enough for it to be able to cooperate with interested parties towards clear goals. However, not everyone is happy with the PoR's position as a spider-in-the-web in the CCS case. Representatives from environmental organisations have stated that while they see that the PoR is interested in the business model created by the transport, storage and re-use of CO_2, they do not understand the PoR's role in these developments and feel that these efforts counter any climate efforts undertaken by the

port authority[194]. Government representatives show support for the PoR's facilitating role, adding that it helps create jobs and supports synergies between businesses in the port[195].

The international domain is more and more important for the port because of the level playing-field argument as well. The cross-border nature of climate change and the market-driven energy trade keeps national governments aiming for agreements at international level. Stricter energy and climate goals and applying CCS in the industrial sector will have an impact on the PoR's day-to-day business. As there is a lot of industry in the port region and carbon leakage remains an issue, the PoR is considering a scenario in which 50% of current industry in the EU will have disappeared by 2030. As a landlord port it is in the authority's interest to avoid empty plots, meaning that the PoR has to take into account that a different business model could be impending.

The advantage the PoR has is its soft power; local and national influence. Initially, it also benefitted from strong local support for CCS, although the city lacks resources to make CCS happen. The Port of Rotterdam is also extremely important for the Dutch economy, making the Ministry of Economic Affairs a natural ally. In CCS matters, the position of the Ministry of Infrastructure and Environment is more unsure and poses a higher risk. At the EU level, potential allies are DG ENER (generally pro-CCS and worked hard to get ROAD going under the EEPR), DG GROW (considering CCS in the industry but only if it does not harm the sector) and DG RTD (for research and development), with some ambivalence within DG CLIMA. The climate department's initial enthusiasm seems to have dwindled and its focus is now more heavily placed on renewables. Whereas the PoR decided to respond to the 2013 CCS review under the banners of RCI, this choice is not viable anymore due to the slow but sure withdrawal of support for RCI from the city's side. EU decisions impacting the energy and industrial sectors indirectly impact the port, so there should be significant interest in making sure that the port authority retains its position as mediator in the network. Its ability to provide a system overview rather than a single company standpoint is a unique selling point.

5.5. CONCLUSIONS

Looking at this case from a MLG perspective uncovers the dynamics of a seemingly local initiative, which is highly dependent on EU-level efforts. The complexities of energy governance in the EU lead to a cascade of responsibilities and competencies which make untangling its governance difficult. Nevertheless, this chapter has sought to provide insight in the dynamics

194 Interview 38 and 39.

195 Interview 19, 27, 31 and 34.

of the governance of CCS. Table 5.7 summarises the conclusions per theoretical expectation, and though not strictly part of the framework, this concluding section will also reflect on the effectiveness of the governance of CCS.

Table 5.7. CCS conclusions per theoretical expectation

Theoretical expectation	Conclusions for CCS case
Actors create interdependencies between business, civil society, and government on an international level, which necessitates policy coordination at not only the national level but also the supranational level *-> The PoR is one of many actors active at international level because the policy solutions the PoR needs cannot be provided at national level alone*	Symbolic shift (just soft coordination) from the domestic to the international, with governmental authorities retaining their decision-making competencies and crucial position in ensuring risk sharing (strengthening vertical governance). Mutual interdependencies are maintained in traditional networks by actors such as the PoR, and by societal actors in a broad sense, but supranational coordination is mostly spurred through nation state and EU activity due to global climate negotiations.
Regional coordination in territorial matters is more efficient than national coordination, which leads to the strengthening of local policy actors *-> PoR is empowered due to being able to employ its resources effectively when stimulating activities in Rotterdam*	Creation of a new centre at EU level yet seems blocked by national government passivity. External factors such as politics and low carbon price hamper local effectiveness. The dependence on international action renders peripheral actors such as the Port of Rotterdam Authority and the city of Rotterdam (nearly) powerless.
Cross-linkages between private and public actors lead to private parties assuming public responsibilities and public parties acting like private groups *-> PoR develops economic activity in cooperation with the private sector and advocates its interests at EU level alongside Dutch governmental actors to obtain favourable policy conditions*	Shift from the state to society due to the critical nature of resource flows, resulting in more horizontal governance, where the public and private sector jointly — yet not blurred — attempt to implement a technology to meet climate targets. The PoR is politically successful in advocating its CO_2 hub concept with the private sector and at EU level, yet implementation is still lacking.

Source: author's own composition based on case study.

The 2020 Climate and Energy package they negotiated contained the first ever legal framework for CCS and was meant to streamline *and* kickstart its development across the EU. This effort was matched by funding opportunities at the EU level through the EEPR and NER 300. Yet the governmental authorities and EU bodies did not foresee that their package would lead to trade-offs. When carbon prices dropped during the financial crisis, the willingness to invest in low-carbon technologies faded away. The EU was left with an ambitious package no-one wanted to implement. National governments, and especially the Eastern European countries, learned that issue linkage at the EU level may not be beneficial at the domestic level. Supranational CCS policy is a case of symbolic policy coordination while national governments keep the reins firmly in hand.

Supranational coordination did not lead to empowered peripheral activity, partly due to the vast differences in implementation of the CCS directive across EU members. Furthermore, the EU is often mentioned as the reason for a passive attitude from both the national government *and* the private sector. The state of the EU ETS is used as an argument for inaction, and therefore it is up to the EU to change the situation. Yet within the larger climate and energy package the EU ETS and effort sharing (in non-ETS sectors) together cover all emissions, so a technology-specific directive such as the CCS Directive was *not strictly necessary*. The EC used the opportunity to get a better grasp on energy policy coordination in proposing these directives. Both EU institutions and national governments fell short in the construction of the Climate and Energy package. On the one hand, the private sector can therefore not be blamed for its resistance to investing into CCS. On the other hand, if climate change is to be taken seriously, the private sector will have to take its responsibility and heavy emitters could be expected to pay for making their business cleaner, be that by using CCS or other methods.

At the local level, it is clear that the city of Rotterdam, the Port of Rotterdam Authority, the other RCI partners and companies such as Engie and Uniper have been important. Without their commitment to CCS the ROAD project might already have been cancelled alongside the other projects under the EEPR. These local actors have actively sought to cement their efforts at the national level, gaining traction in the Ministry of Economic Affairs — which sought to diversify the Dutch energy mix by adding coal to the mostly gas-powered electricity sector — and causing CCS to be part of the *Energieakkoord* and the *Energierapport*. However, the Dutch parliament continuously questions the implementation of the *Energieakkoord* and there is little support for public financing of CCS projects. So far, none of the efforts undertaken by the EU, the Dutch government, the PoR or other actors have led to effective governance: the problem of high emissions is still not solved, and CCS as one of its solutions has not developed. Supranational coordination has provided a catch-22 for CCS: it is deemed necessary by all parties involved, but it creates problems which persist because the necessary level of agreement to solve them is now absent.

What is the 'engine' that seems to be at work in this case but is frustrated by other factors? The wish the EU and its members have to be a global climate leader led to permission from MS to harmonise climate goals at EU level. The result was an EU-wide vision guiding COP-15 negotiations and resulting binding climate targets at EU level, including a CCS Directive. With the Directive came EU funding for CCS demonstration projects. So far, so good. Normally, one would expect demonstration projects to happen successfully, leading to more rounds of EU policy harmonisation as actors learned from the demonstration projects, resulting in wider implementation and cemented EU competencies. However, national governments hesitated in their implementation of the CCS Directive, resulting in delays and various interpretations

of where and how CCS could take place. These delays, and the dramatic drop in the carbon price under EU ETS, made the implementation engine grind to a halt. Demonstration did not happen, member states had no interest in subsequent rounds of revision of the CCS Directive, public opinion turned against CCS, and potential large-scale implementation of CCS became unlikely. Especially The Netherlands, as one of the most promising countries for CCS, hesitated after the Barendrecht CCS project left both the government and the private sector (in this case Shell) scarred. The Port of Rotterdam cannot break through so many showstoppers at various levels of governance. Getting CCS back on track might require a fresh start, for example as a result of the EU's ambitions under COP-21.

Multi-level governance shows how the policy processes work at the EU level and reminds us that governments are dependent on each other and on non-governmental actors for effective governance. Exactly because energy and climate policy in the EU works through complex multi-level governance mechanisms, the absence of political, legal or financial factors *at any level* make governance problematic. The CCS case shows that initially effective regional coordination can be nullified by unforeseen effects of international coordination. While public-private cooperation is necessary, the predicted far-reaching blurring of state and society has not occurred. However, increasing (soft-)coordination attempts by the European Commission do enable more public-private cooperation at domestic level in order to get favourable arrangements at EU level. Concepts such as power and uncertainty add their explanatory value here as well, showing how a technology such as CCS can become deeply political (and thus not 'neutral') and giving insight into how multi-level governance helps tackle uncertainties surrounding the role of CCS in European climate and energy policy. Whether power and uncertainty are covered adequately by Piattoni's conceptualisation of MLG will be discussed in chapter seven, after exploring whether the small-scale LNG case also shows that power and uncertainty help explain governance mechanisms.