Supplementary materials

S1 - Interview protocol

Guidelines for interviewers

1. The interviews are problem based. The problem we introduce/analyze is the societal challenges of CCS and if and how they can possibly be overcome by monitoring.
2. The interviews are semi structured. We follow the structure of 1) introduction, 2) perspective on CCS and societal embeddedness of CCS, 3) linking challenges to monitoring.
3. We invite the interviewees to talk about their perception of CCS, the local project and the societal embeddedness of CCS and what the role of monitoring could be in improving the societal embeddedness.
4. If the interviewee does not think or know how monitoring can contribute, we introduce the motivations/expectations of DigiMon project, and invite them to think about whether they agree that monitoring can make a difference in public perceptions.
5. The topic list is kept at hand during the interviews.

Introduction of our project

[country specific introduction to the local case]

During this interview we want to learn more about how you think CCS [project X] is perceived/understood in society.
We are interested in the **main societal challenges** for the deployment of CCS, Project X (at local level) in specific, and your perspective on how **monitoring of the CCS storage** effects the societal perception of carbon storage.

Introduction of interviewee

1. Please tell me how involved/familiar you are with the project? [or CCS in general]

Challenges on the local CCS site

2. how do you assess the social understanding of CCS in general/your project? What challenges do you see?
    i. …. Impact on the environment?
    ii. …. Stakeholder positions (local)?
    iii. …. Policy and legal requirements
    iv. …. Economic aspects?
    v.

Linking challenges to the monitoring system

Generic goal: how can a monitoring system help to address these challenges?

3. How does your role within [organisation or project X] relate to CCS monitoring?
4. What do you think the role of a monitoring system is in the societal context?
   Optional, if it does not come up in the conversation:
5. You named challenge X [insert a challenge from your conversation] before,

a. (How) can a monitoring system fulfill in that need? / What is needed in the design and implementation strategy of a monitoring system?

Topic list to guide the conversation

- Role of monitoring in current policy and regulations
- Influence of monitoring on the impact on the environment (natural and built?)
- Influence of monitoring on risk perceptions (regarding to environment)
- Stakeholder involvement regarding monitoring
- Communication with stakeholders about monitoring
- Contributions of stakeholders regarding monitoring
- Opinions about monitoring
- Influence of monitoring on (public) trust
- Political climate (barriers, support)
- (allocation of) Monitoring costs (who pays?)
- The role of monitoring in the business case (costs and benefits, risks, how much attention is payed to it)

S2 – Informed questionnaire

	Introduction
	Welcome! This questionnaire was set up by researchers from research institutes in four different countries; TNO in the Netherlands, CRES in Greece, NORCE in Norway and UFZ in Germany. In this survey, we ask you to give your opinion about a technology for reducing climate change called [CCS in your own language] (CCS, carbon capture and storage). Your opinion is very valuable, even if you are not familiar with this technology. There are no correct or incorrect answers, only your own opinion. Filling in the questionnaire takes about 12 minutes. Most people are unfamiliar with the technology discussed in this questionnaire. Therefore, you will be reading information about this technology before we ask for your opinion. The information has been produced in collaboration with a diverse group of experts from universities and knowledge institutions in Europe. This has been done to ensure that the information in the questionnaire is as accurate and balanced as possible. The structure of the questionnaire is as follows. First, you will be asked some general questions. Next, we would like to learn about your environmental values and your knowledge on climate change. Then, we will ask you what you already know about the technology that is central to the questionnaire. You will then receive further information about this technology and its consequences and you will be asked to give your opinion on this technology. Your answers will be processed anonymously. Reporting will be done on group level. The data will be used for statistical analyses and may be used in scientific publications. If you have any questions or feedback before or after completing the questionnaire, or if you have any questions or feedback about the study, please contact by emailing the researcher responsible: [name], [email].
	Social demographics
	How old are you?
	What is your gender? **Male; Female; Non-binary ; Transgender ; I don't want to share**
	What is your highest level of completed education? • No education/elementary school • Primary education • Upper secondary education • University/University college
	In what ZIP code is your home located?
	We would like to start with a question on your employment situation.
1	Have you ever worked or are you currently working in the oil or gas industry and/or energy sector or been professionally associated with it? • Yes, I currently work in the oil or gas industry and/or energy sector • Yes, my current job is closely associated with the oil or gas industry and/or energy sector • Yes, previously I have worked in the oil or gas industry and/or energy sector, or have been closely associated with it • No
	Climate Change Climate change refers to the large-scale, long-term change in weather patterns on our planet. The increase in global average temperatures (also called "global warming") is one of the signs of

	climate change. This global warming is largely caused by increased emissions of gases such as CO_2 (carbon dioxide). **CO_2** CO_2 is a colorless and odorless gas that occurs naturally in the air, but as a result of human activities the amount of CO_2 in the atmosphere has increased rapidly over the last 150 years. This is mainly due to the burning of fossil fuels such as coal, oil and natural gas to provide energy for e.g. industry and the heating of houses. **Global warming** Global warming has a number of negative impacts on life on Earth, including more extreme weather events, rising sea levels, crop failures and public health hazards (e.g. from heat waves). All European countries, including the Netherlands, have committed to international agreements to reduce CO_2 emissions in order to slow down climate change.
2	Below are several statements regarding the environment. Please indicate the extent to which you agree or disagree with each statement. • 'Humans have the right to modify the natural environment to suit their needs', • 'Humans are seriously abusing the environment', • 'Plants and animals have as much right as humans to exist', • 'The balance of nature is strong enough to cope with the impacts of modern industrial nations', • 'Humans were meant to rule over the rest of nature' • 'The balance of nature is very delicate and easily upset' **7-point likert scale (Strongly agree – neither agree nor disagree – strongly disagree); I don't know**
3	Based on what you know, which statement best describes your view on climate change? • I believe that the climate is not changing • I don't know whether the climate is changing or not • I believe that the climate is changing, but that it has little to do with human action • I believe that the climate is changing, to a large extent due to human action
4	Consider the statement below. To what extent do you agree or disagree with the following? • Technological innovations will eventually solve our problems/challenges with climate change **7-point likert scale (Strongly agree – neither agree nor disagree – strongly disagree); I don't know**
5	Have you ever heard of [CCS in your own language] (CCS, carbon capture and storage)? • No, I have not heard about this • Yes, I have heard a little about this • Yes, I have heard a lot about this
6	How much do you know about [CCS in your own language]? **7-point likert scale (A lot - Nothing at all)**
	CO_2 capture There are different types of measures to reduce CO_2 emissions. One measure to reduce CO_2 emissions, for instance, in industry is through applying [CCS in your own language] (CCS, carbon capture and storage). With CCS, the CO_2 emitted by industry is captured directly at the industrial facilities and then liquefied by compressing the CO_2. **CO_2 storage**

	The liquid CO_2 is then transported to a subsurface storage site by pipelines, trucks, trains or ships, where it is stored deep (1 kilometer or deeper) underground in host rock (such as empty oil and gas reservoirs or porous rock formations). On top of the host rock, there is a natural layer of rock that the CO_2 cannot pass through. The captured CO_2 is permanently stored and is not emitted in the air and thus cannot contribute to further climate change. **Societal debate** CO_2 storage is technologically feasible on land (onshore) and on the see (offshore), but due to societal debates on the impact of CO_2 storage on nature and/or society, all current projects in the Netherlands plan for storage offshore, below the seabed in the North Sea.
7	Are you mainly positive or negative about **CO_2 capture** and geological storage as a measure to limit climate change? **7-point likert scale (Very positive – neutral – very negative); I don't know**
8	Below are several statements regarding one part of CO_2 capture and storage: the CO_2 storage. Please let us know how these statements fit with your perspective of this technology? • I believe that CO_2 storage represents a hazard to the environment • I believe that using this CO_2 storage technologies will delay the expansion of renewable energies • I believe that CO_2 storage is safe • I believe that CO_2 storage will improve the national economy • I would be concerned about CO_2 storage sites below the seabed in the North Sea/offshore • I would welcome a CO_2 storage site near my neighborhood. **7-point likert scale (Strongly agree – neither agree nor disagree – strongly disagree); I don't know**
9	We are interested in your opinion on the **CO_2 storage**. To what extent do you have a positive or negative view of the CO_2 storage? **7-point likert scale (Very positive – neutral – very negative); I don't know; I don't want to say**
10	How concerned are you about risks of CO_2 storage? **5 point scale – very concerned, moderately concerned, somewhat concerned, slightly concerned, not at all concerned, I don't know**
11	If you are concerned about risks of CO_2 storage, what are you concerned about? All replies are welcome, preferably a couple of sentences, but just a few words if you would prefer. **[open question]**
	Monitoring CO_2 storage In order to make sure that the subsurface CO_2 storage is working as expected and that the CO_2 remains underground, the movement of injected CO_2 must be monitored. Monitoring is useful for many purposes: i.e. to ensure site safety, protect groundwater resources, safeguard the environment, minimise the possibility of induced seismicity, identify possible leakage, and provide information on reduced CO_2 emissions. **Monitoring techniques** There are various monitoring techniques. How a monitoring system is set up depends on the circumstances of each CO_2 storage site as well as the characteristics of the subsurface at place. Monitoring can be done by measuring disturbances in the host rock as the CO_2 moves through, such as change in the density, elevation, or cracks in the host rock.
12	Please state the extent to which you agree or disagree with each of the statements. I would trust monitoring of a CO2 storage site to … • Companies that operate CO_2 capture and storage sites • Government

	• Scientists • Environmental NGOs **7-point likert scale (Strongly agree – neither agree nor disagree – strongly disagree); I don't know**
13	If you think about a monitoring system for CO_2 storage sites, how important would the following characteristics be for you? A monitoring system should … • Reliably indicate the movement of the injected CO_2 in the storage site • Reliably measure and predict leakages of CO_2 • Be cheap to install and operate • Have a low impact on the environment (e.g. Marine animal life) • Include a warning system in case of deviations from the expected values • Other [plus text box – please state which others] **7-point likert scale (very important – neutral – not important); I don't know**
14	We would like to know your opinion on the involvement of the public in the monitoring of CO_2 storage. • Who should be involved in defining what type of information should be gathered with monitoring? • Who should be involved in defining how the monitoring is conducted? • Who should be involved in defining who is going to be responsible for the monitoring? **5-point scale (Only experts, more experts than public, equally divided, more public than experts, only the public); I don't know**
15	We would like to know if you believe a monitoring system would affect the concerns you have regarding CO_2 storage. • I am not concerned about CO_2 storage • I believe a monitoring system would not affect my concerns about CO_2 storage • I believe a monitoring system would limit my concerns about CO_2 storage • I believe a monitoring system would increase my concerns about CO2 storage • I don't know