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SECURE – Subsurface Evaluation of Carbon capture
and storage and Unconventional risks

**WORKSHOP: TOWARDS TAILOR MADE
PARTICIPATORY MONITORING PROGRAMS.
4-5 MARCH 2019, THE HAGUE, NETHERLANDS**

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Public introduction

Subsurface Evaluation of CCS and Unconventional Risks (SECURE) is gathering unbiased, impartial scientific evidence for risk mitigation and monitoring for environmental protection to underpin subsurface geenergy development. The main outputs of SECURE comprise recommendations for best practice for unconventional hydrocarbon production and geological CO₂ storage. The project is funded from June 2018–May 2021.

The project is developing monitoring and mitigation strategies for the full geenergy project lifecycle; by assessing plausible hazards and monitoring associated environmental risks. This is achieved through a program of experimental research and advanced technology development that includes demonstration at commercial and research facilities to formulate best practice. We will meet stakeholder needs; from the design of monitoring and mitigation strategies relevant to operators and regulators, to developing communication strategies to provide a greater level of understanding of the potential impacts.

The SECURE partnership comprises major research and commercial organisations from countries that host shale gas and CCS industries at different stages of operation (from permitted to closed). We are forming a durable international partnership with non-European groups; providing international access to study sites, creating links between projects and increasing our collective capability through exchange of scientific staff.



Executive report summary

WP6: two-days design workshop: 'towards tailor made participatory monitoring programs', 4th and 5th of March 2019

task 6.3 Meeting, Organised by TNO & EUR.

Venue: Babylon Hotel, Bezuidenhoutseweg 53, The Hague, The Netherlands

Local Hosts:

Hanneke Puts (TNO)

Mike Duijn (Erasmus Research and Business Support, Erasmus University Rotterdam; EUR)

Workshop objective: to introduce the framework for participatory monitoring and accompanying guidance on how the framework could be used in real practice.

On the 4th and 5th of May 2019 a two day workshop on participatory monitoring was held in The Hague (Netherlands), as part of the WP6 research activities within the SECURE project. The goal of this workshop was to introduce a framework for participatory monitoring, which has been developed by TNO and the Erasmus University Rotterdam (EUR), and to jointly explore how this framework could be used for designing tailor made strategies for participatory monitoring in four different case studies at a local level (Appendix 1, workshop invitation).

21 participants from 10 different organisations in 4 countries attended the 2-day workshop. The workshop started with an introduction of the Dutch societal context regarding the development and social licence to operate mining activities, which functioned as an introduction for developing the framework for participatory monitoring. By sharing this typical Dutch context, TNO and EUR could check with the other participants if other societal environments would have led to a different approach for setting up participatory strategies (Chapter 1, minutes of the 1st workshop day).

TNO and EUR introduced the framework for participatory monitoring. This framework consists of the following steps which facilitate the designing process for tailor made pm strategies:

1. Purposes for participatory monitoring
2. Stakeholder identification – force field analysis
3. Exploring main interests and concerns through the perspective of key stakeholders
4. Exploring in what phase of the design and implementation of the participatory monitoring program stakeholders could play a role
5. Exploring what their role would be (could be different in different phases).
6. Including/adapting stakeholder interests into local design monitoring program

During the introduction and explanation of these steps, lots of personal experiences, thoughts and ideas were shared among participants. The main topics for discussion were:

- *What is it that we monitor?* Working with different disciplines creates different monitoring objects; and working in different contexts result in different purposes for setting up a monitoring program and involving stakeholders. As a response to this, EUR gave some examples of



- monitoring objects and ways to involve citizens in the full chain of designing and implementing a monitoring program. Citizens might play a valuable role in designing the monitoring program.
- *How to deal with costs for participatory monitoring?* The participants identified different pro and contra arguments for participatory monitoring and shared thoughts on how to include interests of local stakeholders in the design of a monitoring program. Comparing the costs of setting up a participatory monitoring program with the costs related to losing the social licence to operate and putting technologies on hold for many years because of a lack of public acceptance should make it an easier decision.
 - *Participatory monitoring as a trust-building instrument.* During the day participants shared several examples in which the local community initiated their own monitoring networks, because they lost trust in the professional organisation who used to operate these monitoring systems. We discussed that involving local stakeholders in all phases of designing and implementing a monitoring program could improve trust in the proposed activities and risk management strategies.
 - *The role of timing.* We discussed what the best moment is to involve local communities. In some countries, baseline monitoring is required before the actual operating activities even start. Sometimes formal procedures prescribe how and when local stakeholder should be involved; sometimes this is being initiated by operators (or research teams) themselves.

The workshop program consisted of several blocks of breakout sessions, to jointly explore how the above steps could be implemented in different local case studies. Therefore, TNO and EUR developed hands-on formats for tailoring these steps to the local situation at hand.

Handout Step 1. From literature we identified several purposes for working with a participatory monitoring approach (Figure 1). The question for each group was what the purposes for a participatory monitoring approach could be in their local context.

Step 1: Purposes for participatory monitoring in your local case study – inventory

Your local case study

From literature

- Knowledge generation.
- Improving existing (expert) monitoring methods.
- Raising awareness among citizens and other stakeholders (through informing them).
- Improve (adaptive) management practices.
- Social research: behavior and (multiple-) use of areas and/or infrastructures.
- Policy development and/or legal justification of the chosen policy.
- Influencing public opinion.
- Overcoming tensions between stakeholders involved.
- Societal embeddedness of CCS and/or Shale gas projects (as component of new geo-energy technologies).

Each break out group gets this handout

Figure 1: format for the break out groups to explore the purposes for participatory monitoring including examples from our literature review.

Handout Step 2: Force field analysis. The question for each group was to identify the key stakeholders for their project and to map all relevant stakeholders into a circle diagram (Figure 2). Stakeholders could have interest in the physical system (left site) or the social system (right site); stakeholders could have a positive attitude (upper site) or a negative attitude (lower site) towards



the foreseen project; and stakeholders can be active at different levels of scale: local – regional – national – international (circles).

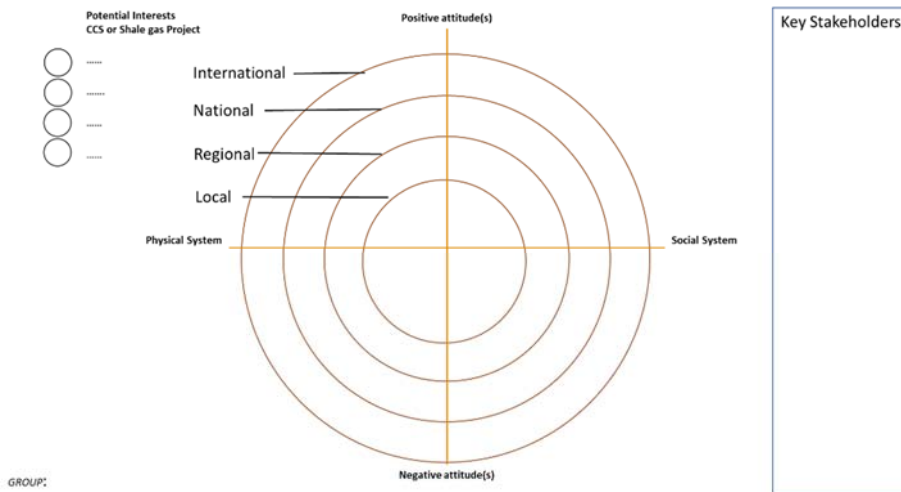


Figure 2: format for the local case studies to compose their own force field analysis.

Handout Step 3: Exploring main interests and concerns through the perspective of key stakeholders. The goal of this step is to identify the main interests of each stakeholder in order to decide who and why needs to be included into the development process and how this should be done. Stakeholders with high interest and high power need to become involved more intensively than stakeholders with less interest and less power (Figure 3).

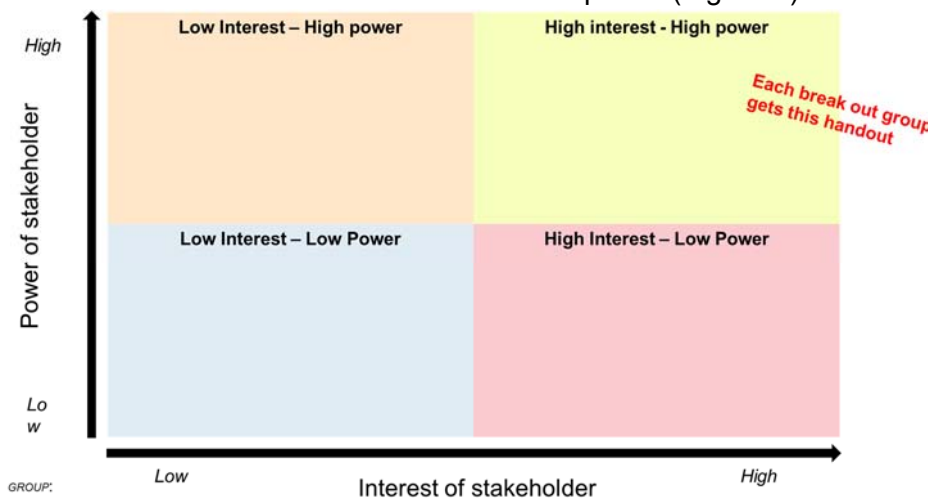


Figure 3: format for identifying the key stakeholders (high interest – high power) for each of the local case studies.

Handout Step 3 and 4: Exploring in which phases of developing and implementing a participatory monitoring program stakeholders could be involved and in what role. Each breakout group worked with the format below to derive possible monitoring objectives, starting from the list with key stakeholders and their main interests.



participants gained more new knowledge than others, but all were enthusiastic about the approach for participatory monitoring. Most of the people asked for an overview of next steps and follow-up on how to apply the framework into their own local context. Therefore TNO and EUR have proposed the following approach towards implementing the framework for participatory monitoring:

- Organising one-on-one conversations with the local site owners/local research teams to jointly explore how the participatory monitoring approach should look like and how it could support them in meeting their local goals and solving the challenges in their local environment.
- Organising a follow up workshop on taking further steps towards tailored participatory monitoring approaches for local case studies.
- Supporting the local teams in drafting and applying their own strategies for participatory monitoring, via (i.e.) reviews, skype conversations, training, etc.
- Organising yearly workshops with the local teams and SECURE researchers to learn from each other's experiences with pm and to enrich the current framework for pm.
- Developing a monitoring and evaluation approach for capturing the experiences, insights and lessons learnt in the local case studies.
- Deriving good practices for applying the participatory monitoring approach as a way to actively engage local stakeholders and/or including their interests in the project design.

In the next few months, these steps will be further discussed the the WP6 partners and local site owners.

At the end of the workshop, all participants filled in a short questionnaire to capture their experiences and learning during the 2-day workshop. The outcomes of this evaluation will be used to organise the further research activities as part of task 6.3 in work package 6 regarding the application of the participatory monitoring approach in various local case studies (Appendix 2).



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1 Workshop minutes: 4 March 2019

Organizers: Hanneke Puts (TNO), Mike Duijn (EUR), Nikki van der Nat (TNO).

Participants: Bob Paap (TNO), Corin Jack (UEDIN), Cristina Chapman (BGS), Jan ter Heege (TNO), Katarzyna Iwinska (AMU), Katarzyna Patola (local governmental agency Poland), Krzysztof Maczka (AMU), Melinda Lewis (BGS), Olga Lipinska (PGI), Pierre Cerasi (Sintef), Robert Sokolowski (local stakeholder Pomerania district & University of Gdansk, Poland), Simon Shackley (UEDIN).

Delayed participants (due to stormy weather): Peter Voss (GEUS), Cathrine Ringstad (Sintef), Klaus Hagby (Sintef), Helen Taylor (BGS), Jonathan Pearce (BGS) and Karen Kirk (BGS)

Workshop objectives

During the design workshop on the 4th and 5th of March 2019 ‘**Towards Tailor made participatory monitoring programs**’, TNO and Erasmus University Rotterdam (EUR) introduced a draft version of the framework for participatory monitoring and an accompanying guidance for using this framework in daily practice. The workshop was mainly dedicated to a practical exercise on how to use the framework and the guidance in practical cases. The workshop has supported the participants to better understand the participation process for setting up a monitoring program and to be able to apply the practical instructions for cases in their own region. Simultaneously, the workshop gave TNO and EUR the opportunity to revise the draft version of the framework, making use of the participants’ reflections, suggestions and additional knowledge questions.

Agenda day 1

13.00	Welcome & getting started
14.00	Introduction framework for participatory monitoring & local application
15.00	Coffee break
15.30	Introduction local case studies: UK, NL, PL
16.00	1st break out session - identifying stakeholders to be involved
17.00	Wrap up break out groups
17.30	End workshop day 1
19.00	Joint diner: Burrata (Italian kitchen) – Turfmarkt 85



1.1 GETTING STARTED

After a welcome to all participants and the notion that several participants are experiencing difficulties reaching the Netherlands because of the stormy weather, we started with an introduction round. We asked all participants to introduce themselves based on the following questions:

- Who is who?
- What is your experience with designing / implementing (participatory) monitoring systems?
- What is your experience with stakeholder engagement?
- Other thoughts, dilemmas, “why not’s” regarding the topic of this 2-days workshop.

This round resulted in a rich overview of the experiences of each of the participants with monitoring and/or stakeholder engagement, as well as in a list of questions and curiosities regarding the 2-day design workshop on participatory monitoring. Most of the participants have a background in geology with only few of the participants having a social science background. Almost all participants have at least some experience with stakeholder communication and/or stakeholder engagement and are curious to understand how they could contribute to stakeholder communication from their own background and role in CCS or shale gas (research) projects.

Identified questions and curiosities from participants regarding the 2-day design workshop included:

- How to better embed local engagement activities within the national context regarding shale gas?
- How to connect environmental monitoring with social monitoring?
- Improving current monitoring programs
- How to mobilize stakeholders?
- How to build trust among stakeholders and local public?
- How can we work with local communities even though shale gas is not yet on the agenda?
- How to develop a platform for all stakeholders to meet and to find a common language (real or virtual)?
- Learn more about who the local stakeholders are, as well as their interests?
- Getting a better feeling what the general public would like to know from monitoring data
- How can we best transfer data to the general public and play a bridging role?
- How can we combine high quality data with low quality data from sensors in households?
- Can we develop a common language, which bridges the different languages and perspectives of scientist and citizens?
- How to visualize the ‘unknown’ geological structure for the general public?
- How can we scale up stakeholder engagement?
- Applying scientific insights into stakeholder processes
- Exploring crossovers between technical, social and stakeholder involvement aspects
- Getting a better view of which risks and perceptions are part of the discussion during this workshop.
- Develop universal building blocks for engaging stakeholders; developing ground rules.
- Bridging language/ knowledge levels
- Role of the subsurface in energy policies
- Differences between common natural gas & shale gas.
- Enriching the assumptions in the programme and the theoretical framework regarding participatory monitoring with the knowledge of the participants of this 2-day workshop.



1.2 INTRODUCTION TO THE THEORETICAL BACKGROUND FOR PARTICIPATORY MONITORING

In this chapter we first introduce the Dutch context within which the framework for participatory monitoring has been developed (1.2.1). Next we introduce the theoretical background for participatory monitoring (1.2.2) and some main discussions among the workshop participants (1.2.3).

1.2.1 Introducing The Dutch Context (As A Pair Of Glasses) For Participatory Monitoring

TNO and EUR starts with the introduction of the current Dutch context in which mining activities are being developed and implemented. This specific context frames the approach of TNO and EUR for developing participatory monitoring programs and guidelines for local application of the generic framework for participatory monitoring. Sharing the typical Dutch history and experiences with societal debates regarding mining activities with the participants was deemed necessary to explore and discuss whether the participants recognize this societal context and/or use other societal perspectives to tailor their approach for participatory monitoring. Thus, the question is if other societal contexts would have led to another approach?

Slide 1: proposed approach biased by the Dutch context

The Netherlands has some recent unfavourable experiences with developing and implementing onshore CCS projects such as in Barendrecht or the North of the Netherlands, as well as shale gas projects such as in Boxtel. Additionally, everyone has heard of the problems with induced seismicity in Groningen, caused by the gas production in the Groningen field. These projects mostly end up in polarized public debates, with strong criticism and opposition to (future) mining activities. There is a lot of distrust towards CCS and shale gas in the Netherlands, often associated with sceptical perceptions regards climate challenges.

Slide 2: pictures of protests in the Netherlands

Responses of participants:

- Comparing CO₂ storage with a CCS bomb is very naïve.
- Perceptions people have are often not based on facts.

Slide 3 and 4: trust

One of Gandhi's sayings highlights that it is important to include people in the dialogue and decision-making process; instead of interpreting what their interest could be and deciding on behalf of them without having a conversation with them. We introduce this saying because we hope this will be an inspiration for this two-day workshop – do not make your own interpretations but involve people in the process.

An evaluation of the decision-making process of onshore CO₂ storage initiatives in the North of the Netherlands learned that there has been no real dialogue in this region – the stakeholders were only informed about the process. The outcome of this 'dialogue' was set; an alternative outcome was not an option.

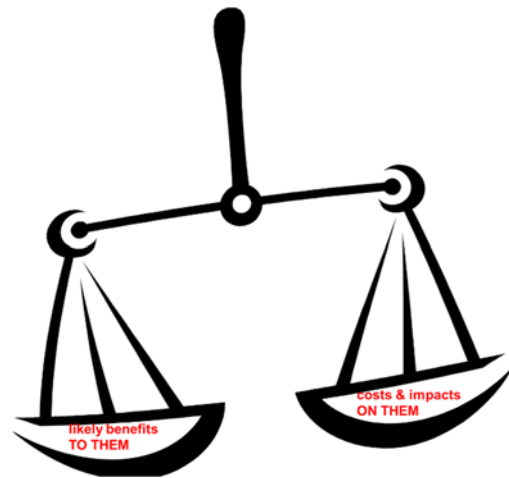
Slide 5: NIMBY – does it really exist (Larry Susskind, MIT)

One of the quotes we like about NIMBY comes from Larry Susskind, working for MIT in Boston. He proposes that NIMBY doesn't exist – if people are against certain projects it's not because they don't



like the project or don't understand it, it's because there is an unbalance between the benefits to them and the costs on them. Finding a balance can overcome the NIMBY argument.

Quote Larry Susskind (2011): "...How arrogant! You think people are opposed because they don't understand? No, they're opposed because the "costs" and "impacts" ON THEM are likely to outweigh the likely benefits TO THEM. The only way to overcome the NIMBY syndrome, regardless of the type of facility, is to make sure that the overwhelming majority of people in the area believe that the benefits TO THEM if the facility is built will outweigh the costs and impacts THEY are likely to experience..."



This quote of Larry Susskind led to different responses among the participants:

- This perception of NIMBY is new to me – It is arrogant to think that people only think about costs and benefits (i.e. money) or that they do not understand what is at stake. They might have a misconception about certain things. There are clearly often miscommunication and knowledge gaps between experts and local people, leading to the wrong interpretations of what is good for them.
- I do not start from the perspective that the local people do not get the problem. I start from the perspective that they care about their environment/community. NIMBY does exist. It is not about the benefits; it is about how you engage with them on that journey¹. This is a psychological process. Governments invest so little in that process. Citizens feel a lack of accountability, respect and empathy. They get worn down in these processes. Governments need to stand out and make clear that they are accountable for the things that they impose on citizens. Do what is necessary to engage with the community. The community often is not used to these processes → it's about trust and listening to the community.
- In the Netherlands, TNO and EUR observe that it is more common in the spatial planning domain to engage stakeholders and to design participatory decision-making processes than it is in the mining industry.
- It is a European law that states how we should deal with this kind of project. But in practice, it differs strongly per region, city and project. It is complicated and therefore important to know the local environment: the context, history, values of people, etc. I studied several toolkits from England, but these didn't work in another environment, because every culture and situation make a difference. The cultural background is very decisive in what you can do to organize stakeholder engagement. The UK-examples are not very transferrable to Poland, for instance.
- Citizen consultation in Norway is less advanced with regard to spatial planning, based on an example of a city in which there was much controversy about the construction of new buildings. The municipality had the perception that the people wanted greenhouses, but the people were more concerned about the heights of the buildings. The municipality did not consult the people because this is not normal to do so in Norway: there is not a consultation culture.

¹ Of project development of CCS or shale gas.



- EUR adds to the NIMBY discussion that if you can actually show to local stakeholders and/or citizens that the input of the local community changed the original plans in their favour, they are more willing to accept the burdens. For example, based on the communities input, the changed plans might generate more economical benefits for the local community. Transparency and visibility are important.
- A participant, working at a Norwegian CCS-site, indicated that changes have been made in the project design, based on the concerns of the local community; for example, the well has been moved to another location, additional noise monitoring was put in place and compensation for damage to private homes was agreed upon.

Slide 6: Bottom line

In the Netherlands the following steps are commonly undertaken:

- Convincing others that an intended project is a good idea. Operators and legislators are very used to explain why a project development is a good idea; in explaining the purpose of the project, they try to have a conversation with the local community.
E.g. 1) securing energy supply, and/or 2) 'buying time' for the sustainable development of renewal sources, and/or 3) creating jobs and economic growth, etc. etc. etc.
- If this 'strategy of deciding and explaining'² does not work, and legislators deem the intended project necessary to achieve their objectives, they can always follow the 'normal' administrative processes. Granting a permit, monitoring the development and production processes.
- In turn, citizens and local stakeholders can always challenge the permit in court and/or pull strings in the political realm to try to terminate the project!

→ The framework that we introduce in this workshop should prevent this situation.

Slide 7: Changing Societal Sense of Urgency

Despite the negative experiences in the recent past, a changing approach can be observed in the Netherlands towards developing and implementing mining activities, like CCS or geothermal energy projects. Examples addressing this changing playing field are:

- Development of a national CCS Roadmap, through a co-creation process with over 50 participants (government – knowledge organisations - industry - NGOs), providing guidelines for scaling up CCS in the Netherlands.
- A National Climate agreement, based on the climate goals of the Paris Agreement and co-created by organising round tables around different domains, like 'built environment', 'industry', 'food sector', etc.
- Recent court rulings stating that the Dutch national government must make more efforts to meet the climate goals.
- A new industrial CCS initiative in the Port of Rotterdam.
- Growing attention for geothermal energy as a sustainable heat source. Now mainly implemented in the horticulture sector.
- The negotiations for compensating local communities in the Province of Groningen by the national government and operators for damage to private properties, caused by the induced seismic events near the Groningen gas field.

² Ducsik (1978) speaks of the 'decide – announce – defend' strategy that is often deployed for (spatial) project development.



This list of actual developments led to several remarks, questions, curiosities among the participants:

- Create a favourable environmental for shale gas is even more difficult than for CCS → this is more controversial and more dependent on (support of local) people.
- The urgency grows – we need to do something within 12 years. We need a paradigm shift, but this is difficult because you see a lot of misunderstanding and a mismatch of goals by the governments.
- Has the Dutch climate agreement been developed via a top-down approach? No, two years ago a new national government was formed/installed, which pays more attention to meeting the climate goals. Although the process for developing the national climate agreement has been via participatory round tables for different sectors, the national climate agreement has to be implemented at a local scale. How will local stakeholders respond to this national process and how will the proposed measures be tailored to the local characteristics?
- At the local level everything is intertwined → there are more discussions about how people's living environments are fundamentally changed by new energy projects. People are scared of these (new) technologies because they read certain articles and create their own interpretations about the effects on their environments. Then you realise that it is no longer about climate change, but about the pressure on their community to accommodate yet another facility. Often these perceptions are hyped by the (social) media.

In general, it is observed that projects must be perceived in the large societal discussion about sustainable development and the role of energy supply. CCS still can be acceptable in the light of the energy transition. For shale gas, the story might be more difficult, depending on the necessity or purpose of introducing this alternative energy source. Projects must be perceived in the bigger picture of fulfilling the increasing energy needs. Both 'technologies' have a rather negative connotation. New geothermal energy systems might develop in the same direction as CCS and shale gas; from positive to negative. This must be prevented, if possible.

A participant stated that it seems that governments are increasingly 'hypocritical' when it comes to promoting economic growth on the one side and pursuing reduction of CO₂-emissions on the other.



1.2.2 Introducing the Theoretical Background for Designing Participatory Monitoring Programs

Creating acceptability from society for new innovative mining activities starts with researching not only the technical aspects of the technology, but also the social aspects. Based on both the technical and the social characteristics of an intended site, the project strategy should be developed (Figure 5).

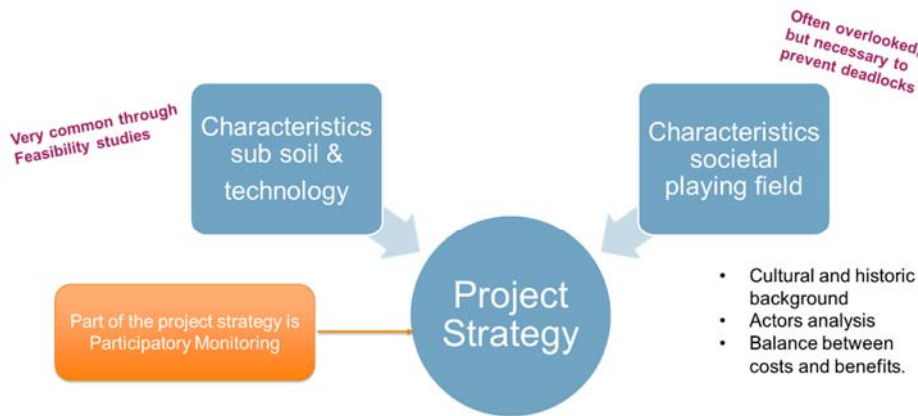


Figure 1: simple version of the framework developed in the EU FP7 project GEISER on 'laying the groundwork for public acceptability for geothermal projects' (2013)

Figure 5: Simple version of the framework developed in the EU FP7 project GEISER on 'laying the groundwork for public acceptability for geothermal projects' (2013)

Developing a strategy for participatory monitoring could be part of the overall project strategy that follows from both technical and social feasibility studies. Within a former EU project, the FP7 EU project GEISER, TNO developed a so-called strategy for creating public acceptance for geothermal energy projects (Figure 6).

FP7-PROJECT GEISER – FRAMEWORK FOR PROJECT STRATEGY

Integrated assessment of both technical and social aspects:



Figure 6: full overview of buildings blocks for developing a project strategy that lays the groundwork for creating public acceptability for geothermal project or other mining activities (©TNO, 2013)

TNO and EUR introduced the building blocks for exploring the social-economic characteristics of a project. The breakout groups of this SECURE workshop mainly focussed on the stakeholder analysis



as a starting point for developing a participatory monitoring program. Below, the three building blocks for exploring the social-economic characteristics of a project are further explained.

Building block 1: Exploring cultural and historical background

In some parts of the country, people are more familiar with mining activities than others. This might affect their attitude towards new activities. Context is therefore important. Exploring the cultural and historical background consists of:

- Identification of perceived benefits and costs of the CCS and/or Shale gas project and of those who receive benefits and bear costs.
- Analysis of how perceived or expected benefits and costs are distributed among the stakeholders.
- Exploration of how local communities and other non-project stakeholders can co-benefit from the project initiative. Can they become 'shareholders'?
- Exploration of options for compensation of local communities if the burdens or costs exceed the potential benefits.

It is important to take these aspects into account (in what kind of area will the project be developed?) Local communities can provide this information.

Building block 2: Stakeholder analysis: who and how



Figure 7: *stakeholders are organised more and more as a network (left side) and for involving them in your project it is helpful to identify which stakeholders have high/low power and high/low interest (right side).*

Our assumptions regarding stakeholder networks:

- Network society. Connections only partially visible, non-manifest relations.
- Role of social media. Fake news, alternative facts.
- Different realms. Civil services ≠ administration ≠ politics ≠ civic society ≠ industry.
- Opposition is organized fairly easy.

→ Know the social context of the intended CCS and/or Shale gas project?

→ Prevent one-dimensional focus on technical and/or economic aspects!



A force field analysis could help project partners (operators, legislators, experts) to better understand who the stakeholders are in the neighborhood of their project. In one of the breakout sessions, participants were given the opportunity to design their own force field for their own local case study.

EUR challenges the participants to look critically at the assumptions that TNO and EUR make: they are not 'a given', these assumptions are a construction. If you want to understand the social context, try to change it. This is also the case in controversial projects. If something (a project, an initiative) is touching the status quo, you will see how the relations in the network / actor system are established and managed.

We have different views in a system based on different codes of conducts, languages and ways of communicating. For example, what we do here today is having expert conversations that are typical for this type of H2020-projects. A discussion emerges about how everyone understands or interprets different terms (administrator, alderman, politics, decision makers). This discussion shows that even the participants in this expert workshop do not speak the same 'language'.

If this is the case, then opposition can be organised fairly easy because understanding and interpretations might easily differ among stakeholders. With this observation in mind, we have to be careful with organising projects because opposition statements will arise rather easily based on biased information and opinions. In most projects that are technically and economically feasible, implementation will be organized but often without keeping productive contact with the local stakeholders.

Building block 3. Exploring cost-benefit balance among stakeholders

What are the benefits? Is it tangible or is it the way you behave or how the project is organized? Many of the projects, organized for CCS and shale gas, have benefits on other levels of abstraction than the levels that carry the costs. Benefits are for the national industry, national government and the economy at large, whereas the costs/burdens are mainly for the local communities. This divide needs to be overcome. A first step might be to explore how local communities could benefit from the intended CCS or shale gas project. Could they be shareholders, by being a co-owner of the intended project? This approach is increasingly applied for projects for wind energy on land.

One participant indicated that this could be understood as bribery and that there is a small line between bribery and subsidising. Maybe it would be easier to do this in America, where they do not see this as bribery.

Based on the outcomes of the socio-economic feasibility study on the cultural and historical background (1), the stakeholders involved and their interest (2) and the balance between costs and benefits (3), the project strategy that lays the groundwork for creating public acceptability could be designed. One of the elements of a project strategy that lays the ground work for creating public acceptability might be a participatory monitoring program.

Our assumption (or research question) is that including the questions and interests of local stakeholders in the design and implementation of a monitoring system, will strengthen the embeddedness of your CCS or shale gas project in its societal context. Monitoring programs should therefore not only focus on environmental monitoring, but also on the needs of the local environment; monitoring programs are therefore tailor-made. Each local network has key stakeholder groups that can be active around participatory monitoring and designing the monitoring program. The approach



TNO and EUR introduce for designing and implementing participatory monitoring programs builds on the 3 buildings blocks from the GEISER strategy and mainly focuses on the stakeholder analysis: who are your stakeholders, what are their interests and how to involve them in the participatory monitoring program? During the break out session the participants will be able to explore this step-by-step.

1.2.3 Discussions on the theoretical background of PM

During the introduction of the theoretical background of the framework for participatory monitoring, lots of participants shared lots of questions and personal experiences with monitoring and/or stakeholder engagement. This is captured in four points of discussion.

Discussion 1: What do you monitor and with who?

Working with multiple disciplines that want to monitor different objectives, led to the question: what do we monitor? Are there any funding schemes that lead to monitoring needs in communities that are not yet accommodated, but may be carried out in the future can? We also have different geological teams that work in different areas that are suitable for CCS, but when do we involve the community? It is likely that there will be new CCS projects developed within the next few years, so these questions become more and more important, we cannot wait another 5 years before actually involving the local community.

As a response to this, EUR gave some examples of monitoring objectives and ways to involve citizens in the full chain of designing and implementing a monitoring program. Citizens might play a valuable role in designing the monitoring program.

Another workshop participant noticed that this works at one level, but a project developer would also want to see if what you are doing right now leads to where you want to be in 5 or 10 years requiring consideration of many different levels and scales. TNO responded to this by saying that PM could be an instrument to embed your project in its societal context. Participatory Monitoring is not *the* way to do this, but just one of the options. A project strategy for 'laying the ground work for public acceptability of your project' is not only about monitoring, but it's also about who to involve when and how to include all different interests in which phase of the project development process. It is also about how to transfer the monitoring data to the citizens and other target groups.

One of the workshop participants suggested that it would be interesting to start a baseline monitoring program before actual projects are implemented; this baseline monitoring will help to identify any changes over the project lifetime.

Discussion 2: How to deal with the costs of participatory monitoring?

A question arose as to what is driving industry and/or operators to work on participatory monitoring right now. This is probably cost-efficiency driven, one of the workshop participants argued that developers will seek a minimum budget for monitoring (reaching maximum potential with minimum resources). Additional questions identified included: 'If you anticipate the future, don't you ruin a market before it even exists?' and 'Could it be a risk that participatory monitoring puts too much attention to the intended project, before it has even begun?'

TNO added that we don't know what we don't know. New energy technologies like geothermal energy, CCS and shale gas, are characterized by many technological and societal uncertainties. If we find it important to learn about these new technologies, then we need to change the usual processes for project development and permit procedures. This means that experimenting and



learning must be included as important aspects in scaling up the implementation of these new technologies. An example is geothermal experimental research in the Netherlands where national and regional governments are subsidizing the geological research, because they acknowledge the importance of joint learning and studying knowledge gaps.

One of the participants noted that she (stakeholder manager) gets involved in a project when there is a solid economic base for that area, which is actually too late in her opinion. She emphasized that the interaction with local stakeholders should be started much earlier to be able to have an open conversation. At the same time, industry seems to be avoiding this approach, possibly as they seem to be fearful that it would terminate their business. “Unless you can change the culture in the industry and the government, you always will be too late”. It is observed that a lack of licence to operate for one mining activity might also terminate the licence to operate for other mining activities. When would the government and industry recognise the importance of this policy challenge (as mentioned in Figure 6)?

One of the participants mentioned that the industry was mostly interested/curious in the Groningen case – they wanted to understand better what was happening.

EUR noticed that it is interesting that the group talks about participative monitoring, but that it can also be about collaborative monitoring. If the industry / operators only answer the questions, you only get the answers from their perspective. So, other perspectives should be included in the entire monitoring program. Would it help if the industry is more responsible? If the governments see that CCS and/or shale gas projects are needed for the energy transition, they could invest as well by taking away the concerns of the local community.

One of the participants stated that it is hard to understand the cost argument for not involving stakeholders in the development process of subsurface projects. The consequence is often that most technologies are put on hold for many years. Imagine the costs for this ‘pause’ compared to the costs for participatory monitoring. Some responses to this notion:

- EUR responded to this by saying that the cost perspective from the industry (jobs/growth) are leading arguments for governments to not invest.
- One participant added that it is dependent on which stakeholders are at play. But there is still a tendency to minimise the monitoring effort.
- TNO mentioned that costs are a more general argument for not involving stakeholders. The first thing you hear is that setting up a participation process costs money and time, and then the following argument is raised that its costs much more when a project is being terminated through lack of acceptance.
- Involving stakeholders in the project should be part of the entire business case. Certainly, if it proves to be not feasible because of too much resistance, it can be decided beforehand, not to develop the project at the intended location. Typically, the start of a project is often solely based on economic and technical arguments, and if the project goes wrong, because of societal opposition, it costs even more money and time to fix it. This course of affairs is a strong argument for a community monitoring system that is partly funded by governments, industry and knowledge institutions.
- Also, monitoring can become expensive; i.e. when everyone wants to do his/her own monitoring, because the formal institutions are not being trusted, which also has an impact on the analyses



of the data (different data sources and data 'owners'); costs for analyses will also get more expensive.

Discussion 3: Can participatory monitoring help to build trust?

One of the workshop participants mentioned that you never see the real data, most of the data are processed by the companies. He hasn't seen real-time monitoring systems in the Netherlands. Another workshop participant proposed that you also need somebody to process the data (analyse it), but that there is also a trust issue with analysing the data. He gives an example of a water-quality study, in which the university got comments about the analysis of the data because the outcomes of the study didn't meet the requirements of companies. In the second study, the results were different (the quality of the data was bad), and they got also a lot of criticism and they did not know how to respond to this.

It was observed in the Groningen case that local people are involved in creating a local monitoring system (at low cost, funded by themselves). Citizens have their own sensors installed in their gardens or houses. In some cases, citizens even own these data because they trust themselves more than the government. Sometimes local companies gather the data because they are more trusted than governments or large companies.

Another workshop participant had similar experiences when it came to issue of trust in a project that is under severe criticism: when you say something positive about shale gas in Groningen, you get a lot of criticism.

Discussion 4: What is the role of timing?

The question of when to organize and apply participatory monitoring leads to different insights.

One of the workshop participants noticed that in Poland, the only chance for involving people in an investment process is during the formal environmental impact assessment procedure. Most often, people are consulted by collecting their opinions, which need to be taken into account later on in the decision-making process, but it is not specified how to consult them. Sometimes the outcomes of public consultations during an environmental impact assessment procedure are not taken into account, since investors and project developers see it as a formality that needs to be done before the project starts. This attitude doesn't lead to a real dialogue with local communities.

This is a good example of differences in culture/context. The prescriptions in Poland seem different than in the Netherlands. In this workshop we see PM as an ongoing activity (beyond baseline surveys to continue into the operational phase). PM could be organized prior to the project, as well as when the project is up and running.

Intermezzo

During the introduction of the theoretical background of the framework for participatory monitoring, lots of participants shared lots of questions and personal experiences with monitoring and/or stakeholder engagement. TNO and EUR decided that it was more valuable to have this sharing amongst the participants rather than trying to follow the workshop program as planned. As a consequence, after this theoretical introduction, there was only little time left for the introduction of the four local case studies and for the breakout sessions. Therefore, TNO, EUR and the participants jointly explored what to do and decided that there would be 2 introductions of local case studies on



day 1 and 2 introductions of local case studies on day 2. The group also concluded that this change made it challenging for TNO and EUR to include all foreseen steps and experimentation in the program for the 2nd day.

1.3 INTRODUCING THE UK AND POLISH LOCAL CASE STUDIES

At the end of the 1st workshop day, two local case studies have been introduced: the British 'Vale of Pickering' site (see 1.3.1) and the Polish 'Krokowa' site (see 1.3.2), both shale gas sites.

1.3.1 Melinda Lewis (BGS) – The Vale of Pickering site (UK); Shale Gas.

- Source Bowland shale in the north of England.
- Fact points about the case, the Vale of Pickering, perceived risks and stakeholders in the PPT-sheets.
- So far, no shale gas has been extracted – only set up an environmental baseline monitoring network.
- The government and BGS put in some money for independent monitoring (now 4 years data). The baseline parameters for the monitoring is in the sheet.
- The locals did some of their own monitoring to see the effects on the local system and to compare these with the BGS data. Melinda Lewis shows different monitoring parameters in one of the slides. The local community crowd sourced their own monitoring system to collect what they call 'unbiased data', about traffic movements, air quality (NO₂, benzene), ground water quality, noise and other issues such as complaints to police, arrests and incidents.

Questions about the presentation:

- *Do you know why the locals wanted to do additional monitoring? did they not trust BGS?* There were various levels of trust, they attended local drop-in events and were interested, curious and engaged. Maybe they wanted to do something on their own.
- *What have they found with their data?* They are also measuring the backgrounds. They have not found anything different. They found there were significant police vehicle movements not in the traffic management plan.
- *What about finance?* It was done with crowd funding.
- *What is the role of BGS?* we are leading the impartial monitoring consortium.
- *Do you have standards for duration of baseline monitoring?* We have monitored baseline environmental conditions for 4 years. *Is that enough?* We started monitoring because we wanted to have at least one year of data. (The UK Infrastructure Act states there should be 12 months of methane measurements prior to operational phase).

1.3.2 Olga Lipinska (PGI) – Krokowa site (PL); Shale Gas.

In Poland there is no single case of participatory monitoring related to shale gas at a particular location that can be presented as a direct case study. Therefore, an overview on shale gas development was given, including environmental studies and participatory programmes executed at national and/or local level.

- 72 boreholes were drilled since 2007 in Poland and 45 hydraulic fracturing treatments were performed; the last hydraulic fracturing treatment took place at Wysin site in 2016; all boreholes are now closed and sites are reclaimed



- Boreholes / shale gas exploratory wells were usually located at rural areas, representing agricultural land use and extensive building pattern; the typical distance between well head and the nearest building was about few hundred meters, always in compliance with legal requirements.
- In terms of geological context, it is important to consider three perspectives (1) target formation, (2) sealing complexes within the profile and (3) superficial geology, as different sets of data are of interest to different stakeholders.
- Geological data (e.g. lithology, stratigraphy, porosity, thickness, heterogeneity, faults location) are needed to assess both economic value of the venture and environmental risks, which also contribute to the economy at the bottom line.
- There is a well-established national environmental monitoring network, consistent with European requirements (e.g. Water Framework Directive WFD) and similar to other state networks in Europe
- A shale gas development in Poland was implemented in accordance with the legal order then in force and simultaneously scientific effort was made in order to assess the differences and give recommendations for performance and monitoring. A comprehensive environmental study was conducted, including surface and groundwater, soil, air quality and emissions, as well as ambient noise and waste management. It was conducted at 7 locations to incorporate different local conditions. Within SECURE, PGI will conduct a monitoring programme at 4 locations, the scope of which includes groundwater and soil and the goal is to develop long-term a monitoring strategy for shale gas operations.
- Also, some participatory programmes were implemented in Poland. The “Info shales” platform is still run by PGI. Additional notable programmes addressed to public administration and local governments were the “Gas for community” project and the expert group working on guidance for monitoring, organized by the General Directive for Environmental Protection, involving experts from science, industry and public administration. They are all closed now and the websites are hidden (or closed).
- From the very beginning (2007) Polish political elites put shale gas high on the political agenda and the enthusiasm for shale gas in Poland has mainly been raising.
- In September 2011, the Centre for Opinion Polls in Warsaw presented the first report³ from a survey study on public attitudes to shale gas, which showed a high level of support for shale gas exploration activities - 73% in favour and only 4% against it (23% had no opinion on this issue). In 2013 (January) almost total support for shale gas exploration by local authorities (97%) and their partners (100%).
- The stage of information process made the people aware of what shale gas is; what the opportunities and threats are, but there is little (public) awareness about potential negative environmental impacts.
- Polish team also presented two different sites (in Pomerania and Lubelskie regions) as interesting case studies of stakeholders’ engagement. The quotes in the sheets show the concerns, hopes and distrust.

Questions about the presentation:

³ CBOS, Wydobywac? Polacy o gazie lupkowym http://www.cbos.pl/SPISKOM.POL/2011/K_112_11.PDF , accessed on 2.08.2015



Was there a discussion about the monitoring (geological or traffic)? PGI did a set of measurements in a set of different projects. PGI did not engage the whole community to their research so far. PGI conducted scientific studies and didn't interact with local communities about the scope of the measurements. Local stakeholders were involved as land owners; they were asked for permission for taking samples etc. Results were shared and were publicly available. PGI also developed an information webpage and initiate other engagement activities. Like participating on local meetings and hearings.

Are these single measurements? Yes, due to time constraints we were restricted in collecting the measurements. Nevertheless, the study was planned and conducted with sufficient prerequisites in terms of place and number of sampling points. At every location (7 in total) the monitoring study included a baseline phase, drilling and fracturing phase and post fracturing phase. A baseline was just a single round of measurements, but archival data were taken into account to fill the gap. All measurement and findings are credible.

Where is the community in this case (with their data and instruments)? I don't know any case in Poland where people do their own measurements related to shale gas. *Why don't they do this?* I don't know this, maybe they have more important needs. For example nowadays there is an issue related to air quality and smog and a lot of local initiatives in the country are active, also with measuring air quality and making results available for as many people as possible; but it was never a case with shale gas, no initiative like the local monitoring initiatives in Vale of Pickering. In case of environmental damage or suspecting of one, people would rather contact local government and WIOŚ than start to measure themselves and also PGI was teaching them to do so as this is a standard procedure to deal with environmental damage or risk of damage.

2 Workshop day 2 – 5th of March (Minutes)

Organizers: Hanneke Puts (TNO), Mike Duijn (EUR), Nikki van der Nat (TNO).

Participants: Bob Paap (TNO), Corin Jack (UEDIN), Jan ter Heege (TNO), Katarzyna Iwinska (AMU), Katarzyna Patola (local governmental agency Poland), Krzysztof Maczka (AMU), Melinda Lewis (BGS), Olga Lipinska (PGI), Pierre Cerasi (Sintef), Robert Sokolowski (local stakeholder Pomerania district & University of Gdansk, Poland), Simon Shackley (UEDIN), Peter Voss (GEUS), Cathrine Ringstad (Sintef), Klaus Hagby (Sintef), Helen Taylor (BGS), Jonathan Pearce (BGS) and Karen Kirk (BGS)

Agenda day 2 – participatory monitoring

9.00	Welcome & reflections on day 1
9.15	Introduction Norwegian (Pierre Cerasi) & Dutch (Jan Terheege) case studies
10.00	1st & 2nd break out session – stakeholder force field & towards local design
11.30	Sharing experiences & insights break out sessions
12.15	Lunch
13.15	3rd break out session – exploring stakeholder roles & questions towards implementation
14.30	Wrap up break out sessions
15.00	End workshop day 2
15.30	Social Event: Visit to Mauritshuis



2.1 REFLECTIONS, THOUGHTS, INSIGHTS AFTER 1ST WORKSHOP DAY

On the first workshop day, TNO and EUR shared the Dutch context which influences the way we look at involving stakeholders in the mining industry. Also, the theoretical background of the framework for participatory monitoring has been introduced. Workshop day 2 starts with the question ‘What are the most striking learning points or conclusions after the 1st workshop day according to the participants?’:

- The discussions revealed that in some places local communities are more committed to monitoring activities than in other places, for example, in the Netherlands or UK, where people were willing to contribute to (or even initiate) monitoring activities themselves. In contrast, in Poland or Denmark people seemed less actively involved in collecting data. This difference surprised some delegates.
- It appears that in most examples, we involve the general public too late. Traditionally this moment is too late. It should be an integrated part of the whole planning of a project. As such, PM should be an integrated part of the overall project strategy.
- Delegates questioned who has a stake in initiating participatory monitoring? Who would like to involve the stakeholders/community? Or who should have done this?
- How to convince the industry to monitor in communities, how to save time and how to get them monitoring before the project. Involving stakeholders very early in the process is important.
- Delegates learnt that monitoring activities could be community-related and how these could be stimulated and facilitated? → how should an engagement process be organized?

2.2 INTRODUCTION NORWEGIAN & DUTCH LOCAL CASE STUDIES

2.2.1 Cathrine Ringstad (SINTEF). Svelvik fieldlab site (N); CCS.

- CO₂ storage case: It is a field lab in Norway (close to Oslo in south-western direction). It is located in a sand pit of a former glass factory.
- Opened in 2010, two wells were drilled. The location was closed in 2013 because of a lack of money. We received money again for an upgrade and reopened the site.
- There are houses, mostly summerhouses, very close by, which are sheltered by a line of trees..
- Different types of surveys are undertaken which are planned to be used for the upgrade.
- During the surveys/preparational phase we cleaned up the area; which was well appreciated by the local community; we also opened-up the test site.
- Communicating with local authorities and local neighbours has been satisfactory thus far. Meeting for the locals, project-website: quite good information about the project. The locals had a kind of neighbour association – this made it easier to re-establish it.
- It’s an open-access test site, with two injection wells: Svelvik 1 and 2.
- We have planned 4 monitoring wells to track the CO₂ plume, as well as surface monitoring.
- We hope we can use both wells for injection, and although the permit is there, we are waiting for approval by the authorities for the injection plans. Drilling of monitoring wells depends on the costs and financing. These monitoring wells will be instrumented with the whole area being open for other sources (measurements).
- Phase one: drilling and instrumentation → phase two experiments for the rest of the year.
- Positive political treatment. Permit is there: still have to get acceptance of what we do. The permit for some new buildings needs yet to go through the administration.



- There are three types of concerns at the local authority with regard to the project: 1) the extra traffic. Politicians were less concerned. Try to find other mobility options for local residents. Large trucks in and out of the project site. 2) The noise: we have trees as a barrier. Some tests show the noise of the caterpillars are not that significant. Noise is not that high. We have to say what we do to mitigate the noise. 3) Where will the stored CO₂ go? Injections are now deeper in the ground water column. CO₂ moves from the north to the south with natural migration towards the south. It will finally disappear. A permit condition is that: the site has to return to its normal situation after the injections.
- SINTEF has to leave the site as it was before they used it. Politicians feel confident about this idea because it is put clearly in the permit. However, the permit does not describe exactly what this means. The ground water must not be damaged in a way it cannot be reused. We expect that ground water will not be contaminated or suffer changes in ecological quality.
- A local office has been opened where people can come with questions about the project. A local SINTEF-employee will be on site.
- New webpage is available to share information about activities as early as possible to inform locals.
- Currently in the construction phase: people can see what is happening in the project.
- Information meetings are held and reported by local newspapers – try to involve other larger papers.
- No one in the local community is against the projects. Small communities are getting together to 'be green'. A lot of support from the local authorities who are very interested to follow what is happening. The project was presented to the local political parties. They responded primarily positively because this small community can contribute to scientific research.

Questions:

- *What kind of data comes from fibre cables?* Temperature, strain, seismics.
- *Are the fibre cables placed in the pit?* In principle in the wells and in between the wells. Another project that tests in the subsurface. The critical one is on the wall of the wells.
- *Does the CO₂ plume flow to the south (as expected)?* Therefore, we want 4 monitoring wells, less thinking about how to position because you can monitor every direction.
- *How does it work with the local office?* Klaus works here as an office manager. Residents can call him with questions or complaints. He knows a lot of local people and is therefore trusted. Mike: the role of trust + benefit for the local community + people are already used to industrial activities. Three things we discussed yesterday that are in place in this case. In addition, a 'left-over well' was offered by the local community to SINTEF, which was accepted as an extra opportunity for monitoring (although not really necessary).
- *Is all the data freely available?* We make them freely available but not on the website. The project is government-financed: the local community can look at it and download it.
- *What do you monitor?* Pressure, temperature and salinity. There will be two measurements a day, and it's the idea to have them placed on our webpage, so you can see the measurements of the day.
- *Have you experienced any issues about processing the data?* So far we have thought about the water monitoring data, we have a lot of data from the last project, we haven't yet discussed how much we make available. The Geo data go to another scientist (want other data in return), we don't let everyone download the raw data because we cannot control who gets it. The Geodata can be connected to the local library to share and make classes for children. In the future we



want a visitor site and a programme to inform people (politicians, classes, university), this requires more money.

2.2.2 Jan ter Heege (TNO). Comparing conventional (Groningen site, NL) to unconventional natural gas production.

- During a previous EU H2020 research project (M4ShaleGas), a long list of risks has been composed regarding shale gas projects. The lack of social licence to operate is one of the risks on this list. Nevertheless, Jan observes that operators pay less attention to this risk during planning of operations; they generally have limited strategy to deal with the risk of losing their social licence to operate and have a strong focus on providing information that may be considered biased by the general public. General safety is generally underestimated in the debate of shale gas in the U.S.A.: according to local communities' safety is most important to them (directly affecting them).
- Despite all the problems in the Groningen case with seismicity, property damage and distrust in formal institutions we can learn valuable lessons for participatory monitoring.
- The earthquakes near the Groningen gas field are due to reservoir compaction resulting from the depletion of gas; in other examples (i.e. city of Prague in Oklahoma or in Western Canada) they are caused by waste water disposal by injection in subsurface reservoir. Earthquakes caused by hydraulic fracturing have been observed in Western Canada (Alberta, British Columbia).
- In the Netherlands, both natural and induced earthquakes occur. In the south in the Province of Limburg natural earthquakes have occurred (Richter magnitude up to 5.8) and in the North induced earthquakes have occurred (magnitude up to 3.8). In the north, it is mainly the Groningen field. Truly induced seismicity – clear relation with the production and extraction of gas. Last year it was decided by the government that the gas production will be ended by 2030.
- More about the Groningen gas field: earthquakes above 1.5 – detected from 1986 until now. A game changer in 2012 when a 3.6M earthquake occurred. Interesting aspects with regard to the public engagement: until the mid-90's the earthquakes were considered a manageable issue by the operator and government. After 2010 public resistance increased dramatically and a strong mismatch emerged in vision on how to manage and compensate damage to houses caused by the earthquakes. After the 2012 earthquake, the increasing lack of a social licence to operate caused a lot of problems for the operator and government, and it is now decided to end production by 2030;
- Scientific research came under scrutiny because of new insights (we now know more) and through the more critical attitude of the general public.
- The public unrest is not only about the earthquakes themselves, but also about how the government and the operator, NAM, deal with the damage to private properties (businesses, homes). Because of ground motion caused by the earthquakes, the damage to homes is significant. Some of the houses needed to be evacuated and will be torn down.
- Also after the large magnitude earthquake in 2012, the operator of the Groningen gas field decided to increase the overall gas production in the field in 2013. The production permit was valid for 5 years and regulated total production within this period rather than yearly production.
- The resolution or density of the monitoring network for the Groningen gas field (detecting ground movement and seismicity) has been changing over the years, more and more sensors are installed. When we initiate new projects, you cannot install the full number of seismic monitors from the start. In what point in time do you install what kind of sensor networks. The original



network can detect up to an earthquake to 2M. To increase sensitivity and resolution requires either building more sensors and/or burying them at depth.

- Popular mitigation measures for seismic risks are traffic lights systems, but they need to include different values (including seismic magnitude and ground motions like PGV, PGA; see Figure 8).

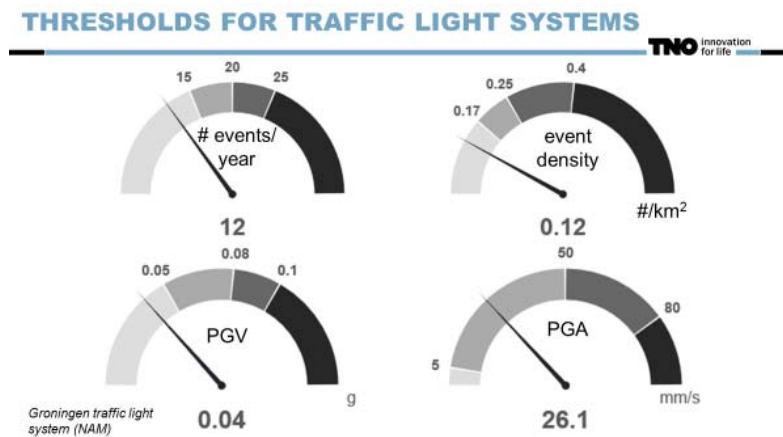


Figure 8: Examples of traffic light systems which are being used in the Groningen case study by the field operator (NAM)

- Most traffic lights use colours rather than grey tones. The use of grey tones may be an example of how the operators deal with the public perceptions (e.g., red may be perceived as a status requiring cessation of production, but that’s not the case in Groningen).
- What has been done with regard to monitoring? Quite a number of initiatives were developed. See examples in Figure 9.

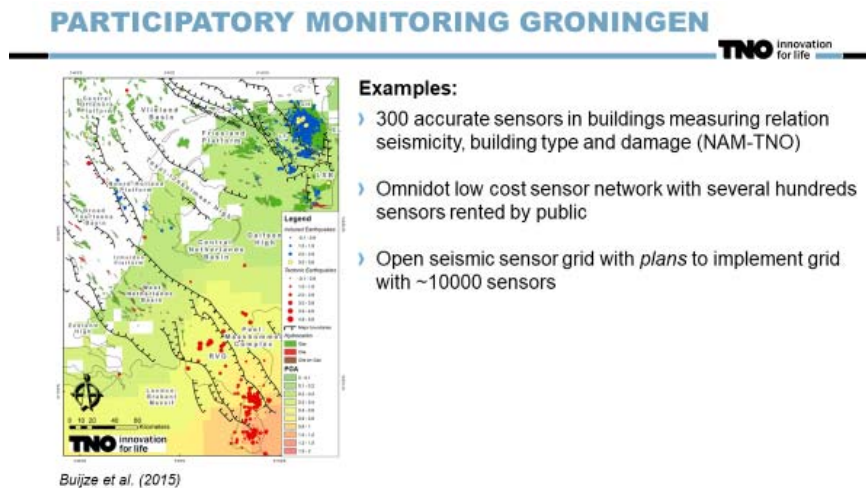


Figure 9: Different monitoring activities have been initiated after the problems with the seismic events in the Groningen Field in the Netherlands. Both initiatives from the operator, knowledge institutes and from society.

Questions:

- *What kind of PM would you advise?* Communicating to the public is to get away from the Magnitude measurement. A lot of studies plot the M (magnitude) against the gas volumes. It is better to speak of Peak Ground Velocity (PGV) and Peak Ground Acceleration (PGA) to characterize the tremors / earthquakes and their potential impacts. It is difficult to get data immediately on the web – a company interprets the data before it comes on the website.
- *What is the best type to measure? When is action required?*



- Green = making plans for action, within a certain time that plan has to be carried out, green is a longer time than red. Stopping the field is not attached to one of these signals. Currently, research focusses on what measures have an effect and what not. NAM 'plays around with different options to keep low seismicity for the remaining production'.
- *Are there any injections?* No, they don't want to do that as it may jeopardize gas production. Varying production from different locations is attempted.
- *Do you plan to store CO₂ in the Groningen field?* The Groningen gas field is too big, this might sound strange, but this field is not suitable for CO₂ storage. The needed CO₂ flow/supply would be too big; we wouldn't be able to fill the field up or to organise the CO₂ supply. It is probably always going to be too big. I don't think it would ever happen unless CO₂ supply will exceed storage capacity in smaller depleted gas fields.
- *Can you estimate the degree of completion?* I think now it is around 80%, not sure. It was ~75% in 2014.



2.3 STEP-BY-STEP APPROACH “DESIGN YOUR OWN TAILOR-MADE PARTICIPATORY MONITORING PROGRAM”

2.3.1 Introducing the step by step approach

TNO and EUR introduced methods to apply the theoretical framework for participatory monitoring step-by-step to the local case studies. The participants formed three breakout groups around the Polish case study, the Norwegian case study and the British case study.

The step-by-step approach for designing a participatory monitoring program for each of the local case studies consists of the following steps:

1. Purposes for participatory monitoring
2. Stakeholder identification – force field analysis
3. Exploring main interests and concerns through the perspective of key stakeholders
4. Exploring in what phase of the design and implementation of the participatory monitoring program stakeholders could play a role
5. Exploring what their role would be (could be different in different phases).
6. Including/adapting stakeholder interests into local design monitoring program

Step 1: discussing the purposes for a participatory monitoring approach in your local context.

From literature we identified several purposes for working with a participatory monitoring approach (Figure 10). The question for each group was what the purposes for a participatory monitoring approach could be in their local context.

Step 1: Purposes for participatory monitoring in your local case study – inventory

Each break out group gets this handout

Your local case study

From literature

- Knowledge generation.
- Improving existing (expert) monitoring methods.
- Raising awareness among citizens and other stakeholders (through informing them).
- Improve (adaptive) management practices.
- Social research: behavior and (multiple-) use of areas and/or infrastructures.
- Policy development and/or legal justification of the chosen policy.
- Influencing public opinion.
- Overcoming tensions between stakeholders involved.
- Societal embeddedness of CCS and/or Shale gas projects (as component of new geo-energy technologies).

Figure 10: format for the break out groups to explore the purposes for participatory monitoring including examples from our literature review.



Step 2: Who are the stakeholders around your foreseen CCS or shale gas project? > make you own force field analysis.

The question for each group was to map all relevant stakeholders into this circle diagram (Figure 11 and Figure 12). Stakeholders could have interest in the physical system (left site) or the social system (right site); stakeholders could have a positive attitude (upper site) or a negative attitude (lower site) towards the foreseen project; and stakeholders can be active at different levels of scale: local – regional – national – international (circles)

FORCE FIELD ANALYSIS (FFA)

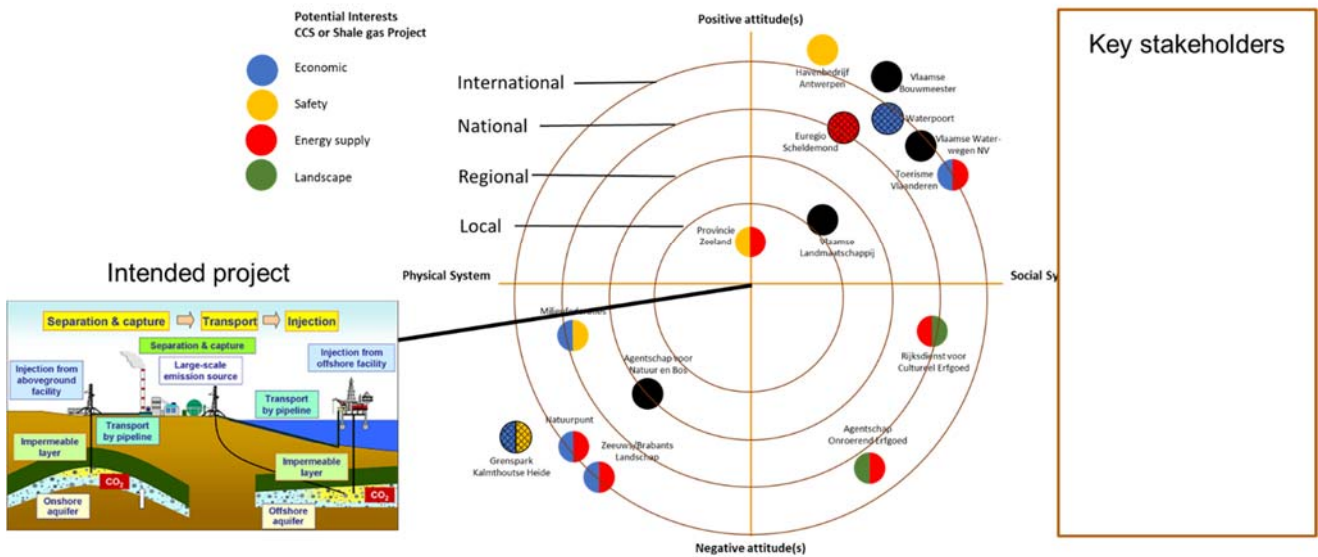


Figure 11: Example of how a force field analysis could look like.

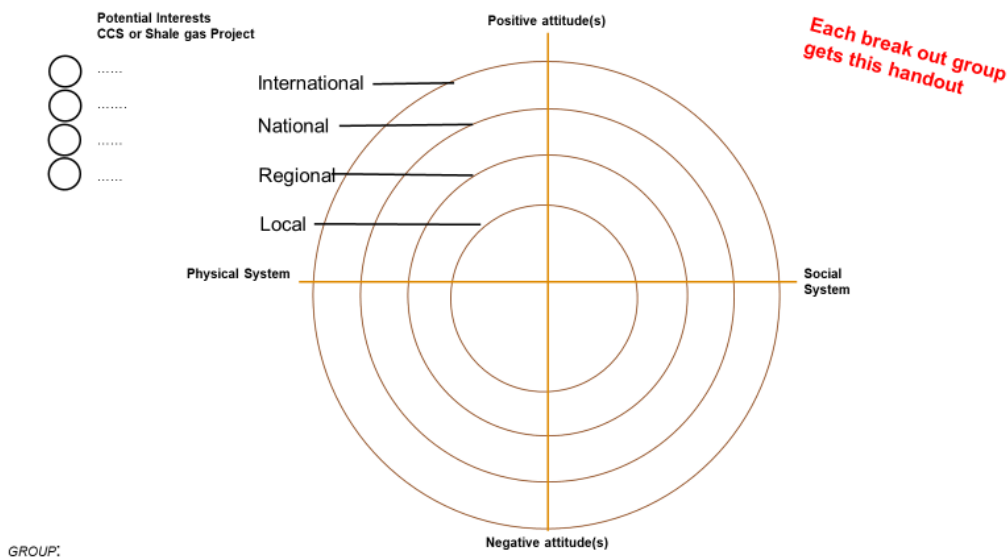


Figure 12: format for the local case studies to compose their own force field analysis.



Step 3: who are your key stakeholders and what are their main interests and concerns?



Figure 13: key stakeholders are the stakeholders with the highest interest en highest power.

The goal of this step is to identify the key interest of all stakeholders in order to decide who and why needs to be included because of their high interest and high power (Figure 13). Each breakout group worked with the format below (Figure 14) to plot the key stakeholders against the axes high-low interest and high-low power, starting from the long list as result of the Step 2. Because of time constraints, we decided to mainly focus on the key stakeholders with 'high interest & high power' for exploring how the framework for participatory monitoring could work. If you would have more time, then it might be interesting to plot the stakeholders from the long list (step 2) in all the quadrants in the figure below (Figure 14).

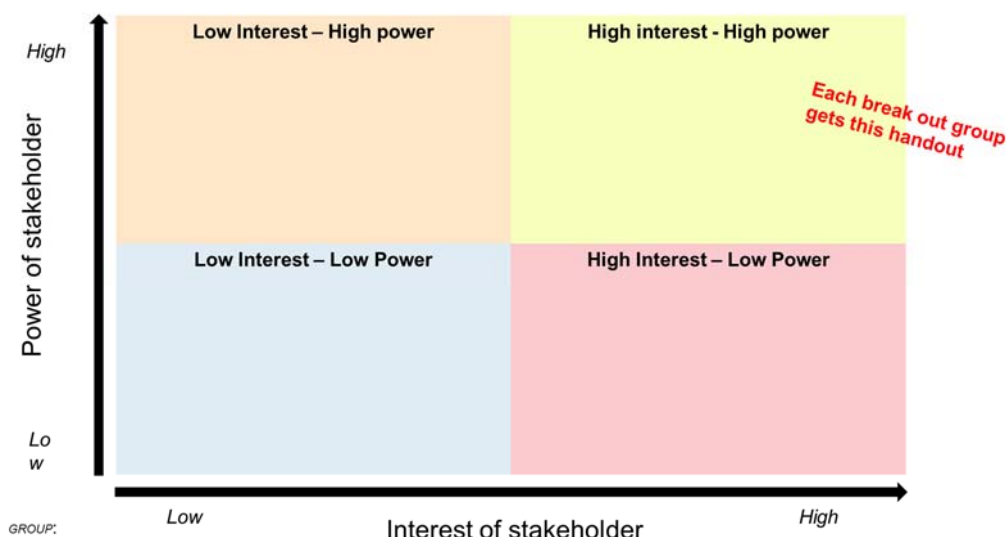


Figure 14: format for identifying the key stakeholders (high interest – high power) for each of the local case studies.



Step 4: in which phases of developing and implementing a participatory monitoring program could you involve these key stakeholders?

Each breakout group worked with the format below to derive possible monitoring objectives, starting from the list with key stakeholders and their main interests (left side of the Figure 15).

GROUP:						
DAY I		DAY II				
Stakeholder (group)	Monitoring objective(s) for each stakeholder (group)	Building Blocks Monitoring System Design				
		Monitoring technology	Monitoring density	Data collection	Data analysis	Transfer results

Figure 15: format for step 3 and 4: exploring the monitoring objectives per key stakeholder (step 3; left site of the format) and the roles these key stakeholders might play in the different phases for designing and implementing the monitoring program (step 4; right site of the format)

Step 5: what could their role be in each phase?

After identifying the most important monitoring objectives, TNO and EUR asked the participants in each breakout group to explore which phases the key stakeholders could play a role in and what their role would be. (right side of the Figure 15).

Step 6: which questions do you have towards fine tuning and implementing your local participatory monitoring program?

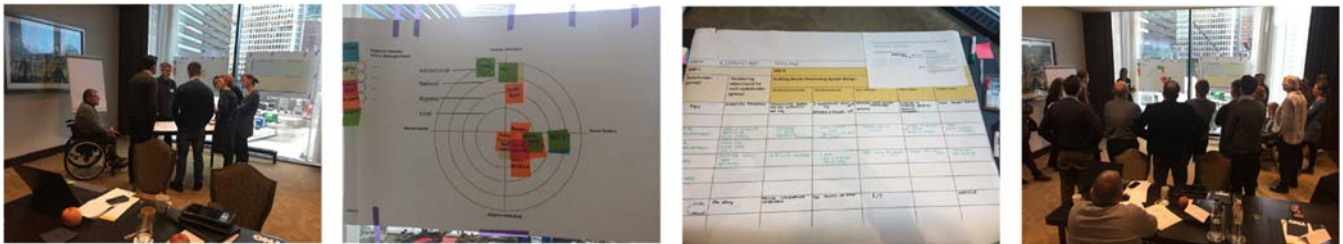
This step was aimed to share thoughts and experiences of all break out groups with applying the step-by-step-approach for participatory monitoring.



2.3.2 Sharing experiences from the break out groups

At the end of the breakout sessions all groups shared their experiences and reflections with the step-by-step application of the participatory monitoring approach to the specific local context.

Experiences group local case study from Poland - Krokowa municipality, Lubocino village (Shale gas)



Brainstorming

>

force field analysis

>

monitoring objectives & roles

>

sharing experiences

- The two main clusters of actors can be seen: one at the national level with science / economic actors, and one at the local level with actors that do not have a clear stand point (not very negative, but not positive either).
- An involvement of stakeholders is regarded as a chance for an improvement of monitoring run by PGI. The basis for this effort is scientific progress.
- The identified interests mainly concern economic aspects (orange colour): important to check for pollution and how it can influence the quality of life, value of the properties, jobs etc.
- Next to economic concerns, a few interests regarding nature (green colour) and safety (yellow colour) were identified.
- Assumed that the local population would not be very optimistic at the beginning, one needs to understand that they are concerned about the actions.
- The researchers' goal is environmental monitoring, but local community may ask about the economic impacts.
- In that case the interest related to climate doesn't come up as the planned monitoring activities are not directly related to climate change.
- Local community cannot block the project but can influence it.
- There is some emerging communication, through a website of the local government, meetings and media. There is a knowledge gap about the project.
- There may be a minor clash of stakeholders interested in nature (green) (e.g. researchers and local communities), but it is also a possibility to find similarities in goals focused mostly on the quality of life Question: was there monitoring in place related to induced seismicity? Yes, when fracking took place, there was local monitoring operative.
- The exercises for the breakout group were not easy and seemed to be quite challenging.



Experiences group local case study from UK – the Vale of Pickering (Shale gas)



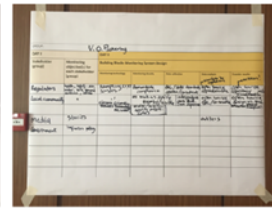
Brainstorming



force field analysis



high/low power & interest



monitoring objectives & roles



sharing experiences

- All of the goals are important to some type of stakeholder, but the most important goal is building trust. And most actors are interested in safety.
- For each individual stakeholder it was decided whether the identified interests were of interest for them. The stakeholder groups were 'clustered' in general: for example, there is one group 'citizens' that represents all different interests that are vital to them (whether they care more about house prices or safety). Same for the other parties.
- Most stakeholders have a high interest otherwise they would not be a stakeholder.
- Questions mostly about the media; how can it be that they have more power than the government? Some newspapers are very powerful in framing the issues at hand. How much influence does social media have on the process? Social media proves to be very tuned in, in what is going on.
- Schools also form a source for collecting data: 1000 schools in the UK have seismometers. So, schools can conduct their own measurements and they can develop a school programme's based on this data → to learn with children.
- It is difficult to gain local trust. Some local farmers did not even allow the Kirby Misperton Monitoring Association to collect samples from their boreholes. People really do not trust each other. The group came up with the idea to let the locals use their own data through an interactive system and design a tool to show them what they could do with the data.
- Media is a difficult factor to involve in the monitoring system. Are they really interested in the technique? Can they cooperate with the citizens? Or can you use the media to tell your story first?
- Monitoring density is an issue that must be organized in compliance with regulation. The local community is interested in monitoring – based on NIMBY – that is independent, 'DIY' and all present (as much as possible).
- Monitoring data must be open source, transparent. Can a visualization tool be developed to improve insight in the meaning of the data? Raw data can only be processed when there is consensus about how this is done (e.g. ground motion instead of magnitude?). Can local communities be involved in the communication of the collected data?



Local case study from Norway – Svelvik site (CCS)



Brainstorming



> force field analysis



> high/low power & interest



> monitoring objectives & roles



> sharing experiences

- Local citizens and local governments are important because they have the power to stop the project.
- Some actors have a positive and negative attitude about the project at the same time. E.g. local government is in favour of the project because of the importance of taking part in scientific research, and at the same time, wants to minimize traffic around the project site.
- Media are also important because they share bad news.
- National government is an important actor because they give research grants with which SINTEF can finance the test site.
- Accordingly, SINTEF is an important stakeholder because they finance and manage the project area.
- Start internally and make sure that your internal organisation is on track before you start new projects.
- Communication with the actors is important because they tell their story to the outside world.
- The group has a question about how they need to present the data on line (raw or analysed), about CO₂-leakages, water and air quality? When they go home they will start working on this question.



3 Reflection from participants: take aways after the 2-days workshop

At the end of the two-days workshop participants share the following reflections and personal learnings:

- One of the participants raises the risk of sabotage (sabotage of the measurements). Has this been a consideration while developing the framework for participatory monitoring?
 - Yes, some articles in literature show how to deal with this risk. A solution might be that a trusted third control party checks all collected data and samples.
- Another participant takes away the importance of trust (or the lack of it). He has learned that one needs to build trust to have any success.
- Another participant has observed from the difference between the different cases and different attitudes of stakeholders. Based on these differences, the participants concludes that it is not likely you can roll out **one** template for participatory monitoring or involving stakeholders that is valid for all cases.
- One of the participants shares that it is inspiring to learn from this international cooperation and to take away the instruments that have been introduced and to try to modify them to different (social) environments. The question that this participant leaves with today is, what is next? How to apply this?
- This 2-days workshop has been very useful. So far, we focussed on communication with the local authorities and neighbours. But we need to do this more systematically. Presenting the case helps us for the next months.
- I have learned a lot about the relationship between monitoring and decision making. The example of the traffic light was amazing because it did not work. It relates to monitoring and behaviour. The intention with this example was not to stop when the monitoring system comes to a certain level. You can have a decent monitoring system but how does this influence the decision making? This is another stage to this process → what will happen with this data. Maybe we could explore this the next meeting?
- The 2-days workshop has been an enlightening experience for me. The question I have is how we will coordinate a further comparison between the case studies who will set up experiments with applying the participatory monitoring approach? It's good to make some description/comparisons on the effects of the results or make some recommendations for the future. It has to be coordinated in some way.
- One of the participants adds that it would be very helpful to organise a follow up on this 2-days workshop. Some of the cases are real cases that we research across the whole SECURE project. We might get more people into practice.
- One of the participants shares that he has learned that participatory monitoring can (or must) be an integrated part of the overall project development strategy because it includes local stakeholders and interests in the intended project in each of the development stages. Local stakeholders are become part of the project because they can contribute to the collection of data that are needed to keep the project development process in balance with local interests.



Closing reflection from EUR & TNO

- We designed a workshop program that was too ambitious. This is a reflective lesson to us: leave enough room for discussions among the participants because these represent the largest learning potential. Knowledge challenge and exchange between experts from different cultural background is both inspiring and informative.
- Breakout groups: it is really important to define your project (what's your project) and to define the societal and environmental surroundings of the project. This leads to identifying the relations between what is happening in the project and in the surrounding of the project.
- UK case break out group took the force field analysis to another level. In the map, you see that stakeholders take conflicting standpoints. Examine how they can be “moved” in the desired direction. And by “moved” we do not mean “convinced” or “forced”, but included in the project development process as genuine stakeholders that can have a decisive say in the design, distribution of benefits and operation of the intended project.



4 Towards tailored strategies for applying the participatory monitoring approach in actual case studies

The active involvement of all participants, the valuable conversations and exchange of ideas and experiences as well as the feedbacks at the end of the workshop have told us that SECURE researchers and local site operators found the framework for participatory monitoring an inspiring and helpful approach for developing strategies for involving local stakeholders. Furthermore, several workshop participants have asked for a clear guidance on how to develop participatory monitoring strategies for their actual local case studies.

In this report, TNO, EUR and BGS have made the decision to only capture the general storyline of the framework for participatory monitoring as well as the headlines of the discussions among workshop participants. The current report gives a rich overview of the thoughts, doubts, curiosities and ideas which have been shared and exchanged among the workshop participants. As such, the report is a valuable resource for the project. Nevertheless, we recognize the need for defining next steps for taking all the insights on participatory monitoring to the local environments of actual case studies.

In order to create tailored strategies for applying the participatory monitoring approach in actual local case studies, we foresee the following steps:

- Organising one-on-one conversations with the local site owners/local research teams to jointly explore how the participatory monitoring approach should look like and how it could support them in meeting their local goals and solving the challenges in their local environment.
- Organising a follow up workshop on taking further steps towards tailored participatory monitoring approaches for local case studies; an opportunity could be to have this workshop as part of the SECURE GA-meeting in June 2019.
- Supporting the local teams in drafting and applying their own strategies for participatory monitoring, via (i.e.) reviews, skype conversations, training, etc.
- Organising yearly workshops with the local teams and SECURE researchers to learn from each other's experiences with pm and to enrich the current framework for pm.
- Developing a monitoring and evaluation approach for capturing the experiences, insights and lessons learnt in the local case studies.
- Analysing the outcomes of the monitoring and evaluation and from there deriving good practices for applying the participatory monitoring approach as a way to actively engage local stakeholders and/or including their interests in the project design.

The strength of the above steps is that they give space to local dynamics and support an optimal connection to local needs. Although we would like to connect as best as possible to the different local dynamics, we are also looking for a way to compare the different experiences with participatory monitoring at local scale. The evaluation strategy facilitates this comparative analysis and contributes to deriving best practices for participatory monitoring as a strategy for stakeholder engagement.



APPENDIX 1: FINAL INVITATION 2-DAYS DESIGN WORKSHOP

INVITATION SECURE DESIGN WORKSHOP, 4 and 5 March 2019
‘Towards Tailor made participatory monitoring programs’
TNO, The Hague⁴, Netherlands.
Registration via Jeanet.Gieskens@tno.nl

Dear Mrs or Mr, dear SECURE colleague or stakeholder,

On behalf of the European research project SECURE, we would like to invite you for a 2-days workshop on participatory monitoring in The Hague, The Netherlands. You have received our “save-the-date” e-mail on December 7th 2018. Hereby we send you our final invite including additional information about the workshop program. We hope that you will attend this meeting.

Background

The transition to sustainable lower carbon economies through the provision of affordable energy remains a principle driver in the development of subsurface energy technologies. SECURE is a European research project that is aimed at achieving a better understanding of the potential environmental impacts of shale gas and CCS technologies. Both activities utilise deep-lying geological formations and may cause similar effects like induced seismicity, detrimental fluid migration and displacement of brines. In response to these concerns, SECURE will provide unbiased and impartial scientific evidence to enable improved risk mitigation for environmental protection, particularly for designing appropriate environmental monitoring systems. These outcomes will be relevant to a range of stakeholders including local communities, operators, regulators, legislators, policymakers as well as commercial subsurface geo-energy project developers willing to control and reduce their environmental footprint. Next to technical research on risks, risk assessments, monitoring technologies and monitoring strategies, SECURE also works on a framework for participatory monitoring and aims to co-develop best practices for participatory monitoring and stakeholder engagement through practical experience and joint research in four practical cases in Poland, the UK, Denmark and the Netherlands.

During the design workshop in March 2019 on ‘Towards Tailor made participatory monitoring programs’, TNO and Erasmus University Rotterdam (EUR) will introduce the draft version of the framework and an accompanying guidance on how the framework could be used in real practice. The biggest part of the workshop is dedicated to a practical exercise on how to use the framework and the guidance in practical cases. The workshop will thus help the participants to better understand the participation process for setting up a monitoring program and to be able to apply the practical instructions given in the guidance in their own region. Simultaneously, the workshop gives TNO and EUR the opportunity to revise the draft version of the framework, making use of your reflections, suggestions and additional knowledge questions.

⁴ Information about the workshop location (city center The Hague) will follow soon.



Participants

The workshop will be valuable for three target groups: (1) all members of WP6, since most of them will be involved in some way in the case studies and in drafting best practices for setting up new monitoring programs, (2) external, local representatives, since they are the ones who will apply the principles for participatory monitoring in their region and (3) technical experts from other WPs in SECURE, since they will be involved in the technical development of the outcome of participatory monitoring and in this preparatory phase they can also give input to technical issues with regards to the (im)possibilities of monitoring.

Program Design Workshop

WORKSHOP DAY 1

Day	Time	Activity
4 March	12.30	Registration
	13:00	Welcome and getting started
		Welcome to all participants Getting to know each other: who is who? Sharing (local) questions, challenges, issues regarding (participatory) monitoring & stakeholder engagement
	14:00	Introduction framework for participatory monitoring & guidance for local application
		Interactive presentation by TNO and EUR Exchanging questions and reflections
	15:15	Coffee break
	15:30	Introduction local case studies
		Local participants have the opportunity to introduce their local case studies/projects/challenges regarding participatory monitoring & stakeholder engagement We are currently inventorying potential case studies and their presenters Based on these introductions we will organise the break out groups
	16:15	Break out groups – part 1: starting from local case studies
		The participants will be split into 2-4 groups, depending on the available local case studies and the number of participants Each group will make a first start with applying the framework on the local context by using the guidance presented. The goal is the jointly explore how a participatory process for designing a monitoring program could look like and how the developed framework works in local contexts (best practices)
	17:15	Short reflection on part 1 Break out groups Preview of tomorrow's program & End meeting workshop day 1
	19.00	Diner together in city centre The Hague (on own costs)



WORKSHOP DAY 2

Day	Time	Activity
5 March	09:00	Welcome and reflections on day 1
	09:30	Break out groups – part 2: towards a local design for participatory monitoring Continuing with application framework on local case studies Aiming to design a process for participatory monitoring for the local context
	10:45	Sharing experiences and insights break out groups with all Sharing main insights and challenges break out groups Exchanging first reflections on application approach for participatory monitoring
	12:00	Lunch
	13:00	Break out groups – part 3: Fine tuning / towards implementation Exploring next steps for fine tuning local participatory monitoring process & main challenges for implementing the design. Identification of new knowledge questions regarding participatory monitoring approach.
	14.00	Final presentations, feedback and reflection. Presenting the final approaches to participatory monitoring for each case. Feedback from the other break groups. Joint reflection on the presented knowledge about participatory monitoring and identification of new knowledge questions.
	14.45 – 15.00	Closing of the 2-days workshop
	15:00 – 17.00	Social Event (all invited) <i>We try to arrange a joint visit to the Maurits house (city center The Hague).</i>
	19.00	Joint diner (for those who stay)

Results

After the workshop the local participants will be better suited for applying participatory monitoring to their local case. The other SECURE researchers will better understand the implications of PM for their research efforts in the other WPs in a more detailed way.

Preparation participants

Our aim is to keep the preparation for each participant as minimal as possible. The focus of the workshop lies on introducing the draft version of the framework and guidance for participatory monitoring and to practice & experience the application of the framework during the workshop itself. In order to tailor the final workshop program and case studies as much as possible to the practices and learning issues of the participants it would be very useful to receive your questions, concerns and challenges regarding (new) monitoring programs and engaging local stakeholders, prior to the workshop. You can send your questions to the organizing team (Hanneke Puts via hanneke.puts@tno.nl, Mike Duijn via duijn@essb.eur.nl, or via your local SECURE contact).

**Registration**

If you want to attend the design workshop on 4 and 5 March 2019 in The Hague in the Netherlands, you can register via e-mail to jeanet.gieskens@tno.nl

Best wishes and hoping to see you in The Hague in March,

On behalf of Hanneke Puts (TNO) and Mike Duijn (EUR)



APPENDIX 2 – RESULTS QUESTIONNAIRES WITH FEEDBACK PARTICIPANTS

In this appendix we show the results of the questionnaires which was handed out to the workshop participants to capture their feedback. All participants filled in the questionnaire at the end of the 2-days workshop. 17 respondents in total. Not all participants filled in all questions. The results of the questionnaires will be analyzed and used to draw the next steps, in close cooperation with the other WP6 partners as well as the case study owners. (this analysis is not part of this appendix)

SECURE Questionnaire
Design workshop ‘Towards tailor made participatory monitoring programs’
4 and 5 March 2019, The Hague

Dear participant of the SECURE design workshop,
 As part of the SECURE research, we would like to learn from your feedback on this 2-days design workshop ‘towards tailor made participatory monitoring programs’. Your feedback will help us to analyze how you experienced the workshop program, how your input has been taken into account and how we can further improve the framework for participatory monitoring.
 Therefore, we would like you to answer the questions below. It will only take about ten minutes. Your answers will be analyzed anonymously.

Thank you for your cooperation!
 Hanneke Puts (TNO) and Mike Duijn (Erasmus University Rotterdam)

Part I - Questions about your background

1. What is your level of education? Please select the answer which applies best to you:

- Primary school
- Secondary school
- Further education
- University (17)
- Other,.....

2. What is your current occupation?

Researcher, PhD (2x)	Senior scientist	Public Administration	Geochemist
Geologist, researcher (3x)	Geophysicist	Hydrologist, researcher	Researcher (4x)
Scientist/project manager	Lecturer (2x)	Consultant @SINTEF	

3. What is your background?

- Social (2)
- Technical (12)



- Other (2):
 - environmental protection and sustainable development
 - social sciences - sociology

Part II - Questions about the 2-days meeting

4. On a scale from 1 (not interesting at all) to 10 (very interesting), how would you rate the 2-days design workshop?

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7 (3x)</u>	<u>8 (7x)</u>	<u>9 (5x)</u>	<u>10 (2x)</u>
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Please explain your answer.

- There were really informative case descriptions and tools for discussion, but there is a lack of the further plan (of comparison [comparison?] etc).
- I got some new insights into the interests of different stakeholders and how they could be involved in participatory monitoring.
- This topic is very thought provoking. Lots of aspects to consider both technically and socially.
- Case study approach.
- I had an opportunity to meet with experiences from other countries.
- I knew the problem of social engagement before and methods of identify stakeholders and their influence but the specific method used in the PM context was something new for me.
- It made me think about engagement from a different perspective than previously.
- Interesting to identify stakeholders and their interests in our project. The participatory monitoring framework will be a useful tool.
- Very interesting to learn about experiences in other countries.
- The interdisciplinary aspect was very interesting.
- Relevant for my work.
- Interested discussion on participatory monitoring, no final conclusions.
- Especially second day, tools.
- Identifying commonalities between ccs & shale gas, between projects and between disciplines is always interesting.
- Nice mixture of perspectives & disciplines represented so brought together technical & social sciences.
- Learned a lot. I missed almost the whole day 1. A pity!

5. On a scale from 1 (not clear at all) to 10 (very clear), how clear was the goal of the 2-days design workshop?

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6 (4x)</u>	<u>7 (7x)</u>	<u>8 (4x)</u>	<u>9 (2x)</u>	<u>10</u>
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Please explain your answer.

- There were really informative case descriptions and tools for discussion, but there is a lack of the further plan (of comparison [comparison?] etc).
- I didn't know what to expect, I'd appreciate more clear description of the goals before meeting.
- This became clear to me during the first day of the workshop.



- The framework was very interesting and useful and introduces a lot of new questions and can be interpreted in many different ways.
- Maybe benefit from more detailed agenda in advance
- At the beginning I didn't understand what is the main goal. It wasn't easily formulated.
- At first it wasn't very clear but it was explained during the workshops.
- I was not present the first day, but I understood more and more during the workshop.
- There remains the question of how to take this further within SECURE.
- Not that clear upfront, but I was neither not a 'secure person' before this workshop.
- Clear framework – may be could have presented this a bit earlier?
- The frameworks were new to me so I struggled initially to understand what was needed. However this became clearer.
- It was presented clearly (and a bit shortly).
- Searching for optimum model/workshop schedule.

6. On a scale from 1 (not suitable at all) to 10 (very suitable) how did you experience the approach (combination of theoretical background & break out groups) that was applied in the 2-days design workshop?

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7 (3x)</u>	<u>8 (6x)</u>	<u>9 (7x)</u>	<u>10 (1x)</u>
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Please explain your answer.

- Time constraints – maybe to many different topics but on the other hand discussions are very valuable.
- Approach invited active participation and open discussion.
- I believe this approach is very relevant for future projects although covers a huge topic.
- Nice mix.
- It was very inspiring to work together. It would be longer.
- I like this combination 😊.
- I think that the presentation of the cases and the breakout sessions were very interesting and pushed me to reflect.
- Good mixture of methods, case studies and breakout group discussions
- There was a good mix.
- Searching for optimum model/workshop schedule.
- It was either too short or too broad (at the beginning). The approach is very useful. Probable these cases follow up is needed.
- All good (though I missed some at the theory due to logistical problems – sorry about that)
- Nice group work & plenary.
- Very useful for our case.



7. On a scale from 1 (nothing at all) to 10 (very much), how much new knowledge and insights did you gain during the 2-days design workshop?

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5 (1x)</u>	<u>6 (1x)</u>	<u>7 (3x)</u>	<u>8 (10x)</u>	<u>9 (2x)</u>	<u>10</u>
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Please explain your answer.

- Really good insight connected with 4 cases description but lack of tool for common comparison.
- New insights on roles of different stakeholders.
- Force field analysis can be very useful.
- Differences between different countries & case studies with regards to force field.
- I feel that a lot of this information is new to me personally.
- Some part of this is common and comparable but I got a lot of new insights.
- I knew the problem of social engagement before and methods of identify stakeholders and their influence but the specific method used in the PM context was something new for me.
- I got to reflect over the current simulation of one project, and how we can improve with regards to participatory monitoring.
- Already some knowledge, but learnt a bit.
- Especially from the social box and broader significance of the term 'monitoring'.
- I got insight to research that I can use in my work.
- Most concepts known, but implementation into practical cases is an insight worth pursuing further.
- I knew a lot but I have learned a lot, too.
- Some ground covered before, but lots of insights gained.
- Some very useful presentations & high quality discussions in plenary.
- The way it was structured was new and found useful.

8. After the 2-days design workshop, how would you describe the value of participatory monitoring approach for the further development of shale gas and/or CO₂ geological storage in Europe?

Answers:

- It is definitely needed when there is high public interests/conflict etc. But I am not sure about it when topic is not controversial.
- I don't know, I [it?] could be helpful but who should initiate this?
- Highly relevant as it can determine the success or failure.
- I think this is a very useful introduction to pm and could certainly be built upon with the help of more workshops.
- Potentially extremely valuable but requires careful design & management.
- In general it is valuable approach to define destination groups. I see needs of further workshop devoted to practical methods of PM
- After the workshops I see it more clear that PM approach is important for the further development of shale gas and CCS.
- If used carefully it could help to reassure local communities about the technologies being used and generate trust between the stakeholder groups.
- I think participatory monitoring (PM) could be really valuable for both shale gas and CCS.



- Very important, only way to develop trust between different stakeholders.
- Extremely important in order to avoid costly failures.
- Important for the projects to be realized and operated successfully
- Very valuable and necessary for shale gas and geothermal; offshore CO2 storage wasn't addressed.
- Fundamental requirement – [...] if these industries show us that [...] it, there is a very high risk at failure!!
- There are multi advantages, but I should focus on citizen science, civic skills & trust.
- Critical.
- On a outreach level it has most value; on a research level it has medium value.

9. On a scale from 1 (not at all) to 10 (very much), how was your input been taken into account during the 2-days design workshop?

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6 (2x)</u>	<u>7 (2x)</u>	<u>8 (6x)</u>	<u>9 (6x)</u>	<u>10 (1x)</u>
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Could you please give an example?

- Yes, it will be considered by the team to prepare further steps.
- Specific types of monitoring sensors for different stakeholders.
- This reflects more my level of experience rather than the opportunities to be involved.
- Stakeholder matrix – stakeholders may not be in the quadrant you want them to be in, you may want them to move.
- I could express my opinion and support some points in discussion.
- I was answered the questions of who's stake it is to initiate PM.
- Experience from monitoring baselines & attending public meetings.
- I did not contribute with lots of reflections in plenary, but in the breakout session my input was definitely taken into account.
- Presented one of case studies.
- Exited that the case studies were considered very meticulously.
- Discussion on early involvement.
- We were working on our own case.

10. How could we further improve the framework for participatory monitoring?

Answers:

- Turn it in more precise tool now it is very nice but too general idea.
- Maybe put it at larger perspective. How much will it contribute to the eventual success of a project (cost-benefit trade off)
- Consider creative solutions for dissemination/communication. Website & social media are not the only tools.
- Generally, more practice
- Put 'a case' in practice and describe the outcomes
- Engagement with schools – earlier education leads to better understanding
- This was maybe explained the first day, but I would like a clear definition of PM and examples of how it could/is being used.
- Produce best practice guidance



- I think by having a detailed terrain [?] application in the framework of SECURE (at least one case, not necessarily covering all aspects of PM)
- Make a case example for illustrative purposes for others who would like to apply the framework but are new to the concept.
- Maybe a few different smaller groups
- I will comment later on this
- Need more next steps > tasks > practical tips
- Think of setting out guidelines & testing them in real life
- Clarify standards

11. Do you have any other suggestions for the research team?

Answers:

- More workshops
- No, it was ok
- Keep up the good work
- Pick one PM idea and try it out at the different national cases where feasible
- We need input from public to prevent scientific bias
- To think over the PM task together – how to cooperate on these cases, what research can be done?
- I would be very good to ‘monitor’ the impact of this framework on the teams within SECURE who are working on real cases – perhaps a follow up workshop would be very beneficial.
- Well done on a stimulating workshop and well planned and executed
- Examples of good and bad participatory monitoring > giving ideas to new projects.

**12. Thinking back, to what extent do you agree or disagree with the following statements?
(1 = fully disagree; 10 = fully agree)**

		1	2	3	4	5	6	7	8	9	10
a	During the 2-days design workshop we exchanged a balanced and comprehensive mix of interests and perspectives					1		3	9	3	
b	The location was convenient for me								5	3	8
c	I appreciated the overall program of the 2-days workshop							2	4	5	4
d	There was enough time for discussion				1	1	2	3	2	4	3
e	I felt comfortable during the 2-days workshop							1	2	5	8
f	The other participants were willing to listen to my contributions								2	5	9
g	The design workshop helped me to get to know the other participants better							2	3	7	4
h	The meeting helped me to learn about participatory monitoring							1	2	8	5
i	The meeting helped me to share my views and opinions with the other participants							1	3	10	2
j	The meeting helped me to structure my own thoughts					1		1	3	8	3



If you have any other comments regarding the methods used or the workshop in general, please use the space provided below:

- We always need more time to talk to each other than we expect. Enjoyed it and very interesting. Thanks!
- Thank you for meeting. Good job 😊

Thank you very much for filling out this evaluation questionnaire.