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Indications and reflections on an experiment

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Abstract

Determination of significance is widely recognised as an important step in environmental assessment (EA) processes. The prescriptive literature and guidance on significance determination is comprehensive within the field of EA, whereas descriptive and explorative studies of how we go about making sense of actions to determine significance are few.

This article makes use of sense-making theory to shed light on the practice of determining significance. Focus is on the first encounter with a description of a strategic choice and thus the initial judgement of significance. An experiment is designed and conducted to investigate how persons make sense of a specific strategic environmental assessment case to determine significance in a screening and scoping of the case.

The experiment indicates patterns in the test persons' sense-making, including important differences in the way individuals screen and scope. These patterns concern what we notice, how fast we frame the choice, and when we are critical about the provided information. The indications provide a basis for reflections on practice, hereunder how to organise EA processes.

Keywords: Sense-making, significance, strategic environmental assessment, screening, scoping

Introduction

Significance is a central concept in environmental assessments, since significance formally is the threshold that prompts assessment processes in the screening stage and the threshold for including impacts and alternatives in the scoping stage. Informally, however, assessment of significance occurs throughout the EA process and the following implementation, when decisions are made on what to include and investigate, how and at what level of detail, and finally if and how results of decisions (e.g. mitigation measures for significant impacts) are implemented in practice. Significance also plays an important role in regulations on EA, e.g. in the scope of the EU directive on strategic environmental assessment (SEA) (article 1 of the EU Directive 2001/42/EF) and in the Directive's instructions on public involvement, the content of the environmental report and monitoring. This article focuses on how people make sense and determine significance in the screening and scoping stages of SEA.

To guide the significance determination, the EU Directive includes significance criteria that concern the characteristics of the effects, the area to be affected as well as the plans and programmes in question. Significance is, however, not further defined in the Directive and the study concerning the report on the application and effectiveness of the SEA Directive found that “neither the Directive itself nor the SEA Guidance provides clear and unambiguous criteria for how to interpret the qualification when deciding to apply the SEA requirement” (COWI 2009, p. 50). Significance is argued to be one of the elements in the Directive, which "many lawyers and environmental assessment practitioners will be employed for many years in sorting out" (Thérivel 2004, p. 33).

Research has documented problems and challenges in the practice of significance determination. As an example, a study examined the results of discretion involved in screening of climate change plans, and found non-compliance with SEA legislation with lack of screening and following environmental assessment – due to the subjective judgments of practitioners (Kørnøv & Wejs 2012).

Despite the importance of significance in EA procedures, the concept is rarely explicitly defined in literature (Weston 2000, p. 193). Significance has been described as dynamic, contextual, political and uncertain (Wood *et al.* 2004) as increased knowledge among involved actors, change of actors, development in actors' preferences and values, and societal developments may all influence perceptions and conceptions of significance in a given context. The contextual character of significance is emphasised by Lawrence (2007b, p. 778) who points at the fact that "perceptions vary among populations and sectors of society regarding which impacts are positive and negative, and to what degree". Significance determination is therefore widely influenced by discourses and practices constituting “dynamic ‘relational complexes’ involving people, things and their many properties, competences and accomplishments” (Healy 2005, p. 239).

The Process of Determining Significance in EA

EA literature provides a manifold of checklists, criteria, procedures, and thresholds to guide significance determination (e.g. Wood 2008, Lawrence 2007b, Thérivel 2004, Thompson 1990). The EU guidance is another example of a try to limit discretion while determining significance in screening and scoping (EU 2001, 2003). The literature also encounters a suggestion for inserting more “common sense” in the assessment of

87 significance (Ross *et al.* 2006) – however, without clarifying and reflecting upon
88 differences in sense-making and thereby the non-existence of a uniform and shared
89 common sense. Despite the manifold of thresholds and criteria, determination of
90 significance is argued to involve "an element of judgement" (Thérivel 2004, p. 134),
91 "subjective decisions" (Wood *et al.* 2007, p. 810), personal viewpoints (Weston 2006),
92 value-dependency (Lawrence 2007a, p. 759) as well as intuition (Canter & Canty 1993,
93 p. 291). The process of determining significance has therefore been described as
94 manipulatable (Wood *et al.* 2007) and imprecise, context-dependent, political, and
95 complex (Lawrence 2007a). The range of adjectives seems to be an indicator for how
96 difficult significance determination is to grasp – and the inevitability of discretionary
97 judgment.

98 The clash between the importance of significance and the complexity of significance
99 determination has given rise to critical questioning of the concept (e.g. Lawrence
100 2007b), of the team determining the significance (e.g. DEAT 2002, Peterson 2010), the
101 process of determining significance (e.g. Wood et al. 2004), the lack of focus (Ross *et al.*
102 2006), and the timing and role of significance determination in practice (e.g. Nielsen et
103 al. 2005, Christensen and Kørnøv 2011). Few studies have dealt with how people in
104 practice identify significance and very few - if any - have investigated what happens
105 when SEA practitioners in their first encounter with a case try to make sense of
106 information in order to determine significance in the early phases of screening and
107 scoping. In an environmental impact assessment (EIA) context, Weston (2000) argues
108 that "[m]ost research in EIA decision making has focused on the project authorization
109 process and not the crucial decisions made at the earlier stages of screening and
110 scoping" (p. 185) and Wood (2008, p. 23) points at a "paucity of research that critically

examines and reflects upon the way in which significance is evaluated and communicated".

The few studies of significance determination practice reveal elements of how we determine significance. By studying British local authorities, Wood *et al.* (2004) divide respondents into two profiles: People either demonstrated "a smooth, gradual and incremental appraisal of significance" or demonstrated a step change response "punctuated by sharp changes in relation to the size/scale of the proposal" (pp. 1 and 13). Wood et al. furthermore show that significance determination practice had no direct relationship with government guidance thresholds. The minor importance of official thresholds and checklist is also supported by the finding that only 2% of the local authority practitioners regarded checklists as the single most effective approach in screening practice (Wood & Becker 2005, p. 358). In a study of practitioners' balancing of precaution and efficiency in EIA scoping in the UK, Snell and Cowell find a tendency of scoping issues in rather than excluding these due to the concern of legal challenges and thereby enlarging the environmental statements (Snell & Cowell 2006). The results of a quality assessment of Environmental Impact Assessment Statements (EIS), based upon both individual and group assessment, showed significant differences with group assessments being more critical than the individual (Peterson 2010). Peterson argues that that the group approach becomes an arena for outbalancing not just expertise but also subjective values and perspectives, and suggests a revision of the current assessment practice.

Besides the British findings, significant determination processes in an EA context is under-researched (Snell & Cowell 2006). We still do not know the details of what happens when practitioners or researchers are presented with some kind of action and

asked to determine whether SEA must be applied and what impacts and alternatives are significant. Insight into similar processes can be found in other fields of study and the fields of socio-psychology and cognition seem especially relevant for shedding light on the first preliminary significance determination. Within these fields, sense-making theory has gained increased importance in the last decades with its focus on how people "construct what they construct, why, and with what effects" (Weick 1995, p. 4).

Aim and Contribution

The article investigates and reflects upon how to improve EA by paying more attention to the sense-making, thus emphasising the social and cognitive elements of assessment - compared to the technical and procedural. The aim of the article is to uncover how we notice and make sense of information in order to determine significance.

In contrast to Wood *et al.*'s (2004) retrospective investigation of significance determination, the aim is to uncover the process as it unfolds – as a direct observation of how the process evolves without retrospective filtering and reasoning. For this purpose, an experiment is designed to investigate how SEA practitioners and researchers make sense of information and determine significant impacts and SEA relevance. The experiment is aimed at the very early sense-making, at what happens the first time we see a text. This focus is chosen since research shows that the initial meaning we assign to information and events can be very influential on the following process; Gawronski *et al.* (2010) refer to a large body of research that shows that people's unconscious evaluation of events can be "relatively rigid and difficult to change" (p. 683). In an EA

context, this means that our initial sense-making is important for the entire process as it unconsciously may hinder openness towards new information and other actors' opinions.

The research questions that are guiding the article are:

1. *What patterns can be found in the way SEA practitioners notice cues and frame information in their process of making sense of a strategic choice?*
2. *How do such patterns influence significance determination?*

Since significance determination is a complex process, the investigation will not find universal patterns, but tendencies in a context. The article discusses these tendencies in terms of inspiration for improving practice.

The study is a part of a research project on SEA and strategic choices in the Danish energy sector (see Lyhne 2011), and the experiment is using a hypothetical but realistic case of a strategic choice in the sector.

In the next section, the article unfolds sense-making theory and relates it to EA. We then present the design of the experiments, before setting out the findings of the research. The article concludes with reflections and ideas on how to acknowledge the sense-making taking place at the early stages of SEA.

Insight from literature on sense-making

Karl E. Weick's theory of sense-making describes human sense-making as a social process of continuously enacting events, extracting cues from these events and retrospectively making plausible stories (Weick 1995, p. 18). Sense-making literature is focused on how people make sense of stimuli; people "sort through prior cues, label them and connect them, which often result in plausible stories that are good enough to keep going" (Weick 2001, p. 237). Mental frameworks, identity and articulation are important elements in the process of reducing multiple meanings and generate a locally plausible story (Weick *et al.* 2005, p. 414), but it is not a clear-cut process. Starbuck and Milliken (1988, p. 49) argue, "people have to have numerous sensemaking frameworks that contradict each other. These numerous frameworks create plentiful interpretive opportunities - if an initial framework fails, one can try its equally plausible converse". Frames serve the function of separating signal from noise and the filtered information, Starbuck and Milliken argue, "is less accurate but, if the filtering is effective, more understandable".

In a SEA context, practitioners apply mental frameworks to organise information and inputs about impacts and alternatives and enact this sense and order back into the society through reports and technical summaries.

Equivocal situations are accompanied by equivocality of terms. Jackson and Dutton (1986, p. 34) conclude that "simple labels do not have simple meanings". Weick emphasises the inevitable inaccuracy of terms we use to describe events: "There is always a slippage between words and what they refer to. Words approximate the territory; they never map it perfectly" (Weick 1995, p. 107). This inevitable inaccuracy

in labelling and understanding what we are dealing with necessitates flexibility in the SEA process to continuously reformulate and reconsider elements like the significant impacts.

Weick describes sense-making as a process initiated when people are experiencing discrepancies and equivocality in their on-going sensing. People first search their frameworks to explain the discrepancies. These frameworks may be "Institutional constraints, organizational premises, plans, expectations, acceptable justifications, and traditions inherited from predecessors" (Weick *et al.* 2005, p. 409). If no explanation is found, they label and notice cues in order to generate plausible stories. If these stories seem to be adequate, they are retained as guidance for future action and interpretation.

The process of making sense has been studied in socio-psychological research for decades. Starbuck and Milliken (1988) refer to studies that have shown that "some stimuli are more available or more likely to attract attention than others" and "the characteristics of perceivers, including their current activities, strongly affect both the availabilities of stimuli and the abilities of stimuli to attract attention". According to Watzlawick *et al.* (1974), blind spots are found in all mental frameworks and the blind spots prevent people from solving some problems. Furthermore, Bargh (1982) argues that part of our attention to stimuli is managed by automatic and involuntary processes which "can either facilitate or inhibit active attentional processing" (p. 425).

Learning from sense-making literature, we - as EA practitioners and researchers - need to acknowledge that we cannot fully control what we notice and what we do not notice, the words we use are never accurate, and our initial interpretation may be rigid. Sense-making literature may provide the insight that is needed to better understand and improve how we read signals of importance and frame problems and opportunities (see

Woodside 2000). Although the conception and the use of 'significance' differ between sense-making and SEA literature, significance plays an important role in both fields. It is thus interesting to use sense-making theory to investigate of how test persons make sense of significance in an SEA framework and reach a decision upon what aspects are relevant to include in the assessment.

Methodology and Set-up of the Experiment

The following presentation of the experiment aims at being reproducible, so that everyone is able to follow the steps and get comparable results.

To investigate patterns of noticing and framing, the experiment is constituted by a case text and a procedure for observing test persons' making sense of this text. The test persons are asked to speak out loud and underline of words and sentences while reading a text.

The experiment procedure is presented with reference to sense-making literature in table 1. The procedure provides for access to the on-going sense-making, judgement of significance as well as occasions for test persons' reflection on the process (steps 5, 6, and 8).

Learning from Weick's recipe of "How can I know what I think until I hear what I say?" a confrontation of interesting statements made by the test persons is added to the experiment. The intention of this confrontation is to make the test person elaborate on interesting elements such as mental frameworks or individual sense-making processes. The number of confrontations per test person is limited to three.

244 Table 1. The steps in the experiment process and their relation to sense-making
245 literature.

Step	**Task**	**Sense-making literature**
1	A SEA practitioner [A] reads a text and during the reading underlines and comments upon what is especially interesting/useful for understanding (interruptions for clarification if needed)	Noticing and labelling of information in the enactment of the case.
2	[A] is asked to explain what she/he noticed (retell the text). ([A] is not informed of the following stages to avoid dominance of interpretation at this stage)	Retrospective account of the noticing of cues, labelling of information and potential beginning of a story of what the case is about.
3	[A] is asked to determine possible significant environmental aspects	Creating stories of what is significant.
4	[A] is asked how she/he would go on: Is EA needed, what analyses, alternatives and measures are especially important?	Creating stories by searching for experience with relevant incidents.
5	[A] is asked of her/his idea about why she/he noticed the specific cues and whether the noticing had a personal touch	Retrospective reflection on the noticing process by the test person (steps 1 and 2)
6	[A] is asked of her/his idea about why she/he pointed at the specific significant environmental aspects	Retrospective reflection on the stories created (steps 1 and 4)
7	Before concluding, [A] re-reads text to confirm his/her understanding (with a new pen colour)	A test for a changed perceptual framework due to the thoughts in steps 4-6 and more detailed knowledge about the experiment

8	[A] is asked about potential changes in understanding caused by the second reading in step 7.	Retrospective reflection on potential changes and the reasons for these.
9	[A] is confronted with statements uttered during the experiment.	Confrontation of statements may give reactions in line with Weick's recipe of "How can I know what I think until I hear what I say?"
10	As a recapitulation [A] is asked about reflections on and learning in the experiment.	It may give indications of how the test persons think about their sense-making process

246

247

248 ***Experiment Set-up***

249 The case text has characteristics similar to the coming years of strategic energy planning
250 in Denmark, e.g. with its point of departure in renewable energy targets and new
251 technologies. The case is formulated so that test persons most likely will recognise
252 elements without being familiar with the situation.

253 The set-up of the experiment is:

254 - A number of EA/SEA researchers and practitioners are test persons ('variable' mental
255 frameworks). These are selected to reach a variety in the test persons' backgrounds
256 and occupational positions, see considerations below.

257 - Each test person does the experiment in isolation and the interviewers only interact
258 during the test persons' sense-making of the information if clarification is needed.

- Before the experiment starts, the aim, duration and content of the study are explained to the test persons. They are instructed to continuously speak out loud, underline words in the text, which they regard as important for understanding, and explain thoughts and underlining during the reading of the text. To enhance trust and informality, it is emphasised to the test persons that their performance will not be graded or evaluated and that there are no trick questions.
- The process is audio recorded, subsequently transcribed, and given to the test persons for commenting.

Due to resource limitations, the number of test persons for this study is set to nine. The selection of test persons has aimed at a variety in job positions, expertise in relation to the information/professional field of expertise, and educational backgrounds, see table 2 below.

Table 2: Test persons in the experiment.

	Non or little familiarity with SEA	Very familiar with SEA
Very familiar with the energy case	Lotte, Anynomous, Christian	Per, Stine,
Little familiar with the energy case	Kristian	Martin, Sanne, Anja

The variety is intended to make differences in mental frameworks more explicit. Furthermore, the variety is intended to reflect that environment professionals are not the only ones who conduct SEA screening and scoping. In practice, the selection of test persons has resulted in a distribution of four university-based SEA researchers and practitioners, one consultancy-based SEA practitioner, one university-based energy

279 planner, one municipality-based energy planner, one company energy planner, and one
280 university-based urban planner.

281

282 ***The Case Text***

283 The case, which the test persons are presented with, is shown in figure 1. The idea
284 behind the text is to present a strategic choice related to a societal need in a way that
285 resemble the sparse information faced by SEA practitioners in the early stage of SEA
286 processes. Information provided at this stage is likely to be uncertain, ambiguous and
287 flawed when it comes to the knowledge about the consequences of the strategic choices.
288 Therefore, the aim of the fictive case text is not to be consistent or technically correct,
289 but potentially problematic and thought provoking. For instance, the need for storage is
290 specified as a single, large figure without providing calculations or references. A variety
291 in content is sought so that it involves technical descriptions, a table with numbers, as
292 well as concrete examples of implications.

293

Strategic choice of storage of renewable energy

The high share of renewable energy (like sun, wind, and wave energy) in the future energy system makes it necessary to store large amounts of energy. 100 % renewable energy is discussed, of which windmills must constitute at least half. The periods between substantial wind speeds may last for weeks and sudden changes in weather can impact the stability of the electricity system. Therefore, the need for storage involves long-term storage and storage technologies with a short reaction time.

The need for storage has been estimated on the basis of the longest period with surplus of wind energy which amounts to 100,000 MWh. The need is, however, dependent on other initiatives within intelligent control of the electricity network, consumer behaviour, development of other storage technologies, etc.

A plan for the future energy system involves a strategic choice of storage possibilities. The Government's experts have determined that three technologies will be relevant in Denmark:

- "Compressed Air Energy Storage" (CAES) in which energy is stored as compressed air below soil layers of various depths. Turbines convert the pressure into electricity.
- "Energy islands" in which energy is stored by pumping up water into big reservoirs. The technology utilises the difference in potential energy between two water reservoirs of different heights, and energy is obtained by use of turbines.
- "Hydrogen storage" in which energy is stored by splitting water into hydrogen (and oxygen). Energy is obtained by fuel cells.

All possibilities have been tested and discussed among specialists. Different characteristics of the three technologies are specified in the table:

Storage technology	**Storage period**		**Capacity per facility**	**Efficiency**	**Investment cost**
	[Sec]	[Month]	[MW]	[%]	[$/kWh]
CAES	X	X	100-1000	75-80	Approx. 100
Energy islands	X	X	100-	80-85	Approx. 100
Hydrogen storage	X	X	10-1000	60	Approx. 500

Geographically, the technologies are different. The energy which can be stored in energy islands depends on the area and the height of the plants. Among others, a proposal has been made to close the Limfjord in one end and put up turbines for utilising height differences, or to establish wind power plants on a ring of embankment, creating a short distance between production and storage of energy. CAES and hydrogen can be established as gas storages in underground soil layers, but a proposal to use artificial air cushions just below surface has also been made. Underground storage of air and hydrogen requires only minor facilities on the surface, and there are several places in Denmark with suitable underground.

In relation to other sectors, hydrogen storage involves a dimension of being storage for hydrogen cars. The

existing natural gas network may furthermore be relevant as a transport network. In terms of research, Denmark is a frontrunner in the development of fuel cells, and the area is mentioned as a possible new wind energy adventure. The oxygen which is split from the water with the hydrogen can be utilised by the industry. The energy islands can be combined with dams and road connections, and a dam across for instance Horsens Fjord would create a large reservoir.

Figure 1: The case text presented to the test persons.

Research Findings

The findings are presented and discussed in the following subsections. Since the number of test persons is limited to nine, the findings are indicative. The most interesting indications for EA practice are:

1. There are substantial differences in noticing and significance determination between first and second readings of the SEA text.
2. Personal and professional experience can only partly explain the difference in significance determination.
3. Framing of the case varies depending on familiarity and practical SEA experience: The older and/or more practically experienced persons, the faster and firmer framing.

The following sections are structured by the two research questions outlined in section 1.2.

Patterns in noticing and framing

The experiment provides an empirical demonstration of the variety of how and when test persons' notice and frame the case. The most prominent findings are presented below.

Noticing and Framing is Approached Differently

The experiment shows a tendency of the first reading being primarily oriented towards the factual details and examples mentioned in the text, whereas the second reading is primarily oriented towards establishing the context and a critical stance towards the text. In the first reading, the underlining thus concerns e.g. the specific technologies presented (e.g. "Compressed air energy storage") and the concrete examples of the implementation ("Closing the Limfjord in one end"). In the second reading, aspects like the strategic context (e.g. "store large amounts of energy") and the strategic alternatives ("intelligent control of electricity system") are underlined.

Four of the test persons show awareness of their approach to the case description. Per comments that "by the first reading I try to establish the structure and by the second I patch it up, where I have overlooked something or maybe redefine something, because you would see that some other things go on in the text". Christian explains his way of approaching the text: "Then I have some specific elements that I look for…I would not say that I memorise, but I remember the essence - maybe remembering the content more than the meaning of the text. Also because when the text is processed several times, it may be that it is another meaning that you make of the text than the first time you read it through".

Patterns in the process of Making Sense of Aspects

The experiment shows differences in how the test persons are making sense of aspects. Stine continuously puts up questions for a range of elements, which she is not familiar with, and points at a range of elements, she would have to investigate more in detail. Besides experiences and knowledge, the experiment also indicates other influential parameters:

- *Talking out loud triggers sense-making*. Kristian comments that his own speaking about alternatives and impacts made him notice the descriptions of initiatives and consequences in the text in the second reading. In a similar vein, Anja comments: "I am aware of it [the information], but when I have to express it, you also become more attentive to it".

- *Concrete examples are helpful.* Kristian especially notices the concrete examples in the text. On the closing of the Limfjord he comments: "It is a concrete proposal for a solution, which actually gives a better picture of what it is all about… If I was to remember something from this case in two weeks, it is probably that".

- *'Shocks' are remembered.* The closing of the Limfjord resembles a 'shock' to Lotte's mental frameworks: "Closing the Fjord! That is like "okay!" I especially notice that one, because that has indeed an environmental impact… It is absolutely absurd!"

- *Accessibility to numbers – compared to written text – varies.* The different types of information in the text clearly influence what the test persons notice. Especially the numbers in the table are less accessible to some of the test persons. Anja skips the table and explains: "Then there is such a typical engineer table, and then I think, "That is a bit boring and skip it". […] I actually also skipped the table the second

time and I did actually not notice that I did so". The unawareness indicates the importance of the structures Anja imposed on the text in the first reading.

- *Local knowledge plays a role.* Identity and local relations seems to play a role in what the persons relate to. Asked about unique aspects in her noticing, Sanne points at her relation to Aalborg, close to the Limfjord: "I am, after all, a local. It is not sure that a person from Zealand [other part of Denmark] would think like that".

Experiences guide Critical Stance

In the second reading, the underlining reveals, as opposed to the first reading, a critical position towards e.g. the strategic choice, the size of the need, government experts and the technologies put forward. As an example, Stine comments: "When it is this strategic level, I think it would be relevant to know the premises in terms of the projections and the expectations to the development". The difference in critical stance between first and second readings is explicitly reflected on by Martin: "What I do in the beginning is actually that I accept the premise about the future electricity system, which makes it necessary to store big amounts of energy. … Others may say, "We need a discussion about this, before I go on"".

The experiment shows a tendency for critical stances to depend on the professional background, so that energy planners are critical towards the correctness of the energy problem and solutions, whereas the environmental managers are critical towards the environmental implications and the need for the energy infrastructure.

Feelings and Intuition are Influential

Further, the experiment reveals some underlining and significance determination which cannot be rationally explained by the test persons. Instead, the test persons implicitly refer to ‘feelings’ or 'intuitions'. Martin describes his choice of what is important as a feeling of what is useful; confronted with the meaning of numbers, he argues: "it is not something that I feel in the moment that I have any use for”. In such cases, noticing thus becomes a guess - a "feeling" - rather than a rational exercise. Lotte does similar non-rational underlining: "Now I underline that wind mills must constitute half of it. I do not know why I did it, but I did".

How we frame the Case is related to who we are and what we do

To explain their framing of the case text, Stine and Kristian explicitly refer to their profession; Lotte refers to the projects she is working on at the time of the experiment; Per and Anonymous relate to their experience and professional opinions. Thus, the test persons' familiarity with the energy sector and the familiarity with preparing an assessment seem to be two important dimensions of when and how significance is framed. Table 3 suggests four personal profiles of significance determination within these two dimensions.

Table 3: Profiles within the dimensions of familiarity with preparing SEA and familiarity with the energy case indicated by the experiment.

	No or low level of familiarity with SEA	High level of familiarity with SEA

High level of familiarity with the energy case	**Relating** (Lotte, Anonymous, Christian)	**Settling** (Per, Stine)
Low level of familiarity with the energy case	**Seeking** (Kristian)	**Arranging** (Martin, Sanne, Anja)

The 'relating' profile found several associations and potentials in the energy case without a certain quick frame on what should be assessed: As an example, Lotte relates cues in the text with a number of experiences she has gained in her profession. The 'seeking' profile recognised few elements in the text and did not identify a specific frame for understanding the case: As an example, Kristian explicitly stated that he emphasised the implementation examples, because they appeared 'funny' to him. The test persons familiar with similar cases and with preparing SEA were quick to settle the case in terms of what it was about and how to proceed. These persons are grouped in a 'settling' profile. The 'arranging' profile found aspects to assess, but did not have the technical insight to develop a specific frame for the energy case.

The patterns' influence on significance determination

The experiment shows that the framing of the case is not a straightforward and linear process and the influence vary over time: Noticing 'storage', Anja initially suggests that the case is about carbon capture and storage. In line with Starbuck and Milliken's "if an initial framework fails, one can try its equally plausible converse", she quickly realises its incorrectness and instead suggests an energy storage framing of the case.

418 The influence of the test persons' framing on their significance determination is
419 outlined in table 4. The findings indicate that test persons' framings of the text are
420 highly influential on their judgement of impacts, alternatives, and need for SEA.

421

422 Table 4: Test persons' dominant framings of the case and their influence on significance
423 determination.

Person	**Framing**	**Influence on significance determination**	**Time of expression**
Per	Complex systems cause conflicts and are not needed - and nature is not the problem.	No doubt about need for application of SEA. Focus on nature and land-use in terms of impacts. Focus on low-tech alternatives.	1 min.
Stine	How to get a smooth authority approval process	SEA not automatically necessary, but depending on authorities	1 min.
Christian	Societal relevance of the technologies	SEA should have been done before delimiting to three technologies	1 min.
Anonymous	Inadequate solutions to energy system planning	Critical stance on the choice. Arguing for a range of alternatives	3 min.
Sanne	Initiatives are unpopular among locals	Focus on impacts on local citizens	5 min.
Lotte	Synergies' potential	Positive potential among significant effects	7 min.
Martin	Valid determination of technologies	Initial refraining from suggesting alternatives	14 min.
Kristian	A planning task	A spatial focus in terms of significant impacts	14 min.

Anja	The big picture	(Not noticeable)	22 min.

When we frame the Case varies considerably

As seen from table 4, some test persons develop a specific framing on what the text is about within few minutes, whereas other test persons never seem to create an overall framing. The two test persons with an age over 50 and a professorship were quick (Anonymous and Per within three minutes) to assign a specific frame to the text. Also the EA practitioners from the consultancy company and the Danish TSO quickly assigned a specific framing to the text. Relevant experience thus seems to lead to quick framings of the text.

Quick Framings reduce Openness to remaining Information

The energy researcher (Anonymous) comments on the text that "I immediately see what this is all about. And then you may say that I have been trapped by my first impression". Anonymous defends his framing: "It is obdurate, however, it is reasoned obduracy… There is no reason to use more time on this; it is bad solutions". Anonymous and Per's quick framings reduce irrelevant stimuli, whereby more attention can be given to the impacts and alternatives that their framings consider as relevant. Automatic and involuntary processes seem to work the other way around for Kristian in noticing certain elements as funny, since they facilitate active attention to these elements.

The experiment findings indicate that a high level of familiarity with the energy case may be both a pitfall and a benefit in terms of significance determination: People that are very familiar with the energy case make a fast framing that precludes information

and at the same time focus their attention on what is (assumed to be) the most important elements. Similarly, a low level of familiarity may mean a more unstructured and slow process, but at the same time a critical stance on the basics of the provided information and openness towards other perspectives on the problem.

Conclusion and Perspectives

In this article we have proposed that sense-making is a central activity in significance determination in both screening and scoping stages of SEA. Sense-making theory provides a theoretical and methodological approach to conceptualising and investigating sense-making involved in test persons' determination of significance.

The experimental research has, due to the low number of test persons, no ambition of making comprehensive and general statements about sense-making in SEA processes. The research is meant as a conceptual and empirical input to the understanding of the social processes that take place initially and continually during the SEA process.

The experiment and findings supplement ideas and concepts within decision-making. Kørnøv and Thissen (2000) disputed the idea that 'more information leads to better significance determination' in SEA, and the experiment shows instances where the test person developed a firm frame in the very beginning of the reading of the case regardless of the remaining information. Simon (1947) proposed the idea of 'satisficing' and the experiment shows instances in which test persons are satisficing their need for information in order to get on with the process.

The article furthermore underlines that the individual engaging with the SEA text is not objective and passive, but is a sense-*maker*. The text is not 'transmitted' and received

fully by the individual. Instead we experience the test persons as constructing stories of meaning, which involves ‘negotiations’ between the SEA text and the individual in the reading process and even ‘re-creation’ of elements in the text.

As a consequence of the findings, sense-making is a mandate of significance determination. The question is then how we can approach our sense-making in a way that is beneficial for significance determination processes? How can we use this insight to develop a better appreciation of the link between information and significance determination? Three suggestions are provided in the following: Recognition of and reflection upon own sense-making, frame awareness in team-setting, and reconsideration of guidance and good governance.

Recognition of and Reflection on Sense-making

As presented, the experiment shows a tendency of test persons being more critical during the second by questioning premises and the intention of the text. Wood and Becker (2005) propose a frame-reflective approach to counteract similar problems: "To limit the problems associated with screening errors, further guidance should seek to raise awareness of the existence of frames amongst practitioners and encourage a frame-reflective approach to screening decision making" (p. 367). They picture "frame-reflective practitioners" who actively question the basis of their assumptions and the subsequent implications, but they do further advise how it can be done in practice.

Insight into how we make sense like the insight the test persons gained through the experiment may be a means to be aware of assumptions. Similar to the experiment, an open dialogue with colleagues based on a comparison of what is noticed and what is

found significant in a given case may provide a basis for increasing our awareness of our blind spots and rigid framings.

Team-setting for Screening and Scoping

The findings indicate the importance of setting a team with different profiles and different degrees of familiarity with the case. Furthermore, the findings indicate that differences in background, age and experience are needed if we want a more heterogeneous and holistic perception of the case. In this way, the findings are in line with Peterson's (2010) arguments on group-based significance determination. Awareness of the frames we employ in team-setting may thus make it possible to reduce 'blind spots' and enhance a broader perspective on impacts and alternatives. Insight into frames in an organisation may therefore be important knowledge when organising SEA processes and aiming at better quality of the SEA process.

The different levels of sophistication of the framings identified in the experiment calls for consideration of familiarity to the case when setting the team. The higher level of sophistication plays an important role in distinguishing between significant and non-significant impacts and alternatives, and sophisticated framings may thus be a necessity to avoid that too many impacts and alternatives are scoped in rather than excluded. At the same time, less familiarity with the case may be needed to question what more firm framings take for granted. The significance determination may thus in practice benefit from openness at different levels of sophistication, so that both basic assumptions and advanced issues are critically questioned.

It may similarly be relevant to consider sense-making processes in the public consultation. DEAT (2002) argues that making the process of significance determination “more explicit, open to comment and public input” would be an improvement of the practice. Public consultation is an opportunity to bring a large number of mental frames into the screening and scoping process and careful consideration to the sense-making process may provide an opportunity to articulate elements that are not noticed or not labelled.

Guidance and good Governance

Guidance on SEA involves a range of checklists on screening and scoping based on targets and thresholds. The limited reference of thresholds in the test persons' sense-making indicates that thresholds do not play an explicit role at this early stage. In line with the study Wood and Becker (2005) the experiment findings indicate that experience seems to play a far larger role. Thresholds and targets may rather be used as retrospective legitimacy for the choices made during meaning creation.

The experiment also suggests a discussion of good governance. As an example, the IAIA best practice principles state, "the [EA] process should result in full consideration of all relevant information on the affected environment, of proposed alternatives and their impacts" (IAIA 1999). The experiment findings suggest a re-consideration of such formulations, as the meaning of 'full consideration', 'all relevant information', and 'affected environment' differs from person to person and from profile to profile. To acknowledge the constructionism and complexity inherent in sense-making, the best

practice principle could instead focus on the openness and ways of interaction during the process.

Overall, the perspectives point at a need to notice and recognise significance determination, have conversations in interactions about its nature and role, and make significance determination an object of both social and institutional learning.

The experiment is made on an individual basis, whereas sense making in practice is taking place in a social interaction between people. The individual basis is chosen to allow for an investigation of the individual's enactment and bracketing of events, which would be difficult to investigate in an experiment with social interaction; if two or more people were brought together, it would be impossible to concurrently access their thoughts as they unfold. An experiment with social interaction is a very relevant extension to the individual experiment and such an extension may reveal how the individuals' enactment and bracketing transform in a social setting.

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