Outreaching, Outsourcing, and Disembedding:

How Offshore Wind Scientists Consider Their Engagement with Society[1]

Sara Heidenreich
Department of Interdisciplinary Studies of Culture
NTNU Norwegian University of Science and Technology
7491 Trondheim, Norway
Email: sara.heidenreich@outlook.com

Abstract

The role of the individual scientist as a socialization agent (i.e. an actor who contributes to embedding technology into society) is increasingly emphasized in science policy. This paper analyzes offshore wind scientists' narratives about science-technology-society relations and their role in them. It particularly focuses on the nuanced and detailed reasons that scientists give for their level of engagement with society. The analysis is based on semi-structured individual and focus group interviews with 35 scientists. It finds a diversity of narratives related to the questions of whether socialization of technology is needed and which approaches to socialization scientists should pursue. The six narratives identified are: (1) upstream engagement, (2) design against resistance, (3) the outreaching scientist, (4) the difficulty of outreach, (5) the outsourcing scientist, and (6) disembedded development of technology. Despite the importance attributed to scientists for the socialization of science and technology, most interviewed scientists did not embrace their role as socialization agent. Based on the scientists' narratives, the paper argues that we should rethink both *who* should be responsible for socialization and *what* should be the object of sciences' engagement with society.

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Introduction

Over the past decades, public authorities have shown concern over public resistance to new technologies and a lack of trust in science. Concurrently, science communication has largely been viewed as a "'technical fix' to impose social consensus" (Bucchi 2013, 908). Policymakers have increasingly expected scientists to engage with society and contribute to science communication related to the technologies they develop (Neresini and Bucchi 2011). Based on interviews, this paper investigates how offshore wind scientists in Norway account for their engagement with society. In doing so, it explores how an ambiguous context of requirements and motives may affect the socialization efforts of scientists to embed a new technology—offshore wind—in society (Bijker and d'Andrea 2009; Sørensen 2015).

An important part of this context is the strong presence of science-society relations in the science policy agendas on both national and European levels. Felt and colleagues (2007, 13) observe that public engagement "has become an almost obligatory passage point for science policy." The Commission's Science in Society (SiS) initiative, for example, claims, "[n]ow more than ever, science must engage with us, and we must engage with science" (European Commission n.d.). The European Charter for Researchers emphasizes the responsibility of the individual scientists to disseminate their research to society to increase public understanding of science, thus making engagement an ethical requirement as well (European Commission 2005).

In Norway, where this study has been undertaken, science policy white papers highlight the importance of science communication for increasing public knowledge about science and for

facilitating public debate and participation, particularly in the context of emerging technologies (St.meld.nr.18 2012-2013; St.meld.nr.20 2004-2005; St.meld.nr.30 2008-2009). Research institutions are in principle obliged to disseminate. This expectation that scientists shall engage with the public is also expressed by university leadership. For example, Rector of NTNU-Norwegian University of Science and Technology (where many of the scientists interviewed for this paper were employed) stated, "We wish to stimulate more and better science communication. To share knowledge with the society around us is a central part of our social mission. […] The responsibility for communication lies with the individual researcher."[i] The national guidelines for research ethics in science and technology also emphasize this responsibility.[ii]

On the other hand, the focus on science communication and scientists' role in efforts to embed new science and technology in society coincides with academic institutions being subjected to new public management (NPM) logic, characterized by a focus on efficiency, competition, and excellence, and enforced through quantitative measurement of performance (Lamont 2012; Holden 2015). As Horst (2013, 760) rightly points out, science communication is a "representati[on] of science and its organizations […] and enacting particular understandings of what science, scientific organizations, and scientists are and should be." The institutional context scientists operate in has implications for their understanding of their role in science-society relations, and this context is experienced as characterized by a tension between potentially contradictory demands (Felt et al. 2016).

Another relevant aspect of the context of scientists' engagement with society is the particular situation of the science or technology they develop. Offshore wind technology in Norway encountered, when the interviews were undertaken, ambiguity and uncertainty regarding its future implementation. This may have affected the scientists' motivation in ambiguous ways.

On the one hand, several issues could be seen to require more communication efforts. First, offshore wind faced strong competition from other sustainable energy sources. Nearly 100 percent of electricity production in Norway is from hydropower. This sets high standards for environmental friendliness and cost efficiency. Communication about offshore wind must argue that this energy source can also meet such standards. Second, the offshore production of oil and gas was extremely profitable, which gave this industry the upper hand when competing with offshore wind for resources and work force. The offshore wind industry has considerable overlap with oil and gas in terms of the expertise needed and "the structure and organization of value and supply chains" (Hansen and Steen 2015, 8). The existing oil and gas work force, technologies, suppliers and procedures could be transferred to a significant extent to the offshore wind industry. Thus, it would seem advantageous to argue that the offshore wind industry could have a profitable future. Third, offshore wind is an emerging technology of renewable energy that promises minimal interference with the public in terms of visibility. Potentially, this represents a strong, favorable argument to enlist public support for funding research and implementation. A development of offshore wind in Norway is dependent on financial support due to high initial investment costs; hence, strong arguments in favor of such support are needed.

On the other hand, offshore wind energy was enthusiastically described as "Norway's new oil"[iii] and "Norway's next industrial adventure"[iv] by two subsequent Ministers of Petroleum and Energy. This could be interpreted as a kind of political support that reduced the need for scientists to communicate.

Accordingly, the context of offshore wind research at the time of the interviews was quite ambiguous. Seemingly, some features would provide positive motivation to engage in communicating this research, like the policy and ethical requirements and the somewhat challenging future situation regarding funding. Compared to onshore wind and solar power,

offshore wind technology also provided potentially effective arguments that future installations would be out of sight. On the other hand, political support seemed to be in place. In addition, NPM and the focus of research institutions to reach measurable goals with respect to output could be expected to produce a more stressful work situation where scientists would be pressed for time and so would prioritize scientific publication over public engagement.

This paper examines how offshore wind scientists accounted for their navigation of these tensions with respect to their participation in science communication and other public engagement activities. It focuses on the scientists' narratives about science-society relations to explore an expected diversity in ways that the interviewed scientists interpreted the context of their work and how they negotiated their level of engagement with society.

From science communication to socialization: Scientists' engagement with society

Following the policy focus on science-society relations, the scientific community is increasingly recognizing its role in science communication and public engagement (Barnett et al. 2012; Burchell et al. 2009; Dudo 2012; Walker et al. 2010). Objectives for engaging with society are manifold and complex, ranging from democratizing science to preventing negative public attitudes and increasing research funding. With respect to offshore wind power, the latter two objectives are most relevant.

Despite this increased awareness, many scientists are hesitant to engage citizens, policy-makers, news media, NGOs, interest groups, and others. Studies find that scientists explain this hesitation as the result of their limited capacity for work, which includes both institutional constraints such as an exclusive focus on academic publications, a lack of time and reward for public engagement, and a limited ability to communicate research (Felt et al. 2013b).

Furthermore, involvement in public engagement activities is not perceived as suitable for all scientists (Pearson 2001), and it is sometimes thought to have negative effects on reputation and career progression (Johnson et al. 2014; McDaid 2008). Moreover, scientists construct science communication as difficult and dangerous (Davies 2008); they believe it involves "getting out of their comfort zone and working in unfamiliar territory" (McDaid 2008, 28).

However, scientists' reluctance to engage is not the whole story. Several studies address the factors influencing scientists' likelihood to engage with actors in society. Poliakoff and Webb (2007), for example, find that scientists' intentions to engage or not were influenced by their attitudes towards public engagement, the extent of their previous engagement activities, the perceived extent of their colleagues' activities, and their own perceived capabilities. Dudo (2012, 491) claims that such intentions are influenced by "a scientist's status, level of PCST [public communication of science and technology] autonomy, use of print and online media, attitude, level of communication training, perceived behavioral control, normative beliefs, and perceived level of medialization among colleagues." However, gender and extrinsic rewards did not affect scientists' level of public communication. Also, Besley (2015) claims that factors such as scientists' views of public engagement, social norms, and institutional contexts influence scientists' communication activities rather than demographic factors such as gender and age. Johnson and colleagues (2014), in contrast, find that gender does indeed matter and argue that women scientists are often extra motivated to engage in science outreach in order to attract more women to science. Further, increased internationalization affects scientists' public engagement in terms of both language problems and the potential lack of a shared cultural frame of reference among scientists who were socialized in countries other than the one in which they currently work (Horst 2013).

To summarize, most research on scientists' engagement with society is quantitative, focusing on the various factors influencing scientists' activities (Johnson et al. 2014). The resulting

picture is unclear, and uncertainty remains about what drives scientists' engagement (Besley 2015). I interpret this situation with respect to previous research as support of the suggestion about ambivalence in the introduction. Hence, the paper does not aim to resolve the partly contradictory findings. My analysis of scientists' narratives, focusing on detailed and nuanced reasoning around their role in science communication and public engagement activities, is an effort to explore if the ambivalent findings from previous research actually represent the ambivalence of scientists themselves. Alternatively, is it the case that the interviewed offshore wind scientists experience that the context of their work required a more active role on their part, since this is necessary for future funding and implementation?

Furthermore, whether active or hesitant, there is the issue of what scientists think about *how* science communication and public engagement should be carried out. Previous research has developed different typologies of approaches to science-society relations (Palmer and Schibeci 2014). Callon (1999), for example, differentiates between "the public education model," "the public debate model," and "the co-production of knowledge model." Similarly, Rowe and Frewer (2005) distinguish between "public communication," "public consultation," and "public participation." Stilgoe and Wilsdon (2009) introduce three phases to describe how scientists engagement with the public has developed (phase 1: public understanding of science; phase 2: from deficit to dialogue; and phase 3: upstream engagement), while Irwin (2008) presents the "deficit model" and "public engagement and dialogue" as different but co-existing orders of thinking, emphasizing that often different approaches are present simultaneously and in hybrid forms. Common to these typologies is a classification of approaches to science communication/public engagement according to the degree of public participation, from passive reception of information to active co-production of knowledge.

The less participative approaches (e.g., public education or deficit models), view scientific and lay knowledge as separate spheres. Scientific knowledge is commonly presented as objective,

factual, and value-free truth that is superior to other forms of knowledge (Holliman and Jensen 2009; Irwin 2008), while the public is portrayed as ignorant and skeptical of science and technology. Hence, the objective for engaging with the public is to eliminate deficits in their knowledge by establishing trust in science and preventing resistance to new technologies (Callon 1999; Stilgoe and Wilsdon 2009). Scientists are understood to be public educators in a one-way relation.

These approaches have been widely criticized for overlooking that lay people actively debate, negotiate, interpret, reframe, make sense of, and deal with scientific knowledge, instead of passively receiving it, and that lay knowledge is not inferior to scientific knowledge, but qualitatively different. This leads to a promotion of more dialogic approaches, which emphasize the value of lay people's participation in debates about science and focus on a two-way relation between science and society (Irwin and Wynne 1996). Although lay knowledge is valued, these dialogic approaches regard scientific and lay knowledge as separate spheres.

The most participative approaches represent efforts to overcome this separation between scientific and lay knowledge. Public participation is conceptualized not solely as a response to science, but as active engagement through participation in decision making, policymaking, and knowledge production (Bucchi and Neresini 2008). The concept of "upstream engagement," for example, refers to an early engagement of publics in science and technology development to enable "scientists to reflect on the social and ethical dimensions of their work" (Stilgoe and Wilsdon 2009, 22).

Still, a wide range of studies indicates that the deficit model is a dominant construction of science-society relations among scientists (see, e.g., Barnett et al. 2012; Besley and Nisbet 2013; Burningham et al. 2007; Davies 2008; Horst 2013). Davies (2008), for example, observes that scientists construct science communication as education of lay people. Also, Tøsse (2013)

notes how climate scientists aim to educate the public through a communication strategy characterized by political robustness as scientists "need to cope with a communication situation characterized by social, economic, and political conflict" (Tøsse 2013, 50). Besley and Nisbet (2013) find that scientists often blame the news media for the public's misunderstandings and lack of knowledge.

Hence, most scientists seem to adhere to the deficit model as their standard model of the "imagined lay person" (Maranta et al. 2003). This functional construct may be performative and influence technology design and the way scientists engage with their publics. Burchell (2007), for example, shows how scientists legitimated their actions and beliefs by claiming that they were based on objective methods and grounded in natural conditions, in contrast to their characterization of society's views "as based on a mixture of subjective and personal inclinations" (Burchell 2007, 159). Such othering of publics is often carried out by characterizing them as emotional and irrational (Cook et al. 2004). Further, Walker and colleagues (2010) find that, with respect to renewable energy actors, "there was significant resistance to pursuing the possibility of 'the public' as being an 'engineering issue'" (Walker et al. 2010, 938).

Clearly, much research shows that the public education or deficit model is a common construction of how scientists should relate to their publics. However, some studies indicate that scientists question the need for public education. Burningham and colleagues (2007) refer to a way of thinking about the public that they describe as "they don't know, but why should they?" Similarly, Besley and Nisbet (2013, 648) report that "scientists agree the public knows too little about science but disagree on whether this presents a problem."

Participatory approaches tend to be used by only a minority of scientists (Besley and Nisbet, 2013; Davies, 2008; Holliman and Jensen 2009). Davies (2008), for example, finds that a few

of the scientists studied depicted publics as complex and communication as a debate. Burchell and colleagues (2009) argue that biological scientists increasingly construct publics as "intelligent, supportive and scientifically capable publics" (Burchell et al. 2009, 6). Martín-Sempere and colleagues (2008) also observe that scientists leaned towards a dialogic model of public engagement. Thus, in some cases there is evidence for a move from deficit to more participative approaches. These participative approaches to engagement with the publics of science are also, as we have seen, increasingly promoted in science policy (Felt et al. 2013a).

To summarize, previous research suggests that scientists in their engagement with their publics may fall into three broad categories: (1) public education or deficit thinking, (2) dialogic, participative approaches, and (3) engagement is not really needed. The context of offshore wind in Norway should provide pressure for scientists to enact option 2, and at least not option 3. In the rest of the paper, I will investigate this further.

Science policy and public discourse tend to reduce science-society relations to science communication. Felt and colleagues (2013a, 8) argue that we should broaden this understanding and "think of science-society relations in more comprehensive ways." Further, they argue that "the multiplicity of simultaneous engagements between science and society on different levels, in different settings and involving different actors" (ibid., 9) should be acknowledged. In its approach, this paper follows this call by drawing on the notion of "socialization of scientific and technological research" (Bijker and d'Andrea 2009). Socialization comprises any "processes involved in the production, use and circulation of scientific research and its products in an inseparable connection with its social context" (ibid., 62). The socialization of a technology refers to processes of embedding this technology into society. Bijker and d'Andrea (2009) identify six areas of socialization: scientific practices, scientific mediation, scientific communication, evaluation, governance, and innovation. Further, they introduce the concept of "socialization agent" to describe all actors "involved in

activities that somehow contribute to the social embedding of science and technology" (ibid., 72). Arguably, scientists (though not exclusively) should be important socialization agents. According to the broad definitions of "socialization" and "socialization agent," scientists may pursue many different approaches to science-society relations.

This paper studies the narratives of offshore wind scientists when inquired about engagement in science-society relationship and socialization of offshore wind technology. In particular, the concept of socialization invites a transgression of the widespread strict focus in the literature on science communication and the attribution of every scientist with the responsibility to engage with society. By considering scientists' narratives of how they consider their role in society, the paper intends to broaden our understanding of scientists' potentially ambiguous engagement with society.

Method

This paper is based on 22 individual and 4 focus group interviews with 35 scientists associated with two research centers focused on offshore wind energy in Norway: NOWITECH and NORCOWE. The 35 scientists represented a large proportion of the offshore wind scientists in Norway. Their positions ranged from PhD candidate to professor. The majority were employed by universities; however, a few worked for other research institutions. Their academic fields ranged from electrical and mechanical engineering to marine technology and meteorology. The interviews, which lasted between 35 and 80 minutes, were transcribed and anonymized. Interviewees, of which 20 were Norwegian and 15 were of other nationalities, were given pseudonyms.

Most interviewees, in focus groups as well as in individual interviews, did not tell a single unambiguous story about science-society relations. Rather, interview accounts were messy and vague with different, sometimes contradictory, constructions. The focus on narratives allowed me to address complex and ambiguous issues and emphasize ambivalences and contradictions in the scientists' understanding of science-society relations as well as the situatedness and context of the narratives (Coffey and Atkinson 1996).

Narratives require linkages and relations between elements (Polkinghorne 1995). Hence, I carried out a thematic narrative analysis that regarded the interviews as a whole and focused on series of arguments. My aim was to detect narratives about science-society relations within the interviews, rather than to attribute a single narrative to a particular scientist. For a richer presentation of the narratives, and in accordance with Polkinghorne's (1995) understanding of narrative analysis as a movement from elements to story, I synthesized the narratives from different interviews. In the following sections, I present six narratives of offshore wind scientists' understanding of science-society relations and their role in such relations, starting with the narratives of most participative approaches.

The narrative of upstream engagement

Participatory approaches to science-society relations correspond with current developments in science policy and theoretical approaches to public engagement with science, and are often referred to normatively as the "best" way of socializing science and technology. However, in accordance with previous studies, participatory constructions of science-society relations were clearly a minority in the interview material.

Two of the interviewed scientists advocated an engagement with society that could be described as upstream engagement—an involvement of publics in the early stages of technology development. Research scientist Holm considered upstream engagement a useful strategy to gain acceptance from relevant stakeholders (such as the fishing industry) early on, in order to prevent later resistance. Thus, upstream engagement was employed pragmatically to prevent conflict, rather than idealistically to enable democratic participation. Holm's approach to science-society relations was clearly based on a construction of specific publics as potentially resistant to offshore wind technology.

Professor Nielsen, however, presented a less instrumental approach when emphasizing the general value of upstream engagement: "I think it would be important to start discussing with the people maybe five or ten years before really starting [the implementation of offshore wind technology] so that people could express their opinions" (Interview 22, 10/10/2011). Hence, traces of both an instrumental and a more idealistic approach to socialization as upstream engagement were found in the interview material.

The narrative of design against resistance

Some scientists presented a narrative of design against resistance, extending public engagement into the actual design of technology. This approach was also based on a construction of publics as potentially resistant, and could be characterized as a preemptive effort to avoid conflict. However, this narrative did not include direct engagement with society. Its main feature was the integration of anticipated public concerns into the design of the technology. It could be thought of as designing technology for the scientists' "imagined lay persons" (Maranta et al. 2003) and as a form of virtual, indirect participation and co-production.

Research manager Sunde argued that public acceptance has been a determining factor in wind technology design in the choice for the number of blades, or between tower or jacket constructions: "It's quite interesting. Why are they round and cylinder shaped? This has almost no other than esthetic reasons. If you go back to the 1980s, then wind turbines were jacket constructions. Yes, it looked terrible. […] It gets much nicer with a tower that is round. […] This is how it developed. From people's acceptance of onshore solutions" (Interview 24, 10/14/2011).

However, in the same interview, Sunde strictly denied that any engineer or scientist he knew considered esthetics when designing technology: "Well, none of the guys I know think about esthetics in this field" (Interview 24, 10/14/2011). This suggests that concerns with respect to society were ambiguous. Most of the scientists did not consider society relevant to technology design. Research scientist Holm stated: "It is about getting a good technological solution and then you will see; can society accept it or not" (Interview 13, 08/30/2011). Society was not considered an "engineering issue" (Walker et al. 2010).

Despite this general reluctance to consider public concerns in technology design, some scientists engaged in a thought experiment during the interview, imagining how technology design could be adjusted to provide technical fixes to public resistance. Research scientist Holm considered the possibility of redesigning details. "It could maybe be some details that you could make less noisy and you could do things to keep the birds away so that they don't get into the rotor blades" (Interview 13, 08/30/2011). PhD candidate Nilsen demanded more investment in technology development to overcome the challenges of public resistance. "I think we should develop the deep-sea offshore. […] Then it's far from the shore and maybe local people may be satisfied with that" (Interview 3, 07/26/2011). He also mentioned that it is important to have an environmentally friendly design. Similarly, Professor Dahl (Interview 6,

08/23/2011) proposed that wind parks be designed with corridors to accommodate the fishing industry.

As Nilsen pointed out, replacing onshore with floating offshore technology seems an obvious example of designing to prevent public resistance. The argument that wind turbines are "out of sight, out of mind" was typical. Scientific manager Antonsen claimed: "It's in itself a motive to go offshore that you avoid a great deal of the environmental conflicts" (Interview 23, 10/10/2011). In this narrative of design against resistance, the design of technology for the imagined layperson could be understood as socializing technology in terms of embedding virtual public concern in the socialization areas of scientific practice and innovation.

The narrative of the outreaching scientist

Consistent with previous studies, the deficit model was a dominant construction among the interviewed scientists through the narrative of the outreaching scientist. In this narrative, negative public attitudes were explained by pointing to knowledge deficits. Scientists argued that people's attitudes towards offshore wind energy were based on feelings. In accordance with the public education model, they considered it important to inform the public about facts.

Research manager Bakke believed that information about offshore wind energy would help counter people's negative attitudes. Furthermore, she argued that opposition to offshore wind energy is not well reasoned, but intuitive and spontaneous: "I believe most people don't really think about it. […] They think: I don't want to have them outside my window, it's destroying my horizon or it destroys the animals in the sea. […] I think it's a little bit like a gut decision for many" (Interview 10, 08/24/2011).

The scientists constructed the public as irrational and emotional "others." This othering happened mostly in discussions of the environmental consequences of offshore wind energy and, in particular, the potential dangers for seabirds. Senior researcher Monsen explained, "there are people who believe that wind power plants are bird killers. [...] If you see a wind park, it's somehow like a guillotine for birds. They picture almost a massacre. Created by the media" (Interview 26, 10/25/2011). Unsurprisingly, the news media were often accused of being the source of these "wrong" stories or myths about offshore wind energy. PhD candidate Tangen claimed, "the real extreme examples of things get put out in the media, and that's what people hear about and that's what sticks in their head" (Interview 17, 09/14/2011).

Research manager Berg, however, argued that public discussion about offshore wind is less emotional than about onshore wind energy. The birds that die from offshore turbines fall into the water and are thus "out of sight and out of mind" for society. However, Berg also complained about the role of feelings and myths in the public discussion: "I think it is easier to focus on facts than on feelings. Because there are many feelings. A dead sea eagle is sad, a dead bat not quite that sad. […] Actually, this is what I often experience in environmental research, that myths are much worse than facts" (Interview 5, 08/05/2011).

Through such reasoning, the scientists argued that society should be provided with information and knowledge. Scientific facts, rather than feelings and myths, should inform people's attitudes. This would lead to greater public acceptance. Statements emphasizing the need for public education often went hand in hand with constructions of a resistant public.

However, most scientists did not find it necessary for society to know much about offshore wind technology itself. People should rather understand the electricity market, how Norway would benefit from developing offshore wind energy and its environmental consequences. This is similar to Davies's (2008, 417) observation: "It is better to communicate 'big ideas' or key

principles than detailed research." Research manager Sunde argued that people "should know more about the environmental aspects. […] That it actually isn't harmful to have them [turbines] standing close to your home or in the neighborhood" (Interview 24, 10/14/2011). Such knowledge was thought to make public sentiment more positive.

However, not all scientists who claimed that the public needs knowledge about offshore wind energy mentioned potential public resistance as a reason. Some referred to the general value of knowledge: as citizens, people ought to know about important and socially relevant issues such as renewable energy. Interviewees also believed that, since the public (taxpayers) fund the research, they have a right to be informed. PhD candidate Olsen argued: "After all, the money comes from the people. […] It is our responsibility to disseminate the information to the people" (Interview 2, 07/11/2011).

To summarize, most interviewees mentioned that society needs more knowledge about scientific facts. This claim was mostly expressed through the deficit model. However, interviewees put a varying degree of emphasis on the importance of scientific facts in the public debate and differed according to what kind of facts they believed were important to disseminate. How did the scientists see their role as socialization agents through this perspective?

Some scientists mentioned that they feel responsible for science communication. They believed that scientists should bring facts into a public debate dominated by myths and feelings. Research manager Berg stated: "As scientists we should not proselytize. We should be neither for nor against wind energy. We should just get out facts" (Interview 5, 08/05/2011).

Mass media outlets were seen as the main channels for information. Research manager Bakke elaborated their importance: "Somehow you wish to reach out. And this [the mass media] is the only way you can inform people to accept that this [developing offshore wind energy] is a

way to go" (Interview 10, 08/24/2011). PhD candidate Hansen portrayed a similar argument as a request from the research center: "They mentioned to us that as scientists we must transfer our knowledge to the media, to society [because] if they don't know they will think negatively about our activity" (Interview 1, 06/27/2011).

The narrative of the difficulty of outreach

Although acknowledging the importance of intensifying science-society relations and educating the public, only a small number of the interviewed scientists said they actively engaged with society. The scientists' statements about their role in communicating scientific knowledge were usually accompanied by the modal verb "should," often with a slight self-criticism of their own inaction, as found in the following statement by Professor Antonsen: "As a scientist you should communicate. I think this is something we could be better at" (Interview 23, 10/10/2011). Senior researcher Tveit argued that technologists lack communication competence: "We're doing it way too little. […] We're not good enough to use the media. […] It's typical for technologists that we somehow don't see a purpose in going out in the media to be misunderstood" (Interview 19, 10/06/2011). Research scientist Arnesen was also self-critical: "We should to a larger extent see it as our responsibility to influence the public opinion. […] We complain a lot about a public opinion being wrong and reactionary, but we can't expect that the public has the same information like we. We have to blame ourselves for our lack of presence" (Interview 21, 10/10/2011).

Difficulties of encountering the public sphere were commonly mentioned in explanations of the low level of activity. These difficulties were attributed to a lack of time and resources, such as limited resources at universities and a system rewarding publications in international journals over engagement with the public: "Universities earn their money by educating students

and publishing in reputable journals. […] And if we write in some newspapers: 'What are you fooling around with? You are wasting your time'" (Interview 6, 08/23/2011).

Furthermore, scientists were nervous about communicating their research through the media. They would need to simplify, and they could be misunderstood, which might harm their reputations: "It's not without risk to involve yourself, and I know that many refuse to do it. They don't dare to enter the debate because it is a tough debate […] and you get somehow attacked a little bit. Very quickly, you get into a defensive position. No, it is a scary field. It is safer with science, we can relate to that" (Interview 21, 10/10/2011).

Several interviewees referred to the science communication of climate scientists in order to emphasize these difficulties. According to Professor Antonsen, communication often fails because scientists lack knowledge about society: "It's like what I've seen with respect to colleagues in the climate world. You think that you understand all these things with economics and politics and media and then you do something wrong […]. Even though you know about climate, you don't know about society. So, we should be a little careful" (Interview 23, 10/10/2011). Thus, many scientists, referring to the difficulties of educating the public in line with Tøsse's (2013) findings about political robustness, concluded that engagement with society should be outsourced.

The narratives of the outsourcing scientist

Partly because of the difficulties mentioned above, many scientists did not want to engage in science communication. As Professor Antonsen stated: "We didn't make any particular decisions about or have intentions to enter the public debate" (Interview 23, 10/10/2011). One reason for this reservation was their feeling that the specific technological details of their work

were difficult to communicate beyond colleagues. Furthermore, many claimed to feel incompetent in commenting on broader issues related to offshore wind. Therefore, they proposed that "others" should act as mediators and engage with society. PhD candidate Amundsen argued: "There are other people who maybe can translate the technical effect into general life. And they'll perhaps do a better job talking to people" (Interview 9, 08/23/2011). PhD candidate Hagen identified these "others" as politicians and social scientists (Interview 4, 07/27/2011).

In one focus group of PhD candidates, this was discussed as follows.

> *Interviewer: Who's going to do that work, this translation?*
>
> *Stone: Maybe you guys [directed towards the two interviewers, both social scientists].*
>
> *Miller: […] As far as people. Yes, I don't really have time to go out and start shaking hands in the streets.*
>
> *Stone: That's what the media is for. […]*
>
> *Miller: I mean on what level should this discussion be? I have a thousand small technical issues which are of interest to a small community of researchers, right. But that's not the kind of things that we share. […]*
>
> *Vik: It's not our job.*
>
> *Miller: Yeah, it's not really our job. In a way that's true. (Interview 16, 09/13/2011)*

Furthermore, the scientists questioned the impact of their contributions on public debate. Research manager Foss stated, "Scientists have little possibility to influence the public opinion in this area. We can talk, we can write articles in the newspapers, and we can go to the politicians and do some marketing. But it is somehow not us who should do this" (Interview 25, 10/25/2011).

In particular, some non-Norwegian scientists (though not all) stated that they were "separated from society" (Interview 1, 06/27/2011). They use this argument as an explanation for not communicating with publics. PhD candidate Tangen claimed that "there is kind of a big disconnect between research, especially among the PhDs and maybe the postdocs and then society in general" (Interview 17, 09/14/2011). He added that this disconnect is even greater for non-Norwegian scientists: "I think that it's kind of a problem to connect what we're doing with society in general that there are no Norwegians in my group" (Interview 17, 09/14/2011).

So far, I have presented five narratives about science-society relations, which mostly drew on a backdrop of resistant publics, and could be thought of as strategies of dealing with anticipated resistance. While the scientists differed in their approaches to science-society relations and had different understandings of their own role in these, they agreed on the need for a socialization of offshore wind technology and hence for techno-science's engagement with society. However, the strategies were presented as something that the scientists (or others) "should" do, rather than something already happening. This reported lack of action challenges the stated importance of science-society relations.

The narrative of a disembedded development of technology

The scientists' dominant narrative about offshore wind technology in Norway, usually brought to light in response to questions about future implementation, did not refer to society as a significant aspect of the development and implementation of offshore wind technology. Rather, society was largely absent in the narrative. The scientists considered the high costs of the technology and a lack of public funding as the main challenges for its successful development in Norway. Hence, interviewees challenged the need for addressing society as part of

technology development by not mentioning it in the dominant narrative of offshore wind technology.

Furthermore, some scientists reflected on the assertion that the public needs knowledge—or, as Besley and Nisbet (2013, 648) put it: "[S]cientists agree the public knows too little about science but disagree on whether this presents a problem." This ambivalent stance was developed mainly within the public education approach by questioning its premises and whether it represents a useful way of thinking about publics. PhD candidate Sandvik referred to the uncertainties connected to offshore wind and argued: "If we who work with this are so uncertain and diffuse, can we expect that a person on the street is less diffuse and vague?" (Interview 15, 09/07/2011)

Other ways of questioning the need for engagement with a broader public included arguing, as Professor Rønning did, that only the local population directly affected by plans for development should be informed (Interview 14, 09/07/2011); or claiming, as research scientist Holm did, that the public only needs information about any serious negative social or environmental consequences. "If there are things that have great consequences for society then I think that all should know about possible consequences. […] But I somehow don't see anything like that" (Interview 13, 08/30/2011).

Challenging the need for involving society was part of the narrative of disembedded technology development, which argued that technology development happens outside the social context, without clear links to society and public concerns. Consequently, there is no need for socialization efforts. This narrative often drew on a construction of a public supportive towards offshore wind developments. When society was considered positive, the scientists saw less need for engagement with society.

Conclusion

This paper has analyzed Norwegian offshore wind scientists' narratives about their engagement in science-society relations and the socialization of offshore wind technology. As argued in the introduction, the context of the interviewees was ambiguous. On the one hand, they were subject to considerable pressure to engage with society, and the challenges related to future funding and implementation of offshore wind technology should provide strong motives to do so. On the other hand, the pressure for academic excellence (to publish in prestigious journals, for example) could be expected to demotivate engagement. The reviewed research literature suggests that we should expect to find ambivalence not only with respect to engagement, but also regarding the content of engagement and the understanding of scientists' role in science-society relations; notwithstanding previous research observing that a public education approach based on deficit thinking is dominant and that many scientists are hesitant to engage with society.

The six narratives identified in this paper, (1) upstream engagement, (2) design against resistance, (3) the outreaching scientist, (4) the difficulty of outreach, (5) the outsourcing scientist, and (6) disembedded development of technology, all showed the expected diversity and ambivalence. The normative move towards dialogic and participative approaches found in scholarly and policy circles left few traces, as the narratives of *upstream engagement* and *design against resistance* were only minority narratives in the interviews. While the more common narrative of *the outreaching scientist* resonated with the expectation that scientists should be socialization agents, the narratives of *the difficulty of outreach* and of *the outsourcing scientist* bowed to the idea of socializing technology, but dismissed the claim that scientists are or should be active agents of socialization themselves. In contrast, the *disembedded development of technology* narrative actually denied the need for a socialization of technology.

Very few of the scientists described themselves as active agents of socialization. Most of the scientists presented, for example, upstream engagement or outreach as something they "ought to do" rather than something they were actively doing. This raises issues with respect to scientific culture because it seems that many of the offshore wind scientists mainly wished to design and develop their technology without considering the social context or engaging in socialization of the technology. The reasons given for this were limited time and capacity as a result of new public management. Further, doubts about the potential impact of outreach efforts and a lack of competence and interest were important mitigating features. Moreover, the increased internalization of academia seemed to contribute to the disembeddedness of science. Thus, the increasing pressure on scientists to act as agents of socialization seems to have been largely ineffective. However, it is interesting to note the widespread sentiment that scientists ought to engage. This suggests that the pressure is recognized.

Earlier, I asked if the ambivalent findings from previous research on scientists' roles in science communication actually represent the ambivalence of scientists themselves. Or, did the interviewed scientists experience that the context of their work required a more active role on their part in order to ensure future funding and implementation? The diversity of the accounts provided by the scientists suggests that the answer to the first question is yes, while the answer to the latter clearly is no. Further, the research literature suggested that scientists in their engagement with their publics would fall into three broad categories: (1) public education or deficit thinking, (2) dialogic, participative approaches, and (3) engagement is not really needed. It seemed that the context of offshore wind in Norway should provide pressure for scientists to enact option 2, and at least not option 3. However, while all three categories could be observed, most of the scientists subscribed to option 1.

Thus, in line with previous research, the paper finds that deficit thinking was a common element in the narratives of the offshore wind scientists. This includes the implied anxiety with

respect to public skepticism and resistance. The scientists often linked the narratives of *upstream engagement*, *design against resistance*, and *the outreaching scientist* to an imagined public that was negative towards offshore wind. Hence, offshore wind energy's dependence on political support seemed to motivate approaches in which scientists actively attempted to reduce resistance. However, the narrative of *disembedded development of technology* tended to be accompanied by references to an imagined positive public. Thus, many interviewees, who perceived the public as positive but lacking any significant role in the development of offshore wind technology, discarded the deficit model. Consequently, the perception of the public as either skeptic or positive seemed to influence the scientists' thinking about their engagement with the public.

Looking at science-society relations through the concept of socialization (Bijker and d'Andrea 2009) allows us to consider different processes, actors, and arenas to gain a better understanding of what it takes to embed technologies into society and facilitate their implementation and use, and thus, "think of science-society relations in more comprehensive ways" (Felt et al. 2013a, 8). The six narratives are evidence of the fruitfulness of going beyond a strict focus on science communication.

Further research should focus more on scientists' engagement with the public and with society in general as an issue of division of labor and the role of scientific institutions (Palmer and Schibeci 2014). In addition to rethinking *who* should be responsible for engaging with the socialization of science and technology, the narratives presented here also invite reflection on *what* should be the object of engagement with society. The scientists felt that their research on small technical details was not a relevant contribution to public debate and that engagement with larger public concerns, such as environmental or economic issues, would be more valuable. The implications of this should be studied.

Author Biography

Sara Heidenreich is a senior research scientist in the Department of Interdisciplinary Studies of Culture at NTNU Norwegian University of Science and Technology. Her current research focuses on energy and society with a particular focus on energy citizenship, public engagement and science communication.

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Author Biography

Sara Heidenreich is a senior research scientist in the Department of Interdisciplinary Studies of Culture at NTNU – Norwegian University of Science and Technology. Her current research focuses on energy and society, with a particular focus on energy citizenship, public engagement, and science communication.

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