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Blowing in the wind

The socialization of offshore wind technology

Thesis for the degree of Philosophiae Doctor

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This thesis is dedicated to the memory of my dear father (1951-2012).

The knight of immortal youth
at the age of fifty found his mind in his heart
and on July morning went out to capture
the right, the beautiful, the just.

Facing him a world of silly and arrogant giants,
he on his sad but brave Rocinante.
I know what it means to be longing for something,
but if your heart weighs only a pound and sixteen ounces,
there's no sense, my Don, in fighting these senseless windmills.

(Nazim Hikmet, Don Quixote, 1-9)

Preface

This thesis deals with the interplay between society and technology. In particular, I examine the socialization of offshore wind technology in Norway. Offshore wind can be depicted as an emerging technology in this context. So far, only one windmill is installed at sea. Thus, ongoing debates and negotiations are mainly taking place around different visions of feasible futures. This panorama certainly reminds of Don Quixote's effort of tilting at windmills. During his adventurous journey, accompanied only by his faithful squire Sancho Panza and his horse Rocinante, Don Quixote misinterprets dozens of windmills for fierce giants and decides to attack them. In the same vein, some opponents of offshore wind in Norway regard the windmills at sea as giant monsters that need to be fought. Similarly, many scientists involved in the development of offshore wind technology fear not the windmills themselves but a strong imagined public opposition that the windmills may generate. However, let us not anticipate too much of the content of the thesis here.

The three years (and a few extra months) of working with this thesis could as well be described as an adventurous journey with its inevitable ups and downs. Particularly during the last months, the text became somehow a gigantic monster and while writing it I sometimes felt like Don Quixote "tilting at windmills." Yet, while Don Quixote only had Sancho Panza and Rocinante I had many people helping and supporting me along the way, making the thesis look less monstrous and the writing more enjoyable.

First and foremost, I would like to thank my supervisor Knut H. Sørensen for his outstanding and valuable guidance during the completion of the thesis. I am also grateful to Vivian A. Lagesen for her support and supervision. Special thanks go to my colleague Robert Næss for his help while conducting some of the interviews together as well as for the inspiring discussions about the data collected.

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Johanne Sæther for a warm welcome to the department and for taking care of all the administrative work.

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As for my family and friends, I thank for your support, for being there, and for continuously reminding me that there are matters more important than this PhD. I promise that I will spend more time with you in the future. The biggest thanks of all goes to Mickey. I do not know whether it was more difficult for me to write this thesis or for you to put up with me during the process. Thank you for your love, encouragement and patience.

Latour (2005, p. 148) remarks: "A good thesis is a thesis that is done." Writing these final words of this work, I can finally and with the greatest joy say that it is.

Dragvoll, April 2014

Sara Heidenreich

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Chapter 1: Overview and synthesis

Introduction

This thesis deals with the interplay of technology and society. More specifically, it addresses the role of news media and scientists for the socialization of the emerging offshore wind technology in Norway. Developing offshore wind energy, a renewable form of energy generated by wind turbines at sea or on other water bodies, is one currently quite popular strategy considered by many countries, especially in Europe, but also globally, to increase the percentage of renewable energy in their energy mix. A main driver for this development is the respective countries' policies for climate change mitigation that aim at a transition of their energy systems from being based on fossil fuels as energy sources to increasingly rely on renewable energy in order to reduce greenhouse gas emissions. Other motivations for developing offshore wind energy include concerns for energy security and the availability of large wind resources and of free space offshore. Moreover, moving the production of renewable energy at sea carries the expectation of less impact on the environment and on humans and consequently less public resistance than land-intensive renewable energy developments such as onshore wind energy (Kaldellis & Kapsali, 2013; Veum, Cameron, Hernando, & Korpås, 2011).

In Norway, offshore wind energy has been described enthusiastically as having the potential to become "Norway's new oil"[1] and "Norway's new industrial adventure."[2] Furthermore, the country has been imagined to have the prospect to be world leading within offshore wind technology. Offshore wind energy has also been mentioned related to depictions of Norway as Europe's future source of renewable energy. It has been described as a potential contribution to Norway's status as "Europe's green battery". Despite these optimistic projections, the country has not developed commercial offshore wind farms yet. So far, only one pilot turbine, Hywind, the world's first floating wind turbine, is placed in Norwegian waters. Although offshore wind technology is new and the development of offshore wind parks is just beginning to take off, having only one turbine installed, Norway is

[1] Petroleum- and energyminister Åslaug Haga in NTBtekst 05.02.2008.
[2] Petroleum- and energyminister Terje Riis-Johansen in Kommunal Rapport 26.06.2009.

lagging behind other countries, such as Denmark, Germany or the UK. This is related to inter alia the country's special energy situation and a lack of political support, which I will discuss further below. Norway does, however, focus on research and development of offshore wind technology. Thus, at this juncture, it is unclear what role offshore wind energy will play in Norway.

Although the term is mostly used for biotechnologies or nanotechnologies, I argue that offshore wind in Norway can be characterized as an emerging technology. Einsiedel (2009b, p. 3) describes emerging technologies as "technologies in the developmental stage of production […] or in early stages of commercialization." She argues that technologies become emergent when they leave the inner circle of actors, who are directly involved in technology design and development, and enter the public arena. Further, she claims that technologies become emergent earlier today than in the past because of a stronger linkage between scientific institutions and popular channels. Moreover, public interest in and attention to new technologies is increasingly due to today's easier access to information but also due to active government support of certain technologies and the enhanced visibility of social groups, either in support of or in opposition to new technologies, in the public arena (Einsiedel, 2009b). Einsiedel adds that new technologies are made emergent, i.e. made visible and accessible in the public sphere, through the media and various other actors, of whom she particularly emphasizes scientists and scientific institutions.

How are new technologies made emergent and how do they become embedded in society? In order to account for the processes and practices through which emerging technologies are linked to society I draw upon the concept of socialization. Grusec and Hastings (2007, p. 1) define socialization broadly as "the way in which individuals are assisted in becoming members of one or more social groups." The concept is most commonly used in the context of child upbringing and early childhood education to refer to the processes of teaching children the necessary skills, norms, values and behaviors in order to function in the culture and society in which they grow up (Maccoby, 2007). Similarly, Bijker and d'Andrea (2009) emphasize the importance of socializing new technologies in order to be

successfully implemented and thus function in society. Hence, with the concept of "socialization of technology" the authors refer to processes of embedding the technology into society. Bijker and d'Andrea explain obstacles new technologies meet in society during implementation with a lack of socialization. Actors, who are involved in any processes of embedding technologies into society, are referred to as "agents of socialization". This thesis addresses news media and offshore wind scientists as potential socialization agents of offshore wind technology.

The urgency of addressing the challenge of climate change through developing renewable energy, such as offshore wind, and the related policy pressure make a study of the socialization of offshore wind technology seem particularly relevant. Also, the current trend to move renewable energy production at sea with its corresponding expectation of less impact on the environment and humans raises interesting and new issues related to the socialization of offshore renewable technologies. However, for a better understanding of the socialization of offshore wind technology in Norway, it is important to consider the Norwegian context. Hence, I will now discuss some major features of renewable energy in general and offshore wind energy in particular in Norway.

Norway, a country with a population of approximately 5 million people, distinguishes itself from most other countries by a special energy situation, which can be characterized by two main factors. First, the country has a large and influential oil and gas industry. In 2012, Norway ranked the seventh largest oil exporting and third largest gas exporting country in the world.[3] The oil and gas industry contributed 23% of Norway's GDP. In 2011, the industry employed nearly 55 000 people.[4] Notably, the surplus generated by the petroleum sector is saved in the Government Pension Fund for future post-oil times. This contributes to the high standing of the oil and gas industry in Norwegian society. Second, nearly all of the country's electricity production is from hydropower and thus already renewable. Hydropower, which is rather cheap in production, represents a kind of gold standard against which all other energy production is measured (Sørensen, 2007).

[3] http://npd.no/Publikasjoner/Faktahefter/Fakta-2013/Kap-3/
[4] http://www.ssb.no/energi-og-industri/statistikker/oljev

Although electricity production already is almost 100% renewable, total energy consumption is not. Thus, Norway focuses on developing new renewable energy such as wind, solar and bioenergy. Due to the cooperation through the European Economic Area (EEA), the EU directive on the "promotion of the use of energy from renewable sources" does also apply for Norway. The country has committed itself to increase the share of renewable energy consumed from nearly 60% in 2005 to 67, 5% before 2020.[5]

Norwegian policy documents reveal different visions for renewable energy. Consequently, renewable energy is linked to several policy areas. The government white paper on renewable energy envisions Norway as an "environmentally friendly energy nation" (St.meld.nr.11, 2006-2007, my translation). It draws upon environmental and climate concerns as motivation for a focus on renewable energy. Likewise, the recent white paper on climate policy (St.meld.nr.21, 2011-2012) describes new technological solutions, for instance new renewable energy technologies, as crucial for reducing greenhouse gas emissions and reaching Norway's aim of being a low carbon society by mid-21st-century. Hence, renewable energy is framed as measure for climate change mitigation. In addition, renewable energy is framed as measure for economic development. Both the white paper on climate policy (St.meld.nr.21, 2011-2012) and the white paper on innovation (St.meld.nr.7, 2008-2009) argue that a focus on new renewables would entail potential for innovation and industrial development as well as the creation of new jobs. Lastly, renewable energy is framed as measure for energy security. It is increasingly expected to contribute to the security of energy supplies (St.meld.nr.7, 2008-2009). However, as Sørensen (2007) points out, this aspect has not been of great importance in the past due to Norway's special energy situation referred to above.

As we have seen, these different government white papers include visions of an important role of new renewable energy for Norway as a low-carbon society and an environmentally friendly energy nation as well as for industrial development. At

[5] http://www.energinorge.no/getfile.php/FILER/NYHETER/ENERGI%20OG%20KLIMA/2011-12-08%20SSB%20-%20Rapport%20fornybardirektivet.pdf

the same time, though, the practical implementation of new renewable energy is referred to with caution. The white paper on climate policy (St.meld.nr.21, 2011-2012), for example, discusses the future development of renewables in a rather non-committal way by pointing to many potential constraining factors such as nature conservation concerns and high costs.

Swensen (2010) also observes this cautiousness about renewable energy development in Norwegian energy policy. He argues that although rhetoric and visions indicate an ambitious focus on renewable energy technologies, the actual focus in government white papers and parliamentary debates is on gas with CCS (Carbon Capture and Storage) or as he puts it, "the vision may be to focus on renewables, while practically and institutionally gas is facilitated" (Swensen, 2010, p. 54, my translation). Swensen shows that this is done by constructing gas with CCS as environmentally friendly and framing it in a technology optimistic way. Renewable energy technologies, in contrast, are framed more vaguely and without political commitment, implying uncertainties about political aims and economic feasibility. Hence, Swensen concludes that these different framings allow for a continued focus on oil and gas (with CCS) in Norwegian energy policy.

Renewable energy technologies are rather constructed as objects for further research. Concurrently, the white paper on innovation (St.meld.nr.7, 2008-2009) states that the government focuses on environmentally friendly technologies by financing research and development (R&D). Also the establishment of the national Centres for Environment-friendly Energy Research (FME) in 2009 reflects this focus on R&D. These centers aim to contribute to climate change mitigation by producing leading research on environmentally friendly energy in close cooperation with the industry. Two of the now eleven centers, NOWITECH[6] and NORCOWE[7], deal exclusively with offshore wind energy.

The formation of these two research centers happened at a time with very optimistic rhetoric about the potential of offshore wind energy, which can be summarized by the statements of the two former Ministers characterizing offshore

[6] Norwegian Research Centre for Offshore Wind Technology
[7] Norwegian Centre for Offshore Wind Energy

wind energy as "Norway's new industrial adventure" and "Norway's new oil", which I already referred to above. Norway's long coastline with abundant wind resources seemed to offer ideal conditions for producing offshore wind energy. In addition, the development of offshore wind technology was believed to benefit from the country's leading expertise and experience in areas such as marine operations, oil and gas, and materials science.

In 2010, the Norwegian Water Resources and Energy Directorate identified fifteen potential areas for offshore wind farms (NVE, 2010). Subsequently, the directorate carried out an impact assessment and recommended the opening of five of the fifteen areas based on good technical and economic conditions and acceptable impacts (NVE, 2012). This impact assessment report also touches on the possibility of using offshore wind energy to electrify the offshore petroleum industry. This solution would increase relevance and opportunities for offshore wind development and bring out offshore wind as alternative to new offshore gas power plants (NVE, 2012).

However, as indicated above, apart from the focus on R&D with respect to offshore wind technology, mirrored by the formation of the two research centers and by the fact that the only turbine in Norwegian waters is the world's first full-scale floating pilot turbine, not much has happened related to the development of offshore wind energy in Norway. This inaction was accompanied by a change in political rhetoric, which can be demonstrated by the way the Minister of Petroleum and Energy, Ola Borten Moe, who came to office in March 2011, commented on offshore wind. According to him, it was too expensive to develop for the time being: "It makes no sense to use a lot of tax billions to build wind farms at sea only so that they can be at sea."[8]

The change in official rhetoric about offshore wind energy is also reflected in the development of Havsul, which was the first offshore wind farm granted license in Norway. Havsul was planned as the world's largest offshore wind farm and a lot of hope was connected to its development as a breakthrough for Norwegian offshore

[8] Stavanger Aftenblad 17.03.2011

wind energy. It was planned as bottom-fixed and near-shore wind farm located between five and ten kilometers off the coast of Mid Norway. However, in December 2012, the developers decided to put the development on hold due to a lack of political support.

Thus, like for renewable energy in general, optimistic visions for offshore wind energy meet inaction and cautiousness in practice. The government white paper on innovation (St.meld.nr.7, 2008-2009), for example, projects offshore wind energy as having great potential, but adds that this lies sometime in the future. Another explanation for the fact that Norway is lagging behind other countries in offshore wind development is that in many cases deep-sea offshore wind technology is needed for installations in Norwegian waters. A development would thus be more challenging and costly than in countries with more shallow waters.

However, the lack of political support for offshore wind energy has been criticized. As we have seen above, while the focus on renewable energy is framed as measure to mitigate climate change, it is also linked to industrial development. In line with the latter framing, offshore wind industry representatives argue that offshore wind primarily is about industrial development and that the Norwegian offshore wind strategy should address the facilitation of industry and technology development for export (Hansen & Steen, 2011). And indeed, while no offshore wind farms are installed in Norway, big Norwegian companies, such as Statoil and Statkraft, are involved in offshore wind developments in other countries, such as the UK, with a more favorable support regime. At the same time, industry representatives, particularly from small and medium-sized companies mention the lack of a home market as main barrier for offshore wind development in Norway and call for more political support in this respect (Steen & Hansen, 2013).

I also mentioned above that offshore wind energy has been envisioned to contribute to Norway as a source of renewable energy for Europe or as "Europe's green battery". However, as Gullberg (2013) suggests, what the concept of "green battery" entails is contested. She finds that while Norwegian decision-makers interpret the concept as Norwegian contribution of balancing power from existing hydropower capacity, European decision-makers "emphasize the great potential of

pumped-storage hydropower[9] in Norway" (Gullberg, 2013, p. 622). Gullberg (2013) argues that in the short term it is not politically feasible for Norway to become Europe's green battery in the sense of European decision-makers' interpretation, i.e. with pumped-storage hydropower, due to inter alia issues of nature conservation and higher electricity prices. She characterizes this development as a long term prospect, while for the time being Norway is going to further contribute with balancing power from existing hydropower without pumped storage.

As we have seen, prospects for developing offshore wind in Norway are characterized by uncertainty and ambiguity. On the one hand, a home market would promise industrial development opening for participation in a rapidly growing global market. Further, it could contribute to Norway's position as source of renewable energy for Europe and thus to climate change mitigation. On the other hand, energy policy focuses on oil and gas instead of renewables. Both the case of the Havsul wind farm, which was put on hold due to a lack of political support, and the missing home market highlighted by industry representatives suggest that the inaction in offshore wind development "is due to an inconclusive and insufficient support regime" (IEA wind, 2010, p. 133). Also the green certificates introduced in 2012 to support renewable energy development will probably not further an offshore wind development since "the certificate price will be too low to be attractive for OWE [offshore wind energy] developers" (Veum, et al., 2011, p. 13). Hence, Benningstad (2009, p. 77) claims that offshore wind energy in Norway is characterized by "a high degree of technology push, combined with a lack of demand pull."

To summarize, studying the socialization of offshore wind technology in Norway is particularly interesting for several reasons. Norway has great potential for developing offshore wind energy in terms of wind resources and space due to its long coastline. Also, the country has an outstanding competence in offshore/marine operations developed mainly by the offshore oil and gas industry, which could be transferred to offshore wind energy. Furthermore, as Norway already produces

[9] The pumped-storage hydropower is about balancing European wind power with electricity from Norwegian hydropower. When the wind is not blowing in Europe, Norway would export hydro-electricity. Later, surplus power, e.g. from wind, would then be used to pump the water back up into the reservoirs and be stored there until it is needed again.

almost all electricity through renewable hydropower, we could expect the country to continue and extend this route by focusing on other renewables as well and take on the role as "Europe's green battery."

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This thesis studies the interplay between technology and society, in particular, practices, strategies and visions in regard to the socialization of an emerging technology. As mentioned above, Bijker and d'Andrea (2009) argue that an embedding of technology into society is necessary for a successful development and implementation of emerging technologies. Considering the lack of political support for developing offshore wind energy in Norway and the sole focus on R&D in this regard, Sørensen (2013, p. 18) suggests that "the involved R&D institutions, together with their industrial partners, have been left with the task of innovating and commercialising offshore wind technology." Hence, as Bijker and d'Andrea (2009) suggest, scientific institutions have a particular responsibility to act as agents of socialization. In this thesis, I focus on two potential agents of socialization, news media and scientists, and how they enact their roles in the embedding of technology into society.

Socializing emerging technology involves imagining prospects of possible futures for the technology. Through processes of socialization, agents of socialization engage in ascribing meaning to the technology. At the same time, socialization facilitates public sense-making and hence prepares for a domestication of the technology. Different imaginaries and visions of the technology may be contested in processes of sense-making or as Einsiedel (2009a, p. 327) puts it: "As new sets of technologies emerge, the same passionate battles are fought over competing visions of what each might mean, each time pitting the magic of the silver bullet against the perils of the poison arrow."

Einsiedel argues that for many emerging technologies "the projections of potential applications remain just that - projected aspirations and hopes" (Einsiedel, 2009b, p. 3). Referring to emerging technologies as strategic technologies, she adds that these technologies exist not only as projections and imaginaries of scientists and

certain stakeholders but involve also national aspirations. Emerging technologies could thus be characterized as socio-technical imaginaries, which Jasanoff and Kim (2009, p. 120) define as "collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects." Accordingly, offshore wind technology could be described as socio-technical imaginary and socialization as processes of embedding the technology into society, which involve sense-making and constructing visions of future prospects for the technology.

This first chapter aims to provide an overview and a synthesis of the thesis. The three papers forming the body of the thesis follow in Chapter 2, 3, and 4. This overview and synthesis chapter is structured as follows: In the next section, I provide a short summary of the three papers. This summary is followed by a review of earlier studies dealing with offshore wind energy and its publics. Then, I discuss different theoretical approaches relevant for thesis, which are the basis for the following cross-cutting analysis of the three papers as a whole. I conclude this chapter with some methodological considerations.

A summary of the three papers

The three papers forming the body of this thesis focus on news media and offshore wind scientists as socialization agents of offshore wind technology. While paper 1 analyzes the news media discourse on offshore wind energy, papers 2 and 3 deal with different aspects of offshore wind scientists' imagined publics and socialization strategies.

Paper 1: Dingpolitik at sea: Offshore wind energy in the news media discourse

The first paper in this thesis sets out from the common expectation that renewable energy production at sea will be less controversial than on land, where land-intensive renewable energy developments have led to many conflicts about negative impacts on the environment and humans. Moving renewable energy production offshore, and thus "out of sight, out of mind," carries the promise of preventing

public resistance. Hence, the paper aims to investigate whether moving wind turbines at sea lives up to this promise.

The paper analyzes the news media discourse on offshore wind energy. Acknowledging the important role of the media for ascribing meanings to emerging technologies, the paper investigates how offshore wind technology is made sense of in Norwegian newspapers. What possible futures for the technology are constructed? News media can be characterized as interface between science/technology and the public. They have an important role as source of information for the public, but also for agenda-setting and for sense-making of the issues in question. In this paper, I regard news media as an arena for Dingpolitik and Naturpolitik. Drawing upon Latour's (2005a) concept of Dingpolitik, which implies a focus on the objects of politics, the paper identifies the relevant actors, arguments and perspectives gathered around the "Ding" offshore wind technology in order to understand how the technology is framed and situated. Based on earlier studies on wind energy, the paper also recognizes the relevance of different conceptualizations of nature in debates. Hence, it introduces the concept of Naturpolitik as aspect of Dingpolitik to analyze the different meanings of nature gathered around offshore wind energy and how they are played out in the debate. The analysis of the news media discourse is based on newspaper articles from 2000-2010.

Earlier studies suggest that debates about offshore wind energy can be seen as a continuation of onshore debates, particularly related to the continuous dominance of aesthetic issues. Thus, they challenge the common belief that moving renewable energy production offshore will end the controversy. This paper argues that the news media discourse on offshore wind energy cannot fully be considered as a continuation of onshore debates. Although not completely living up to the expectation of being non-controversial, news media discourse was largely supportive of offshore wind energy. Significantly more articles were clearly supportive of offshore wind energy (e.g. in 2010: 50% of total number of articles) than clearly negative (e.g. in 2010: 10% of total number of articles).

The findings from a qualitative analysis of the newspaper articles suggest that offshore wind energy was made sense of and contested within three different

frameworks: economic, naturpolitical and moral. Notably, both supporters' and opponents' engagement was triggered by issues within these three frameworks. In the economic framework, which appeared as privileged frame of interpretation, supporters highlighted national and local economic benefits while opponents argued that the development of offshore wind is too expensive. The naturpolitical framework was characterized by supporters who constructed offshore wind energy as environmentally friendly and as a contribution to climate change mitigation. Opponents, by contrast, argued that it has severe environmental consequences on both seascapes and biodiversity. Within the moral framework, supporters argued that Norway has a moral responsibility to produce more renewable energy to export to other countries. Opponents, however, did not agree on this moral responsibility and did not want Norwegian taxpayers to pay for an export of renewable energy. Thus, since aesthetic concerns lost their dominance and accordingly, Naturpolitik shifted to embrace other issues, the paper argues that the offshore debate involved a different Dingpolitik than onshore.

Interestingly though, the Ding itself, the offshore wind technology, was not contested in the controversy. Little was written about the design of the technology itself. Values rather than facts were contested, or *matters of concern* rather than *matters of fact*, and the technology remained blackboxed. Following these observations, the paper concludes that news media discourse illustrates a twisted Dingpolitik.

Paper 2: Sublime technology and object of fear: Offshore wind scientists assessing publics

As we have seen in paper 1, the news media discourse on offshore wind energy was largely supportive, though not completely uncontroversial. News media are central in public discourse (Weingart, 2011) and although they do not mirror public debate, they provide a partial representation of it. Paper 2, then, shifts the attention from news media representations of public debate to scientists' constructions of publics.

The paper draws on the concept of "imagined lay person" (ILP) introduced by Maranta et al. (2003). ILPs are functional constructions of lay people inscribed in

the design of the technology. Hence, scientists' imaginings of publics are performative, in the sense that they may influence scientists' technology design as well as their socialization activities. Based on interviews with scientists associated with two national research centers of offshore wind energy, this paper investigates offshore wind scientists' imagined publics.

Earlier studies of experts' imagined publics find constructions of the publics as resistant to the science or technology in question, often attributing this to irrational and emotional thinking among publics in contrast to rational, factual science. However, as paper 1, also this paper expects offshore wind energy to be a particular case. Offshore wind turbines will be developed at sea and thus may be "out of sight, out of mind." Hence, offshore wind is claimed to be a solution for problems with public resistance experienced onshore. Thus, we may expect that scientists would not be concerned about public resistance and either imagine publics to be positive or indifferent to offshore wind developments, or not to consider or care about the public at all. How did the scientists' imagined publics reflect this? Did resistance play into their imagined publics?

The paper identifies three main narratives of scientists' imagined publics. The first narrative*, out of sight, out of mind: the narrative of the positive public,* confirmed expectation of offshore wind energy as special case. Scientists did not worry about public resistance and claimed that since turbines would be placed far at sea they would be away from public concern. Thus, they constructed the issue of visibility as essential for public attitudes. Interviewees expected fewer conflicts offshore than onshore and the public was portrayed as positive towards the technology. In the second narrative, *ne*w *jobs and high electricity prices: the narrative of economic concerns*, scientists drew upon an economic framework to construct both supportive and resistant publics. In the third narrative, *making the public NIMBY: the narrative of the negative public*, scientists expressed a fear of public resistance, which was mainly linked to environmental impacts and a construction of the public as having a NIMBY (not in my backyard) attitude.

Notably, the interviewed scientists did not adhere to one narrative. Instead, they were moving back and forth between them. Hence, offshore wind scientists'

constructions of publics were ambivalent and messy. On the one hand, they constructed the public as positive or indifferent towards a sublime offshore wind technology, which they thus could develop and implement independent of the social context. Surprisingly, the public was at the same time imagined as resistant and consequently, offshore wind energy constructed as object of fear.

The paper argues that the offshore wind scientists' imagined publics depict a disembedding of offshore wind technology. It attributes particular significance to the persistence of the NIMBY concept in the scientists' imagined publics, as the concept seems to be outdated as explanation for public resistance in mainstream social science. The portrayal of the public as irrational resistant "others", as in the NIMBY concept, allowed the scientists to discredit opposition. Hence, as in the "out of sight, out of mind" narrative, development of technology can happen without considering the public. Taken into consideration the surprising persistence of imaginings of public resistance, the paper concludes by suggesting a pessimistic engineering mindset, i.e. that scientists fear to fail with their technology because of public resistance.

Paper 3: Outreaching, outsourcing and disembedding: How offshore wind scientists consider their engagement with the public

Paper 3, then, changes the focus from offshore wind scientists' imagined publics to their socialization strategies. By depicting offshore wind scientists' narratives of science-public relations in the context of offshore wind energy, the paper analyzes how they view their own role in public engagement.

The background for this paper is an expectation and increasing pressure towards scientists to act as agents of socialization of emerging technologies. This role is attributed to scientists both by science policy and by normative social science theory, such as the socialization of technology approach (Bijker & d'Andrea, 2009). In addition, there is the expectation that scientists pursue dialogic and participative socialization strategies instead of merely a public education strategy.

The particular Norwegian context, however, may raise ambivalent expectations. On the one hand, again, offshore wind technology promises

implementation without public protest. On the other hand, an offshore wind development is dependent on public support for covering the high initial investment costs. In addition, offshore wind is competing with the oil and gas sector for resources. This should motivate scientists to act as socialization agents.

The paper finds a diversity of socialization strategies among the interviewed offshore wind scientists. Despite the normative move towards dialogic and participative approaches to science communication, only a few of the interviewed scientists mentioned these strategies. In contrast, as observed in earlier studies of scientists' communication strategies, a public education strategy paralleling the deficit model was dominant. However, while only a small group of scientists viewed their own role as public educators, many referred to the difficulties of being outreaching scientists and/or argued that public education should be outsourced and carried out by "others". In that way, they avoided the role as socialization agents. Likewise, in the common strategy of non-engagement, active socialization was avoided by the interviewed scientists. Here, the scientists declared socialization irrelevant and technology development as disembedded. Notably, even those strategies involving some degree of activity on part of the scientists were referred to as strategies they "ought to pursue" rather than something they were already doing.

The paper argues, then, that the imagined publics laid out in the second paper, were indeed performative. They influenced the scientists' socialization strategies. Constructions of the public as resistant were likely to be followed by a public education strategy, while constructions of the public as supportive often were related to the narrative of disembedded technology development.

Considering the increasing pressure on scientists to socialize emerging technologies, the dominance of strategies that did not involve scientists as active agents of socialization is surprising. Thus, the paper concludes with the observation that the interviewed scientists preferred to stay in their ivory towers and develop technology without considering the social context.

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Together, these three papers tell a somewhat surprising story of the socialization of offshore wind technology. Put very simplified: Although news media discourse was largely positive towards offshore wind energy, the scientists imagined the public as potentially resistant. However, neither the scientists' imaginings of the public as resistant nor the expectations put forward to them to act as socialization agents seemed to spur enough motivation; the majority of the scientists did not engage in the socialization of offshore wind technology.

This thesis deals with news media and scientists as agents of socialization of offshore wind technology. The important role of the media for the socialization of technology has frequently been emphasized. The media can be considered a mediator between science/technology and society; they provide information to the public, have a role for agenda-setting, and are regarded as one of several sources for public sense-making (Bucchi, 2008; Cox, 2010; A. Hansen, 2010; Olausson, 2011). Likewise, scientists have been given the role as potential socialization agents in social science studies of science/technology and society. Further, public engagement with science and science communication have been increasingly on the agenda in science policy.

Before taking a closer look at the concept of socialization and the two agents of socialization, let us take a step back and consider the question why a socialization of offshore wind technology is relevant at all. So far, I have argued that in particular emerging technologies require socialization. However, as the summaries of the three papers indicate, offshore wind technology is commonly believed to be a technology for which an embedding into society is irrelevant because wind farms will be "out of sight, out of mind" of society. Is that the case? I hope to shed some light on these questions with the following overview of earlier research on offshore wind energy and its publics.

Offshore wind energy and its publics

Extensive literature has addressed public engagement[10] with wind energy. Most studies focus on onshore wind energy. Offshore wind, by contrast, has been studied much less (Devine-Wright & Howes, 2010). This can partly be explained by the simple fact that most wind farms to date are onshore and that offshore wind developments are rather new. However, as Whitmarsh et al. (2011) point out for the UK context:

> *Given that offshore wind is likely to be a major growth sector over the next 25 years, and that offshore projects may be quite different to onshore in terms of public engagement and acceptance, for example due to the very different spatial implication of an offshore project, future studies of offshore are needed (and should not be seen as duplicating onshore wind studies). (Whitmarsh, et al., 2011, p. 145)*

As we have seen, offshore wind energy is often claimed to be different than onshore. It is believed to generate less public resistance and thus be a "solution" to onshore problems. Several studies, though, suggest that offshore projects are similar to onshore projects with respect to the extent and character of public concern (Ellis, Barry, & Robinson, 2007; Haggett, 2008; Wolsink, 2010). Hence, public concerns about offshore wind energy are described as a continuation of discussions and debates related to wind on land. Thus, in order to provide a background for a discussion of the growing number of studies about offshore wind, I will first introduce some main features of the literature about onshore wind energy.

Explaining public resistance to wind energy

The focus of social science research on wind energy has mainly been on public attitudes and acceptance, on explanations of the underlying reasons for public attitudes as well as on issues of local participation in planning and decision-making. This research has various methodological approaches to studying public engagement.

[10] I use public engagement as a broad overarching term here, which includes public attitudes, acceptance, understanding and practices as well as public participation processes and organized engagement activities.

One focus has been to measure public attitudes to wind energy by means of quantitative survey studies. Many of these studies find a high support of wind energy in general among the public, but also related to specific wind energy projects (see e.g., Barry & Chapman, 2009; Bidwell, 2013; Ek, 2005; Krohn & Damborg, 1999; Swofford & Slattery, 2010; Warren & McFadyen, 2010). Despite this high level of public support, particular wind farm developments often meet local opposition, which is thought to potentially block or at least slow down the implementation (Wolsink, 2007). Thus, public acceptance is considered as one of several factors limiting the growth of wind energy (Ellis, et al., 2007; Toke, 2005). Many studies have therefore focused on the search for explanations and underlying reasons for this public opposition. Public support, on the contrary, has been studied less (Ellis, et al., 2007).

A very common explanation of the gap between strong general support and local opposition to particular wind farms among policymakers and developers, in the media and in public discourse has been to refer to NIMBY (Not-in-my-backyard) attitudes among the public (Cotton & Devine-Wright, 2012; Mcclymont & O'hare, 2008; Wolsink, 2012). The NIMBY concept is based on the assumption that people generally are positive towards developments, such as wind energy, but become resistant when these developments are planned in their own neighborhood. Thus, people are thought to place their individual interests above the common good. NIMBY is often attributed to local publics in a pejorative and sometimes even insulting way with underlying assumptions of resistant publics as irrational and selfish. Partly because of this negative depiction of publics, the use of the NIMBY concept to explain local resistance to wind energy projects has been widely criticized (Aitken, 2010b; Devine-Wright, 2009; Haggett, 2011; Wolsink, 2012). The NIMBY concept has also some underlying issues of racism, class and gender, which however, have been addressed more in studies on conflicts about the siting of other facilities than wind turbines (Wolsink, 2006).

Also, an increasing number of studies points out that the assumptions, which the NIMBY-concept is based on, i.e. the proximity hypothesis and the decreasing property value hypothesis, do not always apply (Wolsink, 2012). By contrast, many

studies show that people living close to wind turbines are as supportive or even more supportive towards wind energy than people living farther away and that the distance to wind turbines has no significant effect on property prices (Ek, 2005; Haggett, 2010; Hoen, Wiser, Cappers, Thayer, & Sethi, 2011; Jones & Eiser, 2010; Swofford & Slattery, 2010; Warren, Lumsden, O'Dowd, & Birnie, 2005). However, although the NIMBY concept has been declared inappropriate as analytical tool by mainstream social science (Burningham, 2000; Wolsink, 2006), e.g., Burningham et al. (2006) and Wolsink (2012) show that it is still found as unquestioned explanatory tool, even in some academic studies (see e.g., Dear, 1992; Lim & Lam, 2014).

Following the criticism of the NIMBY concept, other explanations for public opposition to wind energy have been suggested. In a widely cited paper, Bell et al. (2005) characterize the observed gap between high general public support and local opposition as "social gap" and propose three explanations for it: (1) the democratic deficit explanation, i.e. that a strong opposing minority dominates decision-making because the supporting majority is silent and does not have the same incentives to participate in decision-making, (2) the qualified support explanation, i.e. that most people support wind energy with qualifications and that certain conditions, such as the protection of biodiversity and landscapes or community benefits, have to be met for people to be supportive, and (3) the self-interest or NIMBY explanation. Hence, Bell et al. argue that NIMBYism, or what they call the individual gap, is just part of the explanation for the social gap and cannot alone explain local opposition.

However, an increasing number of publications focusing on explaining public opposition with more complex explanations than the NIMBY concept, inspired Bell and colleagues to revise their explanation of the "social gap." Instead of explaining the social gap with "any single attitude type" (Bell, Gray, Haggett, & Swaffield, 2013, p. 130), they explain it with two factors, which partly are a combination of the three single explanations in their original paper. First, they argue that "there are large numbers of qualified supporters and (some) place protectors as well as a few unqualified opponents and, perhaps, some self-interested NIMBYs, who may all work together to oppose particular wind energy developments" (Bell, et al., 2013, p. 130). Second, they point to the institutional rules in wind power

planning, which make it possible for a strong group of opponents to be successful in preventing wind energy projects although they only hold a minority view.

Another widely cited criticism of the NIMBY concept was provided by Devine-Wright (2009, 2011), who proposes to frame the so-called NIMBY-protest as "place-protective actions, which are founded upon processes of place attachment and place identity" (Devine-Wright, 2009, p. 432). He explains local resistance as reactions to changes or disruptions to places to which people are emotionally attached. Changes to such places may threaten place identity and thus cause place-protective behavior, such as opposition to the installations of wind turbines.

Underlying reasons for public attitudes, both in support and in opposition, have been investigated by many studies, both quantitative and qualitative. They include a diversity of issues ranging from visual impact of turbines, environmental consequences and noise to economic aspects connected to community benefits, job creation, stimulation of local economy, effects on electricity prices and tourism and issues of participation, procedural justice and trust, amongst others. However, conflicts about wind farm siting can often be attributed to contested values rather than contested facts (Warren & Birnie, 2009), or as Ellis et al. (2007, p. 521) argue, "key issues facing wind farm development are not 'objective' policy blockages, but clashes of values related to inter alia, governance, technology, landscape aesthetics, issues of participation and power inequalities."

Bidwell (2013), for example, finds that altruistic values encourage support of wind energy while traditionalist and conservative values nourish opposition. Warren et al. (2005) describe conflicts of environmental values related to wind energy as "green on green." With this notion the authors point out that conflicts about wind energy often divide environmentalists. Supporters would argue for clean, renewable, green energy and link it to climate change mitigation while opponents would refer to impacts on landscape and biodiversity. Thus both supporters and opponents draw upon an environmental framework in their argumentation.

Another focus of the literature on public engagement with wind energy is on the role of public participation in planning processes and decision-making and its

impact on the outcome of planned wind energy projects. Research indicates that local participation in decision-making and local/community ownership has a positive impact on public attitudes towards wind projects and may thus lead to more successful developments (Anderson, 2013; Devine-Wright, 2005; Toke, Breukers, & Wolsink, 2008). Trust between publics and developers is frequently mentioned as essential for public participation and thus for a more successful implementation of wind energy (Hall, Ashworth, & Devine-Wright, 2013; Walker, Devine-Wright, Hunter, High, & Evans, 2010).

While many studies regard public acceptance as an important factor for wind energy development, Aitken et al. (2008) and Aitken (2010a) challenge this assumption by showing that the role of public opposition is rather limited in planning processes. Wind energy developments that the authors studied were not prevented by local opposition groups, only delayed. The authors argue that decision-makers rather than local opposition groups are influential in the process and that the planning system itself limits the power of participating publics by constraining the kind of participation that would really challenge the wind energy development as such (Aitken, et al., 2008). However, later Aitken argues that not only the planning system but also local opposition groups themselves limit their participation possibilities (Aitken, 2010a).

In a different paper, Aitken (Aitken, 2010b) further criticizes the existing literature on wind energy for having other assumptions that, as she argues, restrict research and findings. She describes, for example, that the literature often presents support for wind power as "normal" and opposition as deviant. She accuses the literature of siding with wind developers and thus aiming to overcome public opposition and foster greater acceptance for wind power. She argues that "the literature must abandon that it knows who is 'right' and instead must engage with the possibility that objectors to wind power are not always 'wrong'" (Aitken, 2010b, p. 1840) and that a fair regard for opposing views would create a more open dialogue between the relevant stakeholders of wind energy projects.

To summarize, social science studies on wind energy have focused on public opposition and on finding the underlying reasons for it. How has public engagement

with wind energy been addressed in Norway? Norway does only have a few onshore wind farms. However, survey studies about onshore wind energy in Norway point to a positive attitude among the general public (Karlstrøm & Ryghaug, 2014). Bye and Solli (2007) suggest that the low degree of wind energy developments in Norway can be explained by the fact that wind energy has changed meaning in the public debate during the last decades. From being a green environment-friendly alternative energy source it has become a negatively connoted technological intervention in nature and landscapes. As such, the debate on wind energy could be characterized as an example of contested environmental values or a "green on green" conflict (Warren, et al., 2005). In a study of two wind energy projects, Solli (2010) points to the importance of environmental arguments, mainly related to biodiversity and in particular birds, for local opponents' strategies. He analyzed how opposition groups constructed their argumentation, e.g., by using birds to represent threatened nature, to fit both local and national environmental concerns in order to be successful and convincing. Also Rygg (2012) shows in her analysis of wind energy developments in local communities that opponents draw upon environmental arguments. However, contrary to expectations, supportive arguments did not refer to environmental issues such as sustainability or climate change mitigation. Instead, wind energy developments were framed as "modernization hybrids" (Rygg, 2012, p. 175), as solutions for economic problems of small municipalities promising employment and industrial development.

Siting offshore as solution for onshore problems?

As mentioned above, it has often been claimed, also in the Norwegian context, that offshore wind energy will be a solution to the problem of public resistance experienced onshore. Haggett (2008, p. 292) argues that offshore wind "is seen as a good thing not just in its own right, but because it may be the answer to many of the problems encountered with onshore developments."

In this context, it is important to remember that problems related to the development of onshore wind are diverse and complex and that the influence of local opposition on these processes is disputed. Thus, studies of public engagement

with offshore wind energy have often focused on the question whether a siting offshore really provides a solution to the "social gap" by preventing local opposition because turbines are placed at sea and thus removed from people. Parenthetically, this assumption alone could easily be said to have an underlying construction of publics as NIMBYs.

The expectation that problems with public resistance are solved when moving wind turbines offshore is supported by survey studies that show that people generally are even more positive to offshore wind energy than onshore wind energy (Karlstrøm & Ryghaug, 2014; Ladenburg, 2008). Nielsen, e.g., states that developers based on their experience with the Vindeby offshore wind farm in Denmark concluded "that there are no real problems – only advantages – in terms of environmental and public acceptance of offshore siting" (Nielsen, 2002, p. 122). Similarly, Mander (2008) finds in her study of discourse coalitions in wind energy planning in North West England that a siting of wind turbines offshore instead of onshore seems to be the only scenario upon which the otherwise disagreeing and conflicting groups of wind supporters and landscape protectors could agree.

However, other studies looking at particular offshore wind developments suggest that public concerns about offshore wind are quite similar to the ones about onshore wind energy although controversies may partly focus on slightly different topics (Ellis, et al., 2007; Haggett, 2008; Huber & Hobarty, 2010; Whitmarsh, et al., 2011; Wolsink, 2010). As Wolsink (2010) points out, most offshore wind farms are near shore and not "out of sight." Thus, seascapes may play the same role for public attitudes to offshore wind as landscapes for onshore wind. Moreover, Haggett (2008) adds, offshore wind farms may even be visible for a greater amount of people than onshore wind farms, and emphasizes the importance of studying visual impact.

Consequently, the influence of visibility and visual disamenities on public attitudes to offshore wind energy has been investigated thoroughly. Several survey studies suggest that publics are more positive to wind turbines when they are placed at a larger distance from shore than when they are placed near shore (Bishop & Miller, 2007; Krueger, Parsons, & Firestone, 2001; Ladenburg, 2009; Ladenburg & Dubgaard, 2007). The effect of visual impact on public attitudes is also related to

patterns of usage of beaches and coastal zones indicating that people who are more connected to the coast due to frequent usage perceive the visual impact of offshore wind farms more as disamenity than people using the beach less frequently (Ladenburg, 2010; Ladenburg & Dubgaard, 2007).

The effect of distance of turbines to the coast has been particularly studied in the context of tourism. Lilley et al. (2010) find that some beach-goers would avoid the beach due to the visibility of the offshore wind farm and that a siting further away from the coast would be preferable. However, the attraction to beaches with visible wind farms and the interest to take boat tours to the wind farm is greater than the avoidance of these beaches reported in the survey study. Thus, effects on tourism may be positive. Furthermore, Landry et al. describe that a majority of their survey respondents claim that an offshore wind farm could have a positive influence on the seascape and they conclude by characterizing public attitudes as "preference heterogeneity – some respondents find the scenario appealing while others find it aversive" (Landry, Allen, Cherry, & Whitehead, 2012, p. 110; see also Haven et al., 2011).

When discussing aesthetics and visual impact it is important to note that Kempton et al. (2005) find related to the Cape Cod wind farm off Massachusetts that what their respondents referred to as "the view" includes other concerns than only visual and aesthetic. The value and specialness of the ocean in general and the idea that humans do not have the right to intrude the ocean as well as a perception of the uniqueness of Nantucket Sound in particular all played into public perceptions linked to aesthetic issues. Similarly, Gee (2010, p. 185) identifies "deeply held convictions of the sea as a natural space, [and] deeply held views of the local landscape and linked to this local identity" as major public concerns related to offshore wind developments in Northern Germany. This could be related to the concepts place attachment and place identity mentioned above (Devine-Wright, 2009).

Several studies focus on the Cape Wind project that I just referred to, which is the first offshore wind park to be built in the USA. Cape Wind has been very controversial. Comparing public attitudes to a project in Delaware to public attitudes

to the Cape Wind project, Firestone et al. (2012a) find 80% support in Delaware vs. only 57% support for Cape Wind in 2009.

By conducting survey studies in different years (2005 and 2009), Firestone and colleagues are able to show the dynamic nature of public attitudes. Firestone & Kempton (2007) analyze the underlying factors of the public attitudes. Most participants of their study expected negative impacts of the offshore wind farm mainly with respect to aesthetics, community harmony, fishing and recreational boating and a little less on property value, bird life, marine life, and tourism. The main positive impacts expected by local publics were on electricity rates, job creation and air quality. Interestingly, both supporters and opponents ranked environmental effects as main reasons for their attitudes, pointing to a "green on green" conflict also here. In the survey study conducted four years later, Firestone et al. (2012a) find that the main reasons for opposing the offshore wind park were linked to the usage of the sea; that is local fishing and recreational boating, while support was related to energy independence and electricity price. Thus, as Firestone (2011, p. 236) argues, "findings are snapshots in time." Public perceptions and opinions are highly dynamic and contextual, rather than predetermined and static (González & Estévez, 2005).

As we have seen in the case of onshore wind energy, also debates about the development of offshore wind energy are characterized by contested values underlying the conflicts rather than contested facts (Kempton, et al., 2005). Conflicts can often be characterized as "green on green" or as conflicts of contested environmental values. In the early Cape Cod study, Firestone & Kempton (2007) find that both supporters ranked environmental effects as main reasons for their attitudes. González & Estévez (2005) describe divided environmentalists in the context of a proposed offshore development in Southern Spain, where Greenpeace and the Green party were supporting the development while local ecologist groups were among the opponents.

The unfolding of planning and decision-making processes affects public opinion also related to offshore wind developments. Public participation and local ownership is claimed to be important for a successful implementation (Sørensen,

Hansen, Hammarlund, & Larsen, 2001; Wolsink, 2010). However, as e.g., González & Estévez (2005) show in their study, participation exercises have to be organized in a way so that public stakeholders feel that they actually have influence on the decision-making. In addition, trust in developers and organizers of participation exercises need to be established for a successful process. In this particular case in Southern Spain, a forum was organized to activate public participation. However, in the end it seemed more effective for local opponents to stay on the outside and protest mainly through a media debate than to participate in the formally organized processes. Some reasons for this were a lack of trust in the administration and developers and that local actors experienced a lack of will on the side of administration and developing companies to discuss with local actors. Also Firestone et al. (2012b) show that positively perceived transparency, fairness and local participation correlated with supportive public opinion, thus supporting the assumption that public participation in planning processes influences public attitudes.

Gray et al. (2005) address the issue of participation by studying the controversy or "power game" between offshore wind developers and the fishing industry in the UK. The fishing industry is indeed one of the most important stakeholder groups related to offshore wind energy and also a new actor who did not appear to be relevant related to onshore wind energy. The authors describe the fisheries' position as rather weak compared to the powerful offshore wind industry, which, at least in the UK, has political as well as public support. Similar to the local opposition groups in Spain described above, the fishery community perceived the formal participation exercises "as mere cosmetic exercises, with little meaningful dialogue at national level between fishing and wind energy representatives" (Gray, et al., 2005, p. 134). However, other than in the Spanish case, due to the relative weakness of the fishery the authors concluded that the fishery would only "stand a chance of resisting the relentless spread of offshore wind turbines" (Gray, et al., 2005, p. 139) if they presented themselves as more united and succeeded in mobilizing potential allies, such as local communities or environmental conservationists.

To summarize, it has been a common expectation that offshore wind energy is different than onshore wind in the sense that it generates more public support and easier public acceptance. This may be true for some cases. Against expectation, however, many studies about developments of particular offshore wind farms in places, such as Northern Ireland (Ellis, et al., 2007), North Wales (Devine-Wright & Howes, 2010), Northern Germany (Gee, 2010; Glaeser, 2004), the Dutch Wadden Sea (Wolsink, 2010), Southern Sweden (Waldo, 2012) and Southern Spain (González & Estévez, 2005) show that offshore wind farms generate opposition just as or even more than onshore wind farms, suggesting inter alia strong public concern about and place attachment to seascapes. Thus, as Haggett (2011) claims, environmental issues, visual impact, spatial considerations, local context such as place attachment to seascapes as well as issues of participation and trust are as relevant offshore as onshore. However, relevant stakeholders and particular issues within these categories that are contested may differ. Hence, siting wind farms offshore does not automatically solve "onshore problems."

How do public attitudes towards offshore wind play out in Norway? Not much research has addressed these issues. Survey studies suggest that a great majority (79%) of respondents has positive attitudes (Karlstrøm, 2010). However, the planned offshore wind farm Havsul has been controversial. Thele (2008) argues that this controversy largely was about contested definitions of nature, which were at the basis of discussion about a range of issues, such as economy, environmental protection and health, related to the proposed offshore wind development. Thus, it could also be described as 'green on green' conflict.

This overview of some social science studies on public engagement with wind energy has shown that public attitudes are complex, dynamic and contextual and that debates are characterized by contested values. I introduced this section with the promise/hope that it would shed some light on the relevance of socialization in the context of offshore wind energy. Why is it important to socialize offshore wind technology? This overview of earlier research on offshore wind energy and publics indicates that technological innovation is not a linear process. Public acceptance of and participation in offshore wind energy development are considered important

factors of a successful implementation. Hence, contrary to expectation, the moving of renewable energy production offshore does not make publics irrelevant for technology development. The studies reviewed here suggest that also offshore wind technology needs to be embedded in society in order to be deployed. Socialization stands out as a central challenge.

The majority of the studies reviewed here have only shown the public side of public engagement with offshore wind energy. Social science studies dealing with science/technology – society relations have not focused much on technology design and development, but mainly on implementation issues such as public attitudes, accept, and responses. This thesis changes the focus to an equally important and relevant area - I will argue - for the understanding of public engagement with science and technology; the socialization of technology. How shall we understand socialization?

The socialization of technology

As we have seen, the overview of the literature about public engagement with wind energy already indicates that technology is not following a determined trajectory or linear path of innovation, but that technology development happens in and is influenced by its social context. The concept of the socialization of technology, which I draw upon as overarching theoretical resource for this thesis, addresses these issues through its focus on the relation between technology and society. Before discussing the socialization of technology concept further, I would like to briefly and selectively give attention to some of the underlying basic STS (science and technology studies) tenets for studying the socialization of technology.

A central feature in these STS teachings is a critique of technological determinism. In short, the main thinking of technological determinism is that the development of technology is happening independently from its social context and following an inner logic. Furthermore, technology is believed to cause social change. Russell and Williams (2002, p. 39) précis the technological determinist thinking as follows: "Technological change is depicted as beyond social influence; even its adoption is often seen to be determined by a 'technological imperative.'"

However, as Bijker and Law argue, technologies do not develop according to an inner technological logic, "all technologies are shaped by and mirror the complex trade-offs that make up our societies" (Bijker & Law, 1992, p. 3). Hence, technologies are not only technological but also social. They could be described as socio-technical entities. Science and technology are described as socially constructed (Pinch & Bijker, 1984) or socially shaped (MacKenzie & Wajcman, 1985; Sørensen & Williams, 2002; Williams & Edge, 1996). Alongside the critique of technological determinism is a critique of linear models of innovation.

Jasanoff (2004) uses the notion of "co-production" to refer to of the mutual embeddedness of the social and technical. She argues that natural and social orders, the material and the social, are ongoingly produced together. Jasanoff emphasizes "the constant interplay of the cognitive, the material, the social and the normative" (Jasanoff, 2004, p. 38). Thus, with the notion of co-production Jasanoff not only subtends technological determinism but social determinism too. Also actor network theory (ANT) emphasizes the embeddedness of technology and society. Humans and non-humans alike are treated as actors. Hence, ANT engages in dissolving dualisms, such as material and social or technology and society (Law, 1999).

All these STS notions criticizing the technological determinist thinking emphasize the embeddedness of the social and the technical and direct our attention to the mutual processes through which technology and society are embedded. Hence, let us return to the concept of the socialization of technology, which focuses on linking technology to society.

In the *Handbook on the Socialisation of Scientific and Technological Research*, Bijker and d'Andrea propose the idea of socialization as overarching perspective "to overcome the great fragmentation characterising analysis and management of science-society relationships" (Bijker & d'Andrea, 2009, p. 21). They start their discussion of the concept of socialization of scientific and technological research by referring to a paradoxical situation of science and technology. On the one hand, science and technology increasingly gain importance for social and economic development and consequently get linked more closely to society. On the other hand, they observe an increasing mistrust towards science and

technology and thus their potential marginalization in society. The authors argue a changed relationship between science and society is the basis of this paradox.

This changed relationship has, e.g., been addressed by the Mode 1/Mode 2 model (Nowotny, Scott, & Gibbons, 2001). Mode 1 represents the "traditional" way of doing science, which is characterized among other things by being placed in the academic context within clearly marked-off homogeneous disciplines. Mode 2 is described as a heterogeneous practice, which takes place in the context of application. Knowledge is produced transdisciplinary and its production involves not only scientists but political and social actors as well. The research process is described as a dialogue with the users of the knowledge produced and research results are not only controlled and validated by fellow researchers but also by a wider range of social actors and user groups (Nowotny, Scott, & Gibbons, 2003).

Hence, Bijker & d'Andrea (2009) refer to more entangled and complex relations between science and society and describe science and society as co-constructed. At the same time, though, they describe research as less embedded in society than before. This low level of embeddedness may explain the problems that science and technology meet in society. Socialization, then, describes the embedding of science and technology into society or as the authors put it: "the processes involved in the production, use and circulation of scientific research and its products in an inseparable connection with its social context" (Bijker & d'Andrea, 2009, p. 62).

Nielsen & Heyman (2012), e.g., suggest that an early socialization of emerging technologies leads not only to less obstacles in the implementation, but also to a better technology design. Comparing engineers' communication in the field of wind technology in Denmark and Germany, the authors argue that both technical communication among engineers and socio-technical communication with other societal actors were crucial for a successful technology design.

Keeping in mind the literature on public engagement with wind energy, we should note that publics actively make sense of the science and technology that is socialized. Sørensen (2013) argues that socialization facilitates a domestication of

technologies. Domestication in its original sense refers to the taming of wild animals. In technology studies, the concept of domestication has been used to describe processes by which users "tame," that is, make sense of, ascribe meaning to and integrate new technologies into their everyday life (Berker, Hartmann, Punie, & Ward, 2006). Sørensen (2006, p. 40) refers to domestication as "the complexities of human performance or enactment of technologies, related to what is commonly seen as ownership and use." Thus, the processes of embedding a technology into society could be described as preparing for a domestication of the technology by the public.

Socialization can be understood descriptively as "interconnectedness between science, technology and society" or prescriptively as "objective for science and technology" (Bijker & d'Andrea, 2009, p. 62f). Bijker & d'Andrea identify six areas of socialization: scientific practices, scientific mediation, scientific communication, evaluation, governance and innovation. Thereby, they emphasize the role of scientists and scientific and government institutions as agents of socialization. However, any actor making a contribution to link science and society can be considered a socialization agent.

I divided this section on the socialization of science and technology into three subsections. The first discusses scientists as socialization agents, the second discusses media as socialization agents and the third subsection proposes to regard Latour's (2005a) notion of Dingpolitik as socialization.

Scientists as agents of socialization

This thesis focuses in particular on scientists as agents of socialization. With the concept of the civic scientist, we may come a little closer to what being a socialization agent may entail. Civic scientists are scientists who make knowledge accessible in the public sphere. They communicate their research to a general audience, and facilitate public debate and decision making (Checkoway, 2001; Kyvik, 2005). A civic mission is often described to be driven by external factors, such as institutional facilitation in the form of rewards for socialization activities, organization of community partnerships or education efforts towards future scientists. Greenwood and Riordan (2001, p. 31), however, argue that "being a civic

scientist […] requires a deep personal call to action" and that the motivation for being agents of socialization comes from the citizen in the scientist.

Still, the socialization that is mainly referred to as science communication to the public here, may unfold in many different ways. To gain better insight into what being an agent of socialization may involve for scientists, I now outline several approaches to the socialization of technology. The remaining subsection on scientists as agents of socialization is structured as follows: First, I look into science policy to see what role scientists are attributed here. Then I provide a short overview of the theoretical development of the field of Public Engagement with Science and Technology (PEST) by referring to different approaches to science-public relations and socialization. After discussing the different ways scientists may approach socialization I propose the notion of "imagined publics" as helpful tool for studying scientists' views on and strategies of socialization and I provide an overview of some earlier research on scientists' imagined publics. Finally, I address the issue of science communication and refer to some earlier studies about scientists' views and practices of this issue.

What role should scientists play? Socialization in science policy

An expectation towards scientists to act as agents of socialization has been articulated in science policy particularly on the European level. Since more than a decade, both the European Commission and member states focus on science and publics. Felt et al. (2007, p. 13) claim that public engagement "has become an almost obligatory passage point for science policy in some countries." The "Science in Society" (SiS) initiative of the European Commission, which is integrated into the Seventh Framework programme (FP7), emphasizes the central place of science in society and encourages societal engagement with science. On SiS's web page, e.g., it is written that "[n]ow more than ever, science must engage with us, and we must engage with science" (European Commission, n.d.).

An important motivation for the emergence of initiatives to engage publics with science is to rebuild trust in science, as survey data reveal a "lack of interest in scientific activities or even fears regarding some of their impacts" (European

Commission, 2002, p. 7). New forms of science-society relations are suggested in order to meet this aim. In a European Commission working paper from 2000, which forms a basis for the discussion of science and society on the European level, a two-way engagement between science and publics is emphasized. It calls for "new forms of dialogue between researchers, experts, political decision-makers, industrialists and members of the public," (Commission of the European Communities, 2000, p. 16) such as citizens' juries, to facilitate democratic debate and decision-making. Although this document points to the importance of public knowledge and understanding of science in order to be able to engage in a proper dialogue about science, it stresses that science also should listen to society and that the aim of a science-society dialogue is not to produce favorable public attitudes towards science but "to create the conditions for an informed democratic debate" (Commission of the European Communities, 2000, p. 16).

Following up this Commission working paper, the European Commission launched the "Science and Society Action Plan" aiming to "develop stronger and more harmonious relations between science and society" (European Commission, 2002, p. 3). Strategies to reach this aim center around three areas: (1) *Promote scientific and education culture*: In order to participate in our democratic knowledge society citizens need a certain degree of knowledge and access to information about science and technology. In addition, dialogue between science and publics should be fostered. (2) *Bring science politics closer to citizens* through public participation in debates on science and technology, more gender equality and directing scientific activity more towards addressing current questions and public concerns such as sustainability, terrorism or globalization. (3) *Put responsible science at the heart of policy making* by focusing on research ethics, addressing uncertainties and risk issues and improving the use of experts in policy making (European Commission, 2002). The particular role of scientists as socialization agents is described in the European Charter for Researchers, which mentions that scientists are responsible for the dissemination of their research results to society in an easily understandable way to enhance public knowledge of science (European Commission, 2005).

Likewise, in Norway scientists are attributed the role as socialization agents. Universities and colleges of higher education are obliged to disseminate their research results and to facilitate the participation of students and employees in public debate.[11] Furthermore, several white papers on science policy address public engagement. The white paper headed "Vilje til forskning"[12] (St.meld.nr.20, 2004-2005) gives most attention to the issue. Similar to the European policy documents, it emphasizes the importance of society's access to and influence on research. In order to develop new knowledge and technology in a way that is beneficial to society, the white paper argues, the debate about science and its future development has to involve lay people. However, the public needs to be knowledgeable and interested as precondition for entering such a broad debate about science. Thus, research institutions as well as individual scientists, among others, should engage in disseminating and communicating their research to the public with the aims of educating the public, arousing public interest and curiosity, and democratization, i.e. to provide knowledge to enhance active public participation.

The white paper also points out that two-way communication rather than one-way information between science and society is increasingly emphasized (St.meld.nr.20, 2004-2005). A few years later, another science policy white paper (St.meld.nr.30, 2008-2009) adds that dissemination and communication to the public is especially important in new fields of research. Research on offshore technology could be characterized as such a new field. The latest white paper on science policy (St.meld.nr.18, 2012-2013) emphasizes the issue of public trust in science, similar to the EC-documents mentioned above. It also addresses the increasing role of science communication for marketing purposes, and argues that it is therefore even more important that publics are knowledgeable and media critical.

A particular role for the socialization of technology in Norway has the Norwegian Board of Technology. It is responsible for participatory technology assessment and organizes activities based on the principle of two-way dialogue, such as lay conferences (Teknologirådet, 2008). The Board is an independent public body

[11] http://www.lovdata.no/dokument/NL/lov/2005-04-01-15?q=universiter*
[12] English: the will to research

with the task to identify technological challenges and to stimulate a public debate about new technologies and the involved benefits and consequences for society and individuals. The Board is described as "intermediary between research, politics and the public" (EPTA, 2012, p. 61).

The Board claims idealistic motivations for its activities, such as the importance of involving lay people in decision-making to address ethical and value-related issues related to important technologies with big consequences for society and nature. However, the motivation is also pragmatic since an early public participation is expected to legitimate decisions and to increase public accept and thus provide for an easier implementation of the technologies (Teknologirådet, 2008). Although the dialogue with lay people is one of the main tasks of the Board, it has recently been criticized for using methods that involve lay people in a lesser degree than methods involving only experts to assess technologies. Thereby, it loses its role as facilitator of democratic debate about technology development (Langfeldt, Ramberg, & Tømte, 2011).

A different kind of socialization, however very relevant in the context of wind energy, is provided by the formal planning and licensing processes in Norway, which provide opportunities of public participation. According to the Norwegian plan and building act, planning authorities have to provide information to the public and enable the participation of affected groups. The formal licensing procedure includes several public hearings, thus introducing a participatory democratic aspect in the planning processes of wind parks (Gjerald, 2012).

To summarize, scientists should disseminate scientific knowledge and educate the public. They should engage in a two-way dialogue, listen to public concern, and address these concerns in their scientific activity. Although there is a clear move towards dialogic and participative socialization activities, knowledge dissemination and public education are still described as central activities in science policy. To understand the background of these different approaches to socialization I will now turn to the research on public engagement.

Socialization as education, dialogue and co-production: Public Engagement with Science and Technology

The scholarly field commonly referred to as Public Engagement with Science and Technology (PEST) comprises approaches for social science analysis of science-public relations. Public engagement as an overarching framework is multidirectional. As I will discuss later, it addresses public engagement with science and technology as well as scientists' engagement with publics. Socialization, then, focuses mainly on downstream efforts of linking technologies to society. Particular public engagement activities, such as consensus conferences or citizen juries, can be described as socialization practices. As in science policy referred to above, in the field of public engagement scientists are considered potential agents of socialization. However, different approaches to public engagement attribute different roles to scientists and vary in their views on how socialization should be carried out.

The theoretical development in the PEST field, which started as, and is still known under the heading of Public Understanding of Science (PUS), is usually described by referring to three different approaches to public engagement and science-society relations. These approaches are commonly referred to as (1) public education approach, (2) public dialogue approach and (3) public co-production of knowledge approach. Other terms are used as well. A very common one is the term deficit model for a version of the public education approach.

The public education approach could be described as the first approach to socialization within this field. When the field emerged, a main activity was to test the public understanding of science, that is, people's knowledge about science and technology. The survey studies that were carried out revealed deficits in the public's scientific knowledge. Hence, the aim of the public education approach was to improve the public's scientific literacy through science communication activities or, as Rowe and Frewer (2005, p. 263) state, "maximizing the relevant information from the sponsor and efficiently transferring it (with minimal information loss) to the maximum number of the relevant population." An improvement of scientific literacy among the public was thought to establish more trust and prevent resistance towards science and technologies (Callon, 1999; Stilgoe & Wilsdon, 2009).

In the public education approach, socialization is conceptualized as one-way science communication: a linear process of information transformation from the scientists to the public (Bucchi & Neresini, 2008). Scientific knowledge and lay knowledge are viewed as two separate spheres of knowledge. Scientific knowledge is presented "as the embodiment of truth" (Irwin, 2008, p. 203), as "a body of objective, universal, value-free facts that is epistemologically superior to other ways of knowing" (Holliman & Jensen, 2009, p. 37). The public is viewed as passive recipient of scientific knowledge, as "an undifferentiated mass of scientific illiteracy" (Holliman & Jensen, 2009, p. 37), who is potentially hostile towards and mistrusts new scientific or technological developments. This partial view on socialization as an activity to reduce public deficit provoked the introduction of the term "deficit model" for this approach.

The public education approach and in particular the focus on public deficit have provoked strong criticism during the last two decades. The survey studies of public understanding of science were criticized for not taking into account the social context and the "socially rooted meanings that key terms have for social actors" (Wynne, 1995, p. 370). Critics argue that not only publics but also science should be problematized. Moreover, they criticize the depiction of lay knowledge as inferior to scientific knowledge and of publics as passive. Critics claim that publics are not passively receiving scientific knowledge but actively debating, negotiating, interpreting, reframing, making sense of and dealing with scientific knowledge. Communication should not be one-directional, but dialogic. Thus, the public dialogue approach to science-public relations was proposed. Important authors initiating this were, e.g., Brian Wynne and Alan Irwin (Irwin & Wynne, 1996).

The public dialogue approach conceptualizes socialization as two-way communication, and thus more symmetrical. Both science and the public are considered heterogeneous categories and both scientific and lay knowledges are conceptualized as "socially and culturally contingent" (Bucchi & Neresini, 2008, p. 451). Lay knowledge is thought to enrich scientific knowledge. Hence, by taking lay knowledge into consideration the approach aims to break "scientists' monopoly over speech" (Callon, 1999, p. 89). Rowe and Frewer (2005, p. 254f) describe the aim of

this approach, which they term *public consultation*, as "maximizing the relevant information flow from the maximum number of the relevant population and transferring it to the sponsor." Although the publics' understanding of and interest in scientific problems as well as their local knowledge are higher valued here than in the public education approach and considered as relevant for scientists (Miller, 2001), scientific and public knowledge are still considered as two separate spheres.

In the third approach to public engagement, the public co-production of knowledge approach, socialization allows for a more extensive engagement of scientists with publics. Here, public participation is not just thought as response to science through increased dialogue, but publics are thought to take part in deciding on the relevance, benefits and risks of science. With the concept of upstream engagement (Stilgoe & Wilsdon, 2009), e.g., socialization can be described as a facilitation of public involvement early in processes of technology development and decision-making.

Public participation is viewed as central for the production of knowledge. While the other two approaches maintain scientific and public knowledge as separate spheres, the co-production approach aims to resolve this separation. By calling for a co-production of knowledge by scientists and lay-people, the approach redefines the relation between science and publics (Bucchi & Neresini, 2008). Callon (1999, p. 91) argues that collective learning is central in the co-production approach "since the different knowledge is mutually enriching throughout the process of its co-production." The knowledges are intermingled and can therefore not be categorized clearly as either scientific or lay knowledge. This implies that strict categorization of this kind is obsolete.

Both the dialogue and the co-production approaches regard socialization less as relating science to the general public, but rather as an engagement with concerned groups (Callon, 1999) or publics in particular (Michael, 2009), that is publics who have a particular interest in the scientific or technological issues at stake. These participative approaches to socialization are often said to have democratic potential and are related to the idea of the democratization of science (Stengers, 1999). However, they (particularly the concept of upstream engagement) could also be

described as a form of cooptation, i.e. to include public concerns early in technology development in order to neutralize conflicts and to prevent public debate later (see e.g., Selznick, 1966). To account for the different rationales and motivations driving socialization, Stirling (2008, based on Fiorino, 1989) distinguishes three imperatives for public engagement: normative, instrumental and substantive. While under normative imperatives well-conducted participation processes by itself are considered as a right and good thing, under instrumental imperatives participation processes aim at particular ends, similar to co-optation. Substantive imperatives also focus on outcomes of participation processes, however not instrumental outcomes (such as more accept and less resistance), but on general ends and qualities or as Stirling (2008, p. 271) puts it, on "explicit, socially deliberated, publicly reasoned evaluative criteria for the outcomes themselves" (such as general public well-being and health).

The development of the three main approaches to public engagement is often portrayed as a chronological development. Indeed, the theoretical development of this field can be described chronologically. However, since a range of empirical studies show that the public education approach has not completely been replaced by to two other approaches (Besley & Nisbet, 2013; Davies, 2008; Michael & Brown, 2005; Powell, Colin, Kleinman, Delborne, & Anderson, 2011; Tøsse, 2013), it is more appropriate to refer to these approaches as different modes or as Irwin (2008) suggests as "orders of thinking," which exist simultaneously and as hybrids (Bucchi, 2008). Irwin (2006) argues that new theoretical and policy developments, which clearly advertise participative approaches, are not simply changing existing relations of professional power. It requires changing institutional practices more fundamentally to reach the aim of a more democratic science.

To sum up, both science policy and the scholarly field of public engagement with science and technology stress the importance of public engagement in the context of emerging technologies. Scientists are expected to act as agents of socialization and they are increasingly expected to pursue dialogic and participative socialization strategies.

Burchell et al. (2009) argue that while the official, institutional development of these different approaches to socialization, from public education to more dialogic and participative approaches, which I illustrated here, has been given attention in social science research, "a sociological study of scientists' perceptions of these development represents a noticeable gap in the research literature" (Burchell, et al., 2009, p. 6). Hence, this thesis directs its focus towards scientists' views of and approaches to socialization, which in recent years increasingly have gained attention in science and technology studies as we will see below. I study offshore wind scientists as potential socialization agents by investigating their imagined publics and constructions of science-public relations. I will argue that scientists' imagined publics are significant for their socialization strategies and their role in public engagement.

Scientists' imagined publics

As shown above, an emerging literature deals with public engagement with offshore wind technology. Scientists' engagement with publics, however, has been addressed much less. Thus, we could say that scholarly interest has been on the domestication of renewable energy technologies by the public while socialization aspects have largely been neglected. This observation deserves particular attention in the light of the policy push behind the development of renewable energy and the focus on scientists as agents of socialization in science policy.

In a similar vein, Wynne (2014) observes that mainstream social science dealing with science-public relations has not addressed science in the same frame as publics. Hence, he argues that science should be problematized in the same manner as publics. Addressing scientists' imagined publics is an attempt to do that. In this section, I will first discuss the concept of imagined publics, particularly in the context of renewable energy technologies before providing a short overview of earlier studies on scientists' imaginings of publics.

Walker et al. (2011) propose a framework for understanding and conceptualizing public engagement in the context of renewable energy technologies and the processes, dynamics and interactions involved. The framework aims to go

beyond what the authors call "simplistic accounts of public engagement" (Walker, et al., 2011, p. 12), such as the NIMBY concept discussed above, and to represent the complexities involved in processes of public engagement.

The framework has four main characteristics: First, it focuses on symmetry by addressing both publics and RET actors (renewable energy technology actors, i.e. actors developing and promoting the technologies) and their interactions. Or we could say, the framework attends to both public engagement with science and technology and scientists' and other relevant actors' engagement with publics. Second, the framework addresses expectations and anticipations both of publics and of actors developing and promoting the technologies. The publics' expectations of impacts and benefits of renewable energy developments as well as of the project developers and the decision-making processes are thought to shape public acceptance of and engagement with renewable energy development. Likewise, RET actors' expectations of publics, technology developments and decision-making influence their interactions with publics. Third, the framework focuses on dynamics by acknowledging that expectations and engagement shift over time. Fourth, the framework gives attention to contextualities and situatedness such as the wider policy and economic contexts as well as the distinctiveness of local communities, cultures and places (Walker, et al., 2011).

The concept of imagined publics that I draw upon to investigate scientists as agents of socialization of offshore wind technology, relates mainly to the second characteristic of Walker et al.'s framework in that it focuses on scientists' anticipations and expectations of publics. While recognizing the dynamics and contextualities involved, the concept of imagined publics also corresponds to the symmetry characteristic in that it changes the focus from public engagement with science and technology, which is widely studied in the context of wind energy, to scientists' engagement with publics, which has been studied less and thus is a main focus of this thesis.

Maranta et al. introduce the concept of "imagined lay person" (ILP), which they define as "conceptions of lay persons as they are manifested in the products and actions of experts" (Maranta, et al., 2003, p. 151). As background for the

introduction of the ILP concept, the authors point to an epistemic divide between experts and lay people. However, since experts are to produce solutions, advice or assist for lay people, they have to consider the lay persons' world and thus estimate what might be relevant for lay persons. Hence, experts have to deal with a dilemma which the authors describe as follows: "the experts have to preserve the epistemic asymmetry, which is the basis for the epistemic division of labour, while they still have to formulate their advice in a way in which lay persons can apprehend and use in their own world" (Maranta, et al., 2003, p. 151). Moreover, experts commonly do not have direct contact with relevant lay persons, and consequently, the lay persons or users they consider are often imagined lay persons (ILPs). Hence, while doing their "normal" expert work, such as designing technologies, experts also construct lay persons. Maranta et al. (2003, p. 152) describe experts as "lay persons maker[s]." These ILPs, which are integrated to into the experts' work may be implicit. Also, ILPs may differ from "real" lay persons as they mostly are imagined with limited competence and possibilities of action. Rather, ILPs are "functional constructs in expertise" (Maranta, et al., 2003, p. 151).

Further, Maranta et al. (2003) argue that experts construe and thus address ILPs in different ways: as individualized ILPs, as representative ILPs or as generalized ILPs. Generalized ILPs are closest to the expression "imagined public" since they are addressed as collectives in contrast to the individual and representative ILPs, which are addressed as individuals or individual representatives of particular social groups respectively. More than the latter, the generalized ILPs result from experts' imaginaries, models and theories. Walker et al. (2010) describe the process of lay person making as follows: "through such actors constructing shared narratives and 'repertoires', shaped both by direct and by mediated interactions, an imagined, anticipated public is produced, given voice, and assigned a presumed subjectivity" (Walker, et al., 2010, p. 932).

Drawing on the work of Lippmann (1993 [1927]), Marres (2005, p. 216) argues that "a public is a partly imaginary entity," an abstraction or a *phantom*. She proposes to understand the phantomlike qualities of the public, its ungraspability and slipperiness, as an aspect of its agency. Hence, in that sense, the general public is

always abstract and imagined. Walker et al. (2010) propose to include the idea of the public as phantom, or as Latour (2005a, p. 38) puts it, "this fragile and provisional concept," in the understanding of imagined publics and to study how the phantom public is imagined and made real and influential.

Imagining publics may involve boundary work. Gieryn defines boundary work as scientists' "attribution of selected characteristics to the institutions of science […] for purposes of constructing a social boundary that distinguishes some intellectual activity as non-science" (Gieryn, 1983, p. 782). It often involves portraying science in a favorable and superior way. Woolgar (1991), for example, observes that experts "othered" lay people by creating contrasts between experts and users, us and them, insiders and outsiders.

Experts' imagined publics may be performative in the sense that they influence technology design. Scientists and engineers may include imagined publics in the design of their technology. Already Woolgar (1991) argues that future users and use are constructed in the process of technology design. Based on participant observation in a company producing microcomputers, or what he calls an "ethnography of computers," he claims that the construction of these computers involves a configuration of the future users. In order to illustrate his argument Woolgar employs the metaphors of "machine as text" and "user as reader." Constructing a machine is thought of in the same terms as writing a text. Hence, Woolgar emphasizes the interpretative flexibility of the machine; "the relation between readers and writers is understood as mediated by the machine and by interpretation of what the machine is, what it's for, what it can do" (Woolgar, 1991, p. 60). Writing the text (or designing the machine) entails a construction of the readers' identity as well as of their possible actions, and thus configures (i.e. defines, enables and constrains) the readers (users). The process of configuring the user while designing technology may happen implicitly or unconsciously.

Also Akrich argues that designers inscribe imaginaries of user roles and contexts of use in the design of technology. Like a film script, the technical objects define actors, their interactions and the spaces in which they act. Thus, she claims that "the designer expresses the scenario of the device in question – the script out of

which the future history of the object will develop" (Akrich, 1992, p. 216).

In addition to being performative in technology design as exemplified by Akrich and Woolgar, imagined publics may also be performative by influencing the implementation of the technologies in question and driving the experts' interactions with publics and their socialization activities (Maranta, et al., 2003). Interactions between experts and lay persons depend on how experts construe and imagine lay persons in their theories and what competences experts attribute to lay persons. Furthermore, experts' imaginaries of publics may influence the selection of certain engagement activities as well as of the suitable participants in these activities. Thus, they have a constraining effect on public engagement (Felt, et al., 2007; Whitmarsh, et al., 2011).

Hence, the imagined publics, which are produced by experts particularly in the context of application, are given agency. Imagined publics are performative and may have political impact. They may even have more significance than the "real" publics the experts meet face-to-face (Walker, et al., 2010, p. 943). In this way, the integration of imagined publics into the experts' work can be seen as a virtual form of public participation. While imagined publics possibly may be linked to "real" publics, they can also be very different. Publics involved with experts or their technologies in one way or another (e.g., as participants in engagement activities or as users of technologies) can, of course, divert from the inscribed roles and make sense of or use technologies in other ways than imagined by experts (Latour, 1988).

Welsh and Wynne (2013) differentiate between three different modalities of imagined publics developed since Post WWII in the UK, which partly can be described as parallel to the theoretical development within the field of PEST sketched above. The first modality has its beginnings in the 1950s. The authors refer to it as "publics as imagined and practiced non-entities" (Welsh & Wynne, 2013). In this context, publics were imagined as passive audience for technological developments and expected to approve of technologies or even regard them as sublime. Moreover, publics were not attributed a role in technology policy. Although publics were conceptualized as passive non-entities excluded from decision-making, there was still the possibility of public mobilization against

science and technology, which needed to be prevented. However, in general, publics were expected "to comply passively and gratefully with the policies of those who know best" (Welsh & Wynne, 2013, p. 561) within this imaginary.

The second modality of imagined publics identified by Welsh and Wynne, "publics as incipient threats," evolved in the 1990s. The authors describe this imaginary of publics as threat as scientists' and policymakers' frustrated reactions to increasing public resistance to science and technology. It parallels the deficit model with its conception of irrational ignorant publics resistant of science and technology.

The third and most recently developed modality of imagined publics is referred to as "politicised public as subjects of policing and surveillance" (Welsh & Wynne, 2013). The authors argue that parallel to the normative move in science policy and science studies in the 2000s from public education to dialogue, public engagement and participation, publics were increasingly perceived as security threats. When the publics' positions diverge from mainstream science policy, the authors claim, authorities perceive them as threats to the social and economic order and as potential danger for important scientific innovation. This imaginary of highly politicized anti-science groups is for example expressed in increased surveillance and control.

It is important to remember that these modalities identified by Welsh and Wynne (2013), although they developed in different times, today all are relevant. Also, imaginaries and resulting practices may exist in hybrid forms. While the authors describe these modalities as grand state-scientific imaginaries, this thesis focuses on academic scientists' imagined publics (which of course may draw upon such grand narratives) related to a particular emerging technology.

Scientists' imagined publics have mostly been addressed in the context of emerging technologies such as nanotechnology and biotechnology. Imagined publics are studied through survey studies or interviews with scientists or sometimes by observing or interviewing in the context of concrete public engagement activities as publics are also constructed through such activities.

As mentioned before, while an emerging literature addresses public

engagement with offshore wind energy, only very few studies change the perspective and address experts' engagement with publics related to offshore wind energy in particular or renewable energy in general. Furthermore, the few studies dealing with imagined publics in the context of renewable energy focus primarily on experts, who directly are involved in particular developments, rather than on academic scientists. At first sight, scientists may seem less obvious socialization agents than experts directly involved in the implementation of particular developments. However, focusing on scientists makes it possible to investigate the implications of imagined publics not only on implementation and engagement activities but also on the design of the technology itself. In addition, it enables an evaluation of the communication mandate attributed to scientists by science policy.

How have publics been constructed by experts in the context of offshore wind in particular and renewable energy in general? Imagined publics related to offshore wind energy are touched upon peripherally by only a few studies about public engagement. Through a focus on processes of public participation and how these influence public attitudes, these studies also address experts' perceptions of publics. For example, in a study about barriers to the Firth of Forth offshore wind farm in Scotland, stakeholders imagined particular publics, mainly the fishing industry, as potential barriers. The general public, by contrast, was not imagined as barrier because the wind farm was planned to be placed far offshore where it would hardly be visible (O'Keeffe & Haggett, 2012).

One study explicitly dealing with imagined publics and offshore wind energy among other renewable energy technologies is the study by Walker et al. (2010), which is based on interviews with actors within the renewable energy industry and policy development. However, the authors refer especially to offshore wind energy only in a few sentences. They find that interviewees expected offshore wind to generate less public resistance than onshore and attribute the strong focus on offshore wind energy in the UK to the prospect of not having to deal with public opposition. For renewable energy technologies collectively, Walker et al. (2010) find that their interviewees imagined the public to be generally supportive. However interviewees expected resistance to specific renewable energy developments. Thus,

imagined publics parallel the NIMBY (not in my backyard) concept. Onshore wind energy appears to play a prominent role in experts' imaginings of renewable energy publics as talk of resistant publics commonly referred to it.

Several studies show how experts' imagined publics advance different approaches to public engagement (see e.g., Cotton & Devine-Wright, 2012; Skjølsvold, 2012). For onshore wind energy, Barnett et al. show that publics were imagined as knowledge deficient and concerned and that engagement strategies were constructed accordingly as "information provision and addressing concerns" (Barnett, Burningham, Walker, & Cass, 2012, p. 46). Cass & Walker (2009) describe how industry actors strategically dismissed onshore wind opposition by constructing public concerns as emotional. Engagement activities would then have as objective to moderate emotions.

Again, studies about imagined publics related to renewable energy are few and focus mainly on industry actors, developers and other stakeholders directly involved in implementation. This thesis focuses is on academic scientists. How have academic scientists across disciplines imagined publics?

Besley and Nisbet who review the literature on scientists' views of the public find that scientists often imagine the public either as one homogeneous group or as several "specific homogeneous groups of lay-persons" (2013, p. 648). This is similar to Michael's (2009) differentiation between the public in general (PiG) and publics in particular (PiPs). Publics in particular could be stakeholders and interest groups such as environmental organizations or broader groups such as consumers, citizens or neighbors. Several studies also observe a distinction between constructions of public that are "purely imagined" and constructions based on "actually experienced" publics (Blok, Jensen, & Kaltoft, 2008; Burningham, Barnett, Carr, Clift, & Wahrmeyer, 2007).

Braun and Schultz (2010) differentiate between four imaginings of publics, which, they argue, are constructed in different contexts of public engagement: the general public, the pure public, the affected public and the partisan public. The general public refers to a generalized public collectivity and is, according to Braun

and Schultz, constructed through surveys that aim to produce knowledge about the public understanding of the science or technology in question. The pure public is constructed through engagement formats such as citizen juries. Ideally, the pure public is not linked to any interest group, is ignorant of and has no opinion about the scientific or technological topic to be discussed and at the same time open to be educated about it. The affected public represents people, who themselves or whose relatives have relevant experiences, such as living with a disease. The affected public is involved in engagement activities in order to provide knowledge in form of authentic experiences to the experts; education is thus going from publics to experts. Last, the partisan public is made up of organizations or stakeholders with strong opinions about the scientific or technological issue in question. In contrast to the pure public, they "form an 'impure public' of opinionated trouble-makers" (Braun & Schultz, 2010, p. 413). The partisan public is consulted in order to get an overview of the landscape of arguments "out there."

Research on scientists' imagined publics suggests that scientists imagine publics as ignorant, as having little information and expertise, or in other words, a knowledge deficit (Besley & Nisbet, 2013; Boer, McCarthy, Brennan, Kelly, & Ritson, 2005; Burningham, et al., 2007; Powell, et al., 2011; Wynne, 2001). Scientists imagine the public and its concerns as irrational, emotional and self-interested and set the public up against rational, factual science. Thereby, scientists "other" the public, which is often perceived as being critical of science. Scientists demarcate themselves and create a cognitive divide between science and the public (Burningham, et al., 2007; Cook, Pieri, & Robbins, 2004; Kurath & Gisler, 2009; Michael & Birke, 1994; Stilgoe, 2007). Public resistance is explained with knowledge deficits and attitudes based on emotion, self-interest, and irrationality, and is thus declared illegitimate. Publics are also depicted as passive and vulnerable to the influence of for example NGOs, media and other interests.

Scientists are seen to blame particularly the media for "wrong" public attitudes. They are critical of the media coverage of their area of expertise and accuse the media of having a negative influence on the public (Besley & Nisbet, 2013; Boer, et al., 2005; Burchell, et al., 2009; Petersen, Anderson, Allan, &

Wilkinson, 2009; Young & Matthews, 2007). Tøsse (2013), e.g., describes that climate scientists blamed journalists for misinterpreting and misrepresenting climate science. Young and Matthews (2007) find in the case of aquaculture that experts' critical perspective on media coverage correlated with their supportive attitudes towards aquaculture science, while experts less supportive of aquaculture had more trust in a responsible media coverage. Hence, they refer to the "hostile media effect," i.e. that "partisans in highly controversial issues typically perceive media coverage as hostile to their own position" (2007, p. 134), to explain scientists' media blaming.

To summarize, imagined publics are believed to be performative and influence technology design as well as its socialization. Earlier research indicates that imagining publics involves boundary work; demarcating scientific knowledge from lay knowledge, or rather lay knowledge deficits. Hence, constructions of others are at the same time construction of selves. Through the imagining and construction of others, in this case publics, scientists also construct their own role. Thus, I will now discuss some previous research on scientists' views of their own role in science communication and public engagement.

Scientists' communication with the public

Increasingly, scientists and other experts seem to believe that they have a role as agents of socialization in public engagement (Barnett, et al., 2012; Boer, et al., 2005; Burchell, et al., 2009; Walker, et al., 2010). Objectives for scientists' engagement are manifold and complex, ranging from facilitating a democratization of science to preventing negative public attitudes or expecting increased funding (Barnett, et al., 2012; Burchell, et al., 2009). Despite the increased awareness of public engagement as part of their role as scientists, earlier research points to a hesitation among many scientists to take on the role as agents of socialization and engage with society. This has particularly been noted among European scientists (Bijker & d'Andrea, 2009; Neresini & Bucchi, 2011).

Explanations for this hesitation to engage with publics are manifold. Scientists regard potential socialization activities mainly as science communication

through mass media. However, as we have seen above, they are often critical of the coverage and fear to be misrepresented in the media. Science communication is perceived as difficult and dangerous (Davies, 2008) or as McDaid (2008, p. 28) puts it, it involves "getting out of their comfort zone and working in unfamiliar territory." Furthermore, scientists' hesitation to socialize their research has been explained with a (perceived) lack of capacity, which includes both institutional constraints such as an exclusive focus on academic publications and a lack of time and reward for public engagement, and scientists' limited abilities or insecurity about their abilities to communicate their research. Moreover, an involvement in public engagement activities is believed to have negative impacts on career advancement and reputation (Gregory & Miller, 1998; Kyvik, 2005; McDaid, 2008). However, Poliakoff and Webb (2007) find that in addition to scientists' perceived capability for science communication other factors influenced their intentions to involve in public engagement. These factors include the extent of scientists' earlier experience with public engagement, the perceived extent of their colleagues' involvement in engagement activities and their own attitudes towards public engagement.

However, whether active or hesitant agents of socialization, we may expect scientists at least to have some thoughts about how socialization activities should be carried out. How have scientists conceptualized science-public relations and in particular their (potential) role in science communication? As outlined above, different approaches to public engagement have been developed. Previous studies suggest that the deficit model, although widely criticized in social science, is a dominant construction of science-public relations among scientists (Besley & Nisbet, 2013; Davies, 2008; Irwin, 2001; Michael & Brown, 2005; Powell, et al., 2011; Tøsse, 2013). This dominant deficit model is in line with the dominant imaginings of publics as ignorant and irrational, and thus as passive recipients of the information provided by the scientists. However, a few studies indicate that some scientists question the need for public education so prominently declared. Burningham et al. (2007) refer to a way of thinking about the public, which they describe as "they don't know, but why should they?" Similarly, Besley and Nisbet (2013, p. 648) report from recent survey data that "scientists agree the public knows

too little about science but disagree on whether this presents a problem."

Dialogic and participatory approaches to public engagement are usually only found among a minority of scientists (Besley & Nisbet, 2013; Davies, 2008). Still, Burchell et al. (2009), for example, find that biological scientists increasingly constructed publics as "intelligent, supportive and scientifically capable publics" (Burchell, et al., 2009, p. 6). Thus, in some cases there is evidence for a move from deficit to dialogue also in scientists' imaginings of publics.

To sum up, earlier research indicates that the public education approach to science communication and public engagement is dominant among scientists. We have seen that publics are often imagined as ignorant, irrational and resistant to science and socialization consequently as public education. However, earlier studies also note that scientists are hesitant to act as agents of socialization and communicate their research.

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In this thesis I aim to study the socialization of offshore wind technology by addressing scientists as potential agents of socialization. However, why should scientists engage in socialization activities and make an effort to link technology to society?

As we have seen there is an increasing pressure from science policy that scientists should disseminate their research and engage in dialogue and participative activities with publics. Thus, we may expect scientists to react to that pressure. We have also seen that scientists commonly imagine publics as potentially resistant and may expect these imagined publics to lead to active socialization strategies that aim to prevent this imagined resistance.

On the other hand, we may as well expect that scientists do not engage in socialization activities as earlier research observes a hesitation among scientists to involve in public engagement due to a lack of capacity, perceived inability and ambiguous relation to the media as main channel of communication. Also the particular context of offshore wind technology as a technology that may be implemented "out of sight, out of mind" is likely to play into scientists' views and

strategies of socialization.

However, before discussing these questions in a cross-cutting analysis of the three research papers that form the basis of this thesis, I will give attention to a second agent of socialization, namely, the media. As we have seen, scientists attribute an important role to the media. On the one hand, media are blamed for their negative influence on public opinion. However, at the same they provide an important communication channel to the public. How may we then understand the news media as agents of socialization?

Media as agents of socialization

News media have an important role in the socialization of emerging technologies (Petersen, et al., 2009). News media could be described as interface between techno-science and the public. They can be characterized as agents of socialization, in that they create links between technology and society. Schäfer (2012, p. 651) claims that "science coverage in the mass media was and still remains the major channel that bridges the gap between science and the general public." News media are a major source of information for the public (Nelkin, 1995). Although the "media effects" on public attitudes and perceptions are disputed, their agenda-setting power has been acknowledged (Cox, 2010; A. Hansen, 2010; Olausson, 2011).

News media can also be said to be a representation, although partial, of the public. Franzen et al. (2012, p. 8) argue that media construct the public, which unless organized in any form "only exists as an abstract 'referent' of actions and communication." Further, they claim, that "[t]his relation between an intangible and unorganized 'public' and the 'public' constructed by the mass media justifies regarding the mass media as an analytical proxy for the public" (Franzen, et al., 2012, p. 8). As such, news media are not only a source of information about science and technology for the public, but also a source of information for scientists about public concerns and debate, influencing as we have seen, their imagined publics and thus their socialization strategies. Hence, media have diverse and complex roles in the socialization of technology.

News media are at the same time an arena for domestication, where technologies are framed and made sense of, and agents of socialization by contributing to embedding technology into society. As we will see below, science is increasingly interconnected with the media. One concept to explore the increasing entanglement of media and science is "mediatization."

Mediatization is a contested concept within the field of media and communication studies. The concept is widely used. However, there is a diversity of ways of theorizing and defining it. Most generally, mediatization refers to mutual relations and influences between changes in the media field and changes in other social fields (Hepp, 2013; Jansson, 2013). Couldry and Hepp refer to mediatization "as a way of capturing the wider consequences of media's embedding in everyday life" (Couldry & Hepp, 2013, p. 195).

Couldry and Hepp try to organize the diversity of approaches by differentiating between two traditions of understanding mediatization; the institutionalist and the social constructivist traditions. In the institutionalist tradition, mediatization is understood as the process whereby different social fields adjust to and become dependent on the rules of the media. Media is here viewed as an independent institution following its own rules (Couldry & Hepp, 2013). The term media logic is frequently used to refer to these media-specific rules, and mediatization thus as permeation of other social fields by media logic (Hepp, Hjarvard, & Lundby, 2010).

In the social constructivist tradition, Couldry and Hepp argue, mediatization is understood as "the process of a communicative construction of sociocultural reality and analyzes the status of various media within that process" (Couldry & Hepp, 2013, p. 196). Here, the concept of mediatization is used in the study of the construction of reality in the media as well as how media influence the general construction of sociocultural reality in communication. Thus, the approach is broader than a focus merely on media logic.

Indeed, the use of the notion of media logic in the study of mediatization has been criticized, inter alia for conceptualizing mediatization as linear process. Hepp

(2013), for example, draws upon actor network theory and introduces the notion of the "moulding forces of the media," which he characterizes as the potential for human action revealed by the media. He criticizes the thinking that media have certain specifics, media logics, and argues that media get powerful only in relations and that they shape rather than cause action. Furthermore, he emphasizes the openness of the concept of mediatization, which he understands as "a panorama of a sustained metaprocess of change" (Hepp, 2013, p. 69) comparable to conceptual constructs like globalization or individualization. Driessens et al. (2010) approach mediatization through practice theory, arguing similarly that mediatization should not be understood through looking at the effects of media logics on other social fields but through how practices relate to (or avoid) the media.

Since this thesis addresses the relationship between techno-science and the public, I would like to draw upon the work of several German-speaking scholars, who theorize mediatization particularly in relation to science. These scholars sometimes distinguish mediatization (Mediatisierung) with a "t" from medialization (Medialisierung) with an "l," while using these terms interchangeably in other occasions. Franzen et al. (2012) argue that medialization is a narrower concept as it focuses merely on mass media in contrast to mediatization, which more generally deals with technologies for mediated communication.

Rödder and Schäfer, however, stay with the term "mediatization," which they define as "the dynamics of the relationship between science and the media, both understood as social systems that can be analytically and empirically differentiated, despite the fact that they mutually influence and (re)construct each other's functioning and complexity" (Rödder & Schäfer, 2010, p. 250). Hence, by referring to mutual influence and construction they avoid the criticized linearity of the idea of a media logic causing change in other social fields.

Weingart (1998, 2005) introduces the thesis of the *medialization of science* to refer to a changed relationship between the media and science, or what he terms the science-media-coupling. He characterizes mediatization by referring to two mutually dependent dimensions: First, science is increasingly becoming a public issue. The "inner life" of science, from procedures of conflict resolution to

competition for reputation and authority, is made public. Science is constructed, imagined and represented in and through the mass media. Weingart (2005) speaks of the "publicity of science" (Öffentlichkeit der Wissenschaft). Schäfer (2009) characterizes this first dimension of mediatization by referring to an extensified, pluralized and more controversial media coverage of science. Second, science itself is increasingly changing by adapting to constructed public expectations, and by orienting towards the mass media for public accept. Here, Weingart (2005) speaks of the "science of the public" (Wissenschaft der Öffentlichkeit). Thus, as he argues, "the thesis of medialization claims an indirect impact of the orientation to the media on science itself" (Weingart, 1998, p. 872).

However, Rödder and Schäfer (2010) claim that science is a societal arena where mediatization is much less distinct than in other areas. Science is only mediatized in so-called phases of mediatization, which the authors differentiate from routine phases. Thus, certain scientific fields, usually connected to everyday life, may get mediatized in limited periods of time. These phases of mediatization parallel the first dimension of the thesis of the medialization of science (Weingart, 2005), which is characterized by increased and more pluralistic and controversial coverage.

Thus, caution is required about the common assumption that the normative move from PUS to PES, or from Mode 1 to Mode 2 science, which I referred to above, also implies changes in the media coverage of science (Schäfer, 2009). As Schäfer (2009) argues, mediatization may be dependent on the scientific field and its extensiveness may vary. This is in line with empirical findings of research within the field of public engagement about the co-existence or hybridity of different approaches.

To summarize, this thesis about the socialization of offshore wind technology addresses the media as potential agents of socialization by drawing on the concept of mediatization. Is offshore wind technology mediatized? Can we observe the two dimensions of medialization referred to by Weingart (2005), an increased and pluralized media coverage and an increased orientation of science to the media?

After discussing the theoretical framework and concepts, which I chose to approach scientists and media as agents of socialization of offshore wind technology and before drawing these theoretical considerations together in the cross-cutting analysis of my three papers, I would like return to the notion of socialization once more. In the following section, I will explore how the notion of Dingpolitik (Latour, 2005a) and its main call for a movement from *matters of fact* to *matters of concern* can be considered a socialization practice.

Dingpolitik as socialization

Let us return to the notion of socialization of technology. As we have seen, Bijker and d'Andrea (2009) refer to socialization as embeddedness. Socialization addresses relations between technoscience and society, between the technical/material and social. In this section, I want to explore the concept of socialization and the embeddedness of technology and society further by proposing to regard the notion of Dingpolitik (Latour, 2005a) as a socialization practice. Dingpolitik will also be one of the theoretical notions guiding the cross-cutting analysis in the next section. However, before discussing Dingpolitik, I will introduce a snapshot of some STS approaches, namely *the social construction of technology*, *the social shaping of technology* and *actor network theory*, which emerged alongside each other in the 1980s and informed the notion of socialization of technology. How do these approaches understand the embeddedness of technology in society?

When I introduced the socialization of technology approach above, I already touched on some of its underlying STS notions by referring to their common criticism of technological determinism. Hence, although the three approaches I will present here have a lot in common in their thinking of technology-society relations, each is characterized by some distinctive issues.

The main features of the first approach, the social construction of technology (SCOT), were formulated by Pinch and Bijker (1984) in their paper "The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other." Transferring insights from the well-established sociology of scientific knowledge (SSK) to the study of technology,

the authors aimed to build a new sociology of technology. Central was the notion of symmetry, which implies studying failure and success of technological artefacts in the same manner.

The SCOT approach considers both science and technology as socially constructed. Instead of a linear model of innovation, Pinch and Bijker (1984, p. 411) propose a multi-directional model, in which they describe technology development as "an alternation of variation and selection." Variation refers to the interpretive flexibility of technological artefacts. Social groups concerned with the technology in question interpret it in various ways. However, not only people's definition of technology is flexible but also the design of the technology itself. The different social interpretations lead to different developments of technology design. As Bijker & Law (1992, p. 13) put it, technologies "are built in a process of social construction and negotiation, a process often seen as driven by the social interests of participants."

Selection, then, refers to processes in technology development that make some variations of technological design succeed and others fail. Pinch and Bijker (1984) used the notion of closure mechanisms to describe processes through which a certain degree of stabilization of artefacts is reached. Instead of competing interpretations, then, a particular interpretation and design designates the meaning of the technology.

As we have seen, the SCOT approach focused on the role of relevant social groups in technology development. In addition to highlighting interpretive flexibility and closure mechanisms, the approach addressed the relation between the content of a technology and the wider sociocultural and political context of the relevant social groups. In other words, here the embeddedness of technology in society could be said to refer to how social groups and their sociopolitical context influence or determine technology design.

The social shaping of technology (SST) approach as laid out by MacKenzie and Wajcman (1985) was like the SCOT approach critical of technological determinism. It aimed to show how social factors shape technologies. A key

thinking in SST was that technology design and implementation involves a range of (unconscious) choices between different technical options (Williams & Edge, 1996). Sørensen (2002) argues that this initial SST approach differed from the SCOT approach in that it was interested in the influence of particular predefined social interests and values and sociodemographic categories such as gender or ethnicity. The SCOT approach, by contrast, left it more open to analysis what the "social" includes.

Soon, however, the term social shaping of technology was used to refer to a more overarching approach to technology studies drawing on the initial SST approach, SCOT, and actor network theory among others. Williams and Edge (1996, p. 892) describe SST as "a 'broad church,' without any clear orthodoxy." The approach has been extended from focusing on the social shaping of technology development and design to include also areas of application and use (Russell & Williams, 2002). Furthermore, while the initial SST framework could be described as social determinist (Williams & Edge, 1996), the new broader SST approach considers social change as result of interaction of technology and society, of the material and social (Sørensen, 2002). This new SST approach is based on insights also from actor network theory, which is the third approach I would like to present here as entrance to the discussion of Dingpolitik as socialization.

Law describes actor network theory (ANT) as "a disparate family of material-semiotic tools, sensibilities, and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located" (Law, 2008, p. 141). This focus on material-semiotic relations and the symmetrical treatment of the material and the social is articulated in Latour's (2005b) call for a "sociology of associations" instead of a "sociology of the social."

Thus, the social does, according to Latour (2005b), not refer to a specific sphere or domain but lies in the relations or associations between entities. Arguing both against technological and social determinism, everything is considered as constituted in networks, in the relations (Law, 1999). Neither technology nor any given social factors are thought to determine social change. The symmetrical

treatment of the material and the social in ANT does also imply that both humans and non-humans are considered as having agency. They are actors, or actants, because they generate effects, or as Latour (2005b, p. 71) puts it, they "modify a state of affairs by making a difference." Thus, an actor network consists of associations between human and non-human actors.

Latour claims that the main ANT tenet is "that actors themselves make everything, including their own frames, their own theories, their own contexts, their own metaphysics, even their own ontologies" (Latour, 2005b, p. 147). Hence, the research strategy is to follow the actors and their associations.

Thus, socialization could be regarded as process of coproduction of the social and the technical. Law (2008, p. 147f) argues "that it simply isn't possible to explore the social without at the same time studying the hows of relational materiality." Similarly, Latour (2005b) claims that the separation of technology and society into two coherent and homogeneous entities does not made sense. Hence, the embeddedness of technology and society is brought to a different dimension as both society and technology are viewed as actor networks of human and non-humans and as interconnected, entangled and co-produced of the material and the social.

Technology, as other actors or socio-technical entities, could thus be regarded as an increasingly stabilizing network of relations between human and non-human elements. This view on technology and also on science is relevant for the following discussion of Dingpolitik with its central call to think of objects as gatherings and hence as *matters of concern* instead of as *matters of facts*.

Latour (2005a) introduces the concept of Dingpolitik to call for a different approach to politics or as he puts it, a movement "Back to Things" in political thinking. The Germanic term "Ding" or "Thing" has long been used to describe a place or an assembly where people meet around an issue of concern. A prominent example is one of the oldest parliamentary institutions, the Althing meeting at Thingvellir assembly place in Iceland. Still today the Icelandic parliament is called Althing, the Norwegian Storting and the Danish Folketing, all containing the term Ding/Ting/Thing in the names for their parliaments. Thus, Ding refers to "the issue

that brings people together because it divides them" (Latour, 2005a, p. 23).

Instead of maintaining *Realpolitik*, which Latour describes as "positive, materialist, no-nonsense, interest-only, matter-of-factual way of navigating through power relations" (Latour, 2008, p. 309) with a focus mainly on political procedures, he argues that we should approach politics as Dingpolitik. Rather than merely giving attention to political procedures, Dingpolitik implies a turn of political thought to *things*, to the objects or issues of politics. Latour claims that the procedures of authorization and legitimation are "only half of what it is to assemble: the other half lies in the issues themselves, in the matters that matter" (Latour, 2008, p. 311).

Drawing on the work of the pragmatist thinkers Lippmann and Dewey, Marres (2005, p. 217) argues that "issues call a public into being." Objects - or issues - of politics create opportunities for contestation, for agreement and disagreement. They gather different patterns of opinions and emotions, as well as various interested parties, around themselves. For each object of politics, different actors, opinions and procedures are generated. Latour argues that these objects "bind all of us in ways that map out a public space profoundly different from what is usually recognized under the label of 'the political'" (Latour, 2005a, p. 15). In an object-oriented democracy, then, we should bring both the objects of politics and the relevant actors into the debate; "the Ding designates both those who assemble because they are concerned as much as what causes their concerns and divisions" (Latour, 2008, p. 316).

Central for a substitution of Realpolitik by Dingpolitik is a transition from matters of fact to matters of concern; from objects to things. When objects become things, matters of fact are changed to matters of concern. According to Latour (2008), objects of politics have misleadingly been depicted as matters of facts, thereby ignoring inter alia the contextualities, uncertainties, complexities and relationalities involved, which are included in the understanding of science and facts implicated in the move to Dingpolitik and to matters of concern.

For instance, Goeminne & François (2010) refer to environmental politics, in particular related to climate change, as example of the prevalence of matters of fact.

The authors claim that a scientization of environmental politics reduces issues such as climate change to scientific puzzles leaving only small spaces for decision about acceptable risks, technological options and market instruments for politics. Environmental issues are merely framed as matters of fact.

Following Latour's call back to things, Goeminne and François (2010) argue for an understanding of environmental issues as things, as matters of concern instead of matters of fact. This changed understanding of environmental issues entails more space for politics to negotiate not only issues of risk in scientific terms, but more substantial issues or as the authors put it, it entails "a struggle over topical truth" (Goeminne & François, 2010, p. 126). Regarding environmental issues as things enables debate about the question of what to be concerned with. However, Goeminne (2011) argues that this changed perspective on environmental issues does not necessarily exclude matters of fact from environmental politics. Matters of fact, such as CO2 in the case of climate change, may be involved in producing matters of concern. However, here we should remember that matters of fact always also have been matters of concern that are merely blackboxed to matters of fact, or as Latour (2004, p. 247) puts it: "All objects are born things, all matters of fact require, in order to exist, a bewildering variety of matters of concern."

Callon (2005, p. 312) states that: "Matters of concern exist only if the concerned groups create them as such by making them visible and perceptible in the public sphere." Hence, Dingpolitik as movement from object to things, from matters of fact to matters of concern, could be described as form of socialization. Objects (technologies) are made public and links are created to society. Politics gets not reduced to dealing with matters of fact, with decisions about the few uncertainties left by science, but with things, with matters of concern involving both what to be concerned about and who to be concerned.

Krauss (2010) argues that the implementation of wind energy in Northern Germany could be described as Dingpolitik. He describes wind turbines as "things that bring forth new assemblies and changes in power relations" (Krauss, 2010, p. 206). How is this with regard to offshore wind energy in Norway? Can the socialization be considered Dingpolitik? Can we observe a transition of matters of

fact to matters of concern? The following cross-cutting analysis will address these questions among others.

Cross-cutting analysis: The difficulty of socializing matters of concern

After this rather long account of different theoretical approaches and notions, which in some way or another relate to the socialization of technology, I finally return to the three papers forming the body of this thesis. Guided by my discussions of scientists and media as agents of socialization as well as of Dingpolitik, in this section I aim to summarize some findings cutting across the three papers. I will refer to the papers as paper 1,[13] paper 2[14] and paper 3[15] according to the order in which they appear in the thesis.

However, let us very briefly consider the context again. This thesis deals with the socialization of the emerging offshore wind technology in Norway. While the development of offshore wind energy globally is expected to increase greatly, prospects for an implementation of offshore wind technology in Norway are characterized by ambiguity and uncertainty. The particular energy situation of Norway is one factor contributing to the uncertain offshore wind future. Norwegian policymakers do not seem to see the same necessity for the implementation of offshore wind technology as is the case in other comparable countries. On the other hand, the country focuses on research and development of offshore wind technology and a home market would facilitate industrial development and participation in the rapidly growing international market. Further, Norway has great potential in terms of wind resources and valuable offshore/marine expertise. A development of offshore wind could strengthen Norway's position as source of renewable energy for other European countries.

[13] Paper 1 refers to the paper "The end of controversy? Moving renewable energy production offshore" (see Chapter 2).
[14] Paper 2 refers to the paper "Sublime technology and object of fear: Offshore wind scientists assessing publics" (see Chapter 3).
[15] Paper 3 refers to the paper "Outreaching, outsourcing, and disembedding: How offshore wind scientists consider their engagement with the public (see Chapter 4).

This particular situation of offshore wind technology with promising potential but in need of public support due to high initial investment costs as well as the aspect that offshore wind is an emerging technology puts the scientists developing the technology, who are the main focus of this thesis, in a foregrounded position when it comes to socializing the technology. Another important aspect to consider is that a central driver for the development of offshore wind energy globally is the expectation that moving energy production at sea will change the ways in which publics relate to the technology. This expectation may also influence the socialization of the technology.

When I summarized the three papers earlier in this chapter, I claimed that all three papers together tell a surprising story of the socialization of offshore wind technology. The first paper analyzing the media discourse on offshore wind energy finds that it was largely written about in positive terms. The second paper about scientists' imagined publics, finds ambivalent constructions of publics. Next to a dominant narrative about the public to be relatively positive to offshore wind energy since the turbines are placed out of sight, a narrative about a negative public resisting offshore wind was surprisingly prevalent. Hence, from a largely positive media discourse we move to ambivalent and contradictory (positive and resistant) imagined publics. The third paper then addresses scientists' socialization strategies and finds that the majority of the interviewed scientists did not engage in socialization, although their constructions of the public as potentially resistant in addition to the pressure put forward to them to act as agents of socialization and the particular Norwegian context should motivate them to engage with society.

How may we understand this story of socialization of Norwegian offshore wind technology? The theoretical considerations outlined in the previous section generated three sets of questions regarding the socialization of offshore wind technology and news media and scientists as agents of socialization, which I will discuss as follows: First, I address the issue of the mediatization of offshore wind energy. Second, I turn to news media and scientists as agents of socialization. And third, I attend to Dingpolitik and how matters of fact and matters of concern play a role for the socialization of technology.

As we have seen, Weingart (2005) differentiates between two dimensions of mediatization, the publicity of science (Öffentlichkeit der Wissenschaft) and the science of the public (Wissenschaft der Öffentlichkeit), to describe the increased coupling between science and media. The first dimension refers to increased and pluralized media coverage. Can we observe a mediatization of offshore wind according to this first dimension?

Paper 1 addresses the news media discourse on offshore wind energy. It finds that the media coverage has both increased and become pluralized between 2000 and 2010. In plain numbers, articles in Norwegian newspapers containing the search words for offshore wind energy have increased from less than 10 in the year 2000 to 250 in 2010. Regarding the pluralization, I argue that the emergence of offshore wind technology was accompanied by an evolving controversy, characterized both by a diversity of actors and a plurality of perspectives and arguments. However, positive arguments were clearly dominant.

The controversy displayed utopian and dystopian visions of the technology from expecting offshore wind to be Norway's new industrial adventure to considering it a holocaust for birds. Offshore wind was contested in different frameworks; both supporting and opposing actors expressed economic, environmental, and moral concerns. Hence, I argue that media coverage entered what Rödder and Schäfer (2010) refer to as a phase of mediatization.

However, although media coverage has increased and pluralized, offshore wind did not make it into many headlines and front pages. Considering the total number of 654 articles published in all Norwegian newspapers[16] between 2000 and 2010 and the fact that the interviewed scientists disagreed about the question whether offshore wind energy was covered in the Norwegian media at all, it may be more appropriate to describe it as a limited mediatization triggered by the emergence of the technology, which was made visible and public through first policy efforts and proposals for local offshore wind developments.

[16] This refers to all Norwegian newspapers available in the online archive Retriever. On the 22.03.2014 the total number of newspapers was 162.

The second dimension of mediatization Weingart (2005) introduces, refers to an increased orientation of science to the media and hence an increased influence of media on science. Can we observe this second dimension of mediatization in relation to research on offshore wind energy? What role did the interviewed offshore wind scientists attribute to the media? Paper 2 and 3 touch on a few aspects of these questions. Together, they indicate that scientists have diverse and ambivalent perspectives on news media.

In paper 2, I argue that mediatized conflicts about energy infrastructure developments played into the interviewed scientists' imagined offshore wind publics in different ways. The scientists referred to the media coverage mainly of onshore wind energy and of power lines (which they characterized as very negative to the infrastructure development in question) to construct the *narrative of the positive public*. In other words, the positive offshore wind public was constructed in contrast to the negative onshore and power lines publics because the scientists expected offshore wind energy to be "out of sight, out of mind" of the public and hence non-controversial. At the same time, though, the scientists used the same references to construct the *narrative of the negative public*. Here, the scientists seemed to transfer the public resistance they noted in the media coverage of onshore wind and power lines to the offshore wind public. A few references to local newspaper reports on public protest against offshore wind energy did also play into the narrative of the negative public. Hence, the news media influenced the offshore wind scientists' ambiguous imaginings of publics.

In paper 3, which analyzes narratives about scientists' socialization strategies, the interviewed scientists addressed news media more directly. They blamed the media for creating "wrong," sensationalist and emotional stories or myths about offshore wind energy. These media-induced myths are, according to the scientists, responsible for the negative attitude of the public because they misinform the public. An example drawn on by many scientists was that the media pictured wind turbines as bird killers. This kind of media blaming happened in the *narrative of the outreaching scientist* where scientists conceptualized socialization as public education. They argued that more facts were needed in the public debate in order to

fight the myths and misinformation created by the media. However, at the same time mass media were seen as main channel for public education and information dissemination. Hence, an ambivalent relation to the media is disclosed here.

The media also played a role in the *narrative of the difficulty of being an outreaching scientist*. Here, scientists referred to the problems involved when dealing with the media. One the one hand, this included again some media blaming. Scientists expressed fear to be misunderstood and to expose themselves to a tough debate in the media. On the other hand, they claimed that they were lacking competence to deal with the media as this would require a more thorough understanding of how society and media works as well as the ability to simplify research results and jargon. Furthermore, scientists doubted that their engagement in the form of, for example, communication through the mass media would change anything. They believed that they have little possibility to influence public opinion. Thus, many scientists concluded that it would be better to outsource science communication.

We have seen that media play diverse roles both in narratives about scientists' imagined publics and in narratives about scientists' socialization strategies. Does this suggest that offshore wind science is influenced by and oriented towards the media? We could argue that since media seem to have a significant influence on scientists' imagined publics and since such constructions of publics are potentially thought to be performative, or inscripted, in technology design (Akrich, 1992; Maranta, et al., 2003; Woolgar, 1991), media do influence research and development of offshore wind technology. Further, scientists' socialization strategies are clearly oriented towards and influenced by their perspectives on the media. Thus, we could observe a limited mediatization of offshore wind science and technology both in terms of the first and the second dimension of Weingart's concept of mediatization.

However, regarding the mediatization of the scientists' socialization strategies it is important to note that the scientists referred to the strategies as something they as scientists "ought to do," rather than as something they were already doing. Only very few of the interviewed scientists were actively using the

media to socialize offshore wind technology. Does this indicate that offshore wind technology is not becoming socialized?

This brings us to the second issue to discuss in this cross-cutting analysis: news media and scientists as agents of socialization. As we have seen, the particular context of offshore wind energy in Norway with its dependence mainly on scientists and industry actors for the socialization of the technology in order to obtain the necessary public support for implementation, points to science communication as key issue and hence to scientists and media as central agents of socialization. How do they engage in the socialization of offshore wind technology?

I have argued earlier that media both can be regarded as agents of socialization and as arena for other socialization agents. The analysis of the media discourse in paper 1 has shown that journalists as well as various other actors contribute to linking the emerging offshore wind technology to society and to making sense of it in the news media. The plurality of actors allowed into the media debate emphasizes particularly the role of news media as arena for socialization and domestication. However, the limited extent of the mediatization described above could be interpreted as limited degree of socialization.

How do offshore wind scientists enact the role as agents of socialization? Already the analysis of the media discourse in paper 1 reveals that not many scientists were among the contributors to the debate on offshore wind energy. The interviews conducted with the offshore wind scientists confirm this finding; the great majority of interviewed scientists were hesitant to engage in the socialization of offshore wind technology.

On basis of the theoretical considerations and previous studies outlined above I developed different expectations related to the scientists' socialization efforts, which lead in different directions. On the one hand, we may expect scientists to actively engage in socializing offshore wind technology for several reasons. First, science policy requires scientists to communicate their research to the public, particularly in the context of emerging technologies. Second, the particular Norwegian context of offshore wind energy should motivate scientists to act as

agents of socialization to get public support for implementing the technology in Norway. Third, earlier studies find that scientists construct the public as potentially resistant to the technology in question. Hence we may expect scientists to act upon this resistance and pursue a public education socialization strategy, as many earlier studies suggest.

On the other hand, we may as well expect scientists to hesitate to be active agents of socialization for the following reasons. First, earlier studies point to a lack of capacity, which includes both factors such as lack of time and reward, but also perceived inability to communicate with the public and fear of negative consequences of involvement in media debate, leading to reluctance among scientists to engage with the public. Second, the expectations of positive or indifferent public perceptions of offshore wind energy due to the fact that it is placed at sea and thus "out of sight, out of mind" of the public may lead scientists to consider socialization unnecessary.

The findings of paper 2 and 3 suggest that the interviewed offshore wind scientists actually oscillate between these expectations.

The requirement to act as agents of socialization formulated by science policy and the motivation to socialize offshore technology in order to obtain public support are both aspects informing the scientists' views on socialization. Both the *narrative of upstream engagement*, which refers to an early public involvement in technology development, and the *narrative of the outreaching scientist* outlined in paper 3 include a depiction of scientists as active agents of socialization. However, as mentioned above, only very few of the scientists constructing these narratives were engaging with publics upstream or reaching out to the public to educate them. Rather, scientists often confined themselves to statements such as "As a scientist you should communicate" or "We have to blame ourselves that we are not more present." Hence, in paper 3, I argue that the expectation put forward to scientists to be socialization agents merely did lead to bad conscience and excuses for inactivity. This became particularly articulated in the *narrative of the difficulty of being an outreaching scientist*, which very often followed the *narrative of the outreaching scientist*.

While the common socialization strategy of public education involves a construction of the public according to the deficit model, we will see below that the offshore wind scientists interviewed for this thesis produced more complex and ambivalent constructions. However, considering the dominance of the *narrative of the difficulty of being an outreaching scientist*, we could argue that some scientists constructed themselves as deficient and unable to socialize the technology. In the *narrative of the outsourcing scientist*, in contrast, scientists supported the idea of public education about scientific facts, but most of them made it clear that they did not see it as their job.

Furthermore, the scientists' imagined publics played a role for how they viewed their role as agents of socialization. While previous research of imagined renewable energy publics suggests that experts construct a potentially resistant public, paper 2 finds that offshore wind scientists' imagined publics were very ambiguous. I characterize these imagined publics as a balancing between technological optimism and cultural pessimism, between regarding offshore wind as sublime technology generating a positive public and viewing it as object of fear producing a negative public. Scientists' imaginings of a negative public were linked to the public education socialization strategy. Likewise, scientists' constructions of a positive public were often accompanied by the socialization strategy I referred to as the *narrative of disembedded technology development*.

The notion of disembedded technology development, which I use both in paper 2 and 3, can be linked to the initial question about what moving renewable energy offshore does to the socialization of technology. Paper 2 argues that the scientists' imagined publics portray a disembedding of technology development from the public. The *narrative of the positive public* indicates that scientists do not have to deal with the public because the wind turbines are placed "out of sight, out of mind." Similarly, by constructing the public as irrational resistant "other" in the *narrative of the negative public*, scientists delegitimized public opposition. Hence, they created room to develop the technology without having to consider the public.

The *narrative of disembedded technology development*, which I discuss in paper 3, questions the need for a socialization of technology. The public is regarded

as irrelevant for the development and implementation of offshore wind technology. Although a public knowledge deficit of offshore wind energy is observed, scientists do not regard this as a problem and hence see no need for science communication or public engagement. I already mentioned before that this *narrative of disembedded technology development* frequently was accompanied by the "*out of sight, out of mind" narrative of the positive public*. Thus, it can be linked to the expectations of a less or non-controversial implementation associated with moving renewable energy production offshore.

The idea that offshore wind turbines will be "out of sight, out of mind" is a recurrent motive in all three papers. In paper 1, it is part of the supporting arguments for offshore wind energy in the media discourse. In paper 2, it designates the narrative of the positive public and in paper 3 it serves as reason for not socializing offshore wind technology. We could also argue that by constructing the technology to be "out of sight, out of mind" of the public, the public becomes "out of sight, out of mind" of the scientists.

A different way to understand the hesitation of the scientists to act as agents of socialization is to look at the socialization from the perspective of Dingpolitik, or more specific, the role of matters of fact and matters of concern. This brings us to the third set of questions to address in this cross-cutting analysis: Can the socialization of offshore wind technology be considered as Dingpolitik? Do we observe a movement from matters of fact to matters of concern in the socialization?

Latour's (2005a) notion of Dingpolitik, the politics of things, focuses on the objects of politics, on the things that gather relevant actors and concerns around themselves. Marres (2005) argues that issues make publics. Who are the offshore wind publics? Paper 1 shows how a diversity of interested actors, or PiPs, publics in particular (Michael, 2009), engaged in the media debate on offshore wind energy. These actors included politicians, industry actors and representatives of environmental organizations, tourism organizations and the fishing industry.

What kind of offshore wind publics did scientists make? Here we encounter much more uncertainty about who the offshore wind publics are. To emphasize this

uncertainty I suggest using the notion of the public as phantom (Latour, 2005a; Marres, 2005). Both in paper 2 and 3, scientists mostly referred to the PiG, public in general (Michael, 2009), such as "people" or "the Norwegians." However, in a few cases they also referred to PiPs such as electricity users, the fishing industry and environmental organizations. In paper 2, I argue that the "phantom public" becomes "real" and influential through the scientists' constructions of resistant publics. However, because scientists' constructions of the public are so ambiguous and messy through moving back and forth between the different narratives, I argue that the public at the same time keeps its slippery phantom-like features.

Central for the notion of Dingpolitik is the transition from matters of fact to matters of concern. Paper 1 does explicitly draw upon Dingpolitik and argues that the news media discourse on offshore wind energy is characterized by contested concerns and not facts. Matters of concern are made controversial not matters of fact. Further, the analysis of the news media discourse indicates that the Ding, the offshore wind technology, is blackboxed in the debate. Hence, I argue that the debate illustrates a twisted Dingpolitik: publics are gathered around the issue of offshore wind energy, but the Ding itself, which should be in the focus, is absent.

The offshore wind debate seems to be different than, e.g., the public controversy about climate change where issues largely are reduced to matters of fact (Goeminne & François, 2010). Hence, Latour's (2005a) call for more matters of concern is not necessary here, as we only have matters of concern and no matters of fact.

What role do matters of fact and matters of concern play in the other papers about scientists as agents of socialization? In paper 2, I argue that scientists construct publics both as morally and intellectually deficient in the *narrative of the negative public*. The deficit model of the public stood strong in the interview material. Resisting public attitudes were thought to be caused by knowledge deficits, for instance about costs, number of birds killed by wind turbines or amount of energy produced by a wind turbine, i.e. matters of fact in the view of the scientists. However, matters of concern, such as the concern for jobs, environmental friendliness, the role of nature in Norwegian identity and people's resistance to

change, featured even more prominently in scientists' explanations of public attitudes.

Accordingly, in the *public education narrative* outlined in paper 3 scientists first argued that the public needs information about scientific facts so that the media-induced sensational and emotional misinformation of the public would be counteracted. However, when following up with the question what the interviewees thought the public needed to know, the scientists argued that the public did not need to be informed about technological details of offshore wind, but rather about socio-technical imaginaries such as general benefits of offshore wind energy, environmental consequences and about the electricity market. Hence, also here, is it more about matters of concern than matters of fact.

In paper 3, I further argue that some scientists were ambivalent or became ambivalent about the need for knowledge dissemination to the public. One scientist, for example, pointed out that the scientists themselves are very vague and uncertain about the technology they develop and he questioned the use of communicating this to the public. Hence, here offshore wind technology itself was opened up as a matter of concern (presumably due to its emerging status) rather than regarded as a matter of fact. On the other hand, the analysis of scientists' socialization strategies in paper 3 also indicates that scientists do not feel confident and competent to leave their narrow field of research on technological details and communicate broader ideas related to offshore wind technology as matters of concern. This may also be a reason for their hesitation to act as agents of socialization. Maybe scientists would be more willing to be socialization agents if the controversy would be about matters of fact as in the case of climate change, while socializing matters of concern seems too difficult for the scientists.

To conclude, offshore wind energy seems to generate a twisted Dingpolitik or a dingpolitical paradox. The object of politics, the offshore wind technology, and matters of fact play a minor role; they are "out of sight." Hence, the call for more matters of concern is superfluous here. On the other hand, the absence of matters of fact seems to complicate the socialization of the technology for the scientists.

By drawing upon the notions of mediatization and Dingpolitik in the study of socialization, I have generated some interesting and new insights and perspectives. I particularly highlighted the important role of the media not only as agent of and arena for socialization, but also for scientists' constructions of publics and socialization strategies. Furthermore, I emphasized the significance of matters of concern and matters of fact for the socialization of technology and suitable agents of socialization.

Let us now return to the story of socialization mentioned in the beginning of this section. I hope to have illuminated this story a little bit so that it is not as surprising anymore. The issue of moving renewable energy production offshore has been of significance for all three papers with "out of sight, out of mind" a central motive. The thesis has made clear that although "out of sight," socialization is still necessary for a technology to be successfully implemented. However, scientists seemed to use the "out of sight" motive to construct socialization as irrelevant and disembed technology development. Hence, the new trend to produce renewable energy at sea may present some new challenges for its socialization.

Since the scientists do not take on the task as socialization agents, which they are expected to fulfill, we may conclude that the respective policy instruments are not sufficient. Furthermore, if the scientists do not participate in the socialization of offshore wind technology, other actors must do it or the technology will stay in the laboratory. Hence, following up this thesis, a study of other potential agents of socialization appears relevant. Moreover, the inactivity among scientists does open up for the question whether it really should be the scientists who ought to socialize emerging technologies. Other actors may be more suitable agents of socialization, and hence the scientists' strategy of outsourcing the socialization an appropriate strategy.

Method

> *We start in the middle of things,* in medias res*, pressed by our colleagues, pushed by fellowships, starved for money, strangled by deadlines. […] No matter how grandiose the perspective, no matter how scientific the outlook, no matter how tough the requirements, no matter how astute the advisor, the result of the inquiry – in 99% of the cases – will be a report prepared under immense duress on a topic requested by some colleagues for reasons that will remain for the most part unexplained. And that is excellent because* there is no better way. *(Latour, 2005b, p. 123)*

This following account of the methods mobilized in this thesis is a retrospective construction and a retrospective justification of what I did during the three years of working with this thesis. It has often been claimed that there is a discrepancy between how we actually do method and how we later write about it. Hence, also this section is an attempt to make sense of the messy and complex processes of gathering and analyzing data, which I present more linear and straight-forward here than they have actually been.

Law (2004) argues that method is performative. In the same manner, I do not claim that the methods I will present here enable me to report "reality" or depict the "truth." Rather, I acknowledge that these methods contribute to produce realities, or, as Law (2004, p. 143) puts it, method "re-crafts realities and creates new versions of the world." By assembling particular methods and data I tell particular stories about the socialization of offshore wind energy, and leave out others. This argument already indicates the researcher's participation in the production of realities. Interpretation always involves the researcher, her preconceptions, assumptions and scholarly socialization.

When I embarked on this PhD project in the fall of 2010, I was a newly graduated M.A. in social anthropology and had just moved to Norway. I was new to the country and new to the field of science and technology studies. Hence, while the methodological approaches and epistemologies seemed relatively familiar, the theoretical perspectives and the context of renewable energy in Norway were something I had to acquaint myself with. My PhD project was part of a larger project interested in *Public Engagement with Post Carbon Strategies* (project

manager: Knut H. Sørensen) and offshore wind energy was the 'post carbon strategy' I should focus on. As we have seen in the introduction of this first chapter I started on the project at a time when offshore wind energy was hyped in Norway. However, soon this enthusiasm faded and the expected development of offshore wind energy in Norway did not happen mainly due to a change of political priorities. This particular situation was one of the reasons why the initial project focus on public engagement and my initial plans to mainly interview public stakeholders and representatives of the "general public" and to study public perceptions and engagement related to the technology, increasingly changed to a focus on socialization. Another reason was that we stumbled across work on, e.g., imagined publics, which we found interesting and motivating to pursue. Moreover, we realized that socialization issues had gained little attention by earlier research in the context of renewable energy technologies. Hence, a focus on socialization and socialization agents rather than on public engagement and perceptions entered the project.

This thesis focuses on two agents of socialization of offshore wind technology, news media and scientists, which both play an important role in science communication. Accordingly, the thesis combines two sets of data and different methods for analysis. Each of the three papers included in this thesis already addresses the particular methodological issues relevant to the individual paper, however, I want to use the opportunity to discuss and reflect my choice of methods and the processes of data collection and analysis more detailed here.

Analyzing news media discourse

I started my project with an analysis of the news media discourse on offshore wind energy. I was interested in science/technology-public relations and news media seemed a good starting point due to their role as mediators between science/technology and publics. They are involved in the sense-making of the technology and are at the same time a source of information for publics about science and technology and for scientists about public debate. Further, starting the

project with a media analysis allowed me to get a first impression of relevant issues related to offshore wind energy in Norway.

When I write that I analyzed the news media discourse, I refer to the word "discourse" in a very general sense, or as Clarke (2005, p. 148) describes it, "the concept of discourse writ large: communication of any kind around/about/on a particular socially or culturally recognizable theme – contemporary and/or historical."

I chose to study the discourse in newspapers. Newspapers have a strong position in Norway with a large number of titles and readers (Østbye, 2008). Other than broadcasting media such as television or radio, newspapers were easily accessible for research and allowed an analysis of written text. Further, due to their debate sections and the possibility to publish letters to the editor and feature articles newspapers allow for a different participation of public actors.

Newspaper articles belong to the type of data Charmaz (2006) refers to as extant texts. The specific feature of extant texts as data is that the researcher is not involved in their construction like she would be involved in the construction of interviews or observation protocols. Extant texts are produced for other purposes and have other intentions than to serve as data in a research project. When analyzing extant texts one can for instance, address its form and content, its audiences and authors and its production and presentation.

I collected my data, the newspaper articles, via the online archive Retriever[17] with the following search words "vindkraft til havs" and "offshore vindkraft," i.e. the main Norwegian words for offshore wind energy. I searched for articles published between 2000 and 2010 and included all Norwegian newspapers in my search in order to provide a good overview of the Norwegian newspaper landscape and to enable the consideration of national and local concerns in the analysis. After I manually removed newspaper items from my sample that did not seem relevant, such as articles where offshore wind energy was only mentioned in the discussion of other topics, or in advertisements, I was left with 654 articles to be analyzed.

[17] www.retriever.no

I included both news articles written by journalists and letters to the editor and feature articles in the analysis. Clearly, these are two different types of newspaper features that many would claim should be analyzed separately. However, the aim of my analysis was to investigate how offshore wind energy was made sense of in the news media, how the newspapers as a whole fill the technology with meaning. Not only journalists but also other actors use the newspapers as an arena for debate and sense-making, and together they influence public sense-making. Hence, I argue that a combination of these different types of newspaper features is legitimate for the purposes of my study.

The data analysis was a qualitative analysis, which I supplemented with some quantitative data retrieved from the online archive Retriever about the number of articles published about offshore wind energy per year. Further, I quantified the articles in order to provide an overview of the proportion of positive and negative arguments. This was done on basis of the qualitative coding of the articles.

However, since I was interested in the construction of meaning of offshore wind energy, I focused on the qualitative analysis, which was inspired by Charmaz' (2006) constructivist approach to grounded theory methods. Weick (1995), for example, mentions grounded theory as suitable method for studying sense-making. Through their focus on systematic coding, grounded theory methods are also very useful to identify categories and clusters of arguments.

Grounded theory methods were developed as strategies to conduct qualitative data analysis. Instead of applying existing theories on the data material, theories, so-called middle range theories, should be grounded in the data, i.e. a grounded theory is a result of the data analysis. Charmaz (2006, p. 2) describes that "grounded theory methods consist of systematic, yet flexible guidelines for collecting and analyzing qualitative data to construct theories 'grounded' in the data themselves". The term grounded theory is used in different ways in the literature. Used in its original sense, the term refers to the *outcome* of the research. However, the term is mostly used to describe the *methods* employed in the research process (Jacobsen, 2002). To avoid this confusion of theory and method, Bryant and Charmaz (2007) propose using the term *grounded theory methods* to refer to the

methods of data analysis employed. Here, I follow their example.

Distancing herself from earlier positivist approaches to grounded theory methods (see e.g., the original grounded theory text by Glaser & Strauss, 1967), Charmaz' (2000) constructivist approach emphasizes the mutual construction of knowledge, of the data and the analysis. Categories and theory developed during the analysis and the data itself are produced through the interaction between the researcher and the research field, between the viewer and the viewed. The final text is a story composed by the researcher, a construction of how the researcher and the people being studied construct their realities. It is one of many possible interpretations. This indicates that instead of assuming one external reality, constructivist grounded theory "assumes the relativism of multiple social realities" (Charmaz, 2000, p. 510). Hence, Charmaz shifts the focus on (the construction and production of) meaning.

Although Charmaz (2006) advocates the constructivist approach, she emphasizes that grounded theory methods do not have to be tied to a single epistemology. Regardless of the theoretical or epistemological background of the research GTM can provide practical tools for data analysis. Charmaz describes the following processes of data analysis: coding (initial and focused), memo-writing, theoretical sampling, theorizing and writing.

Accordingly, I started my analysis of the newspaper articles with an initial coding. The initial coding, also referred to as open coding, involves a close reading of the data while "naming each word, line, or segment of data" (Charmaz, 2006, p. 46). However, I carried out the analysis in two steps. In order get an overview of the news media discourse and to identify its main topics and whether these changed over the selected timeframe, I first coded the 443 articles published between 2000 and 2009 with the article as unit of analysis. In a second step, I coded the 211 articles published in 2010 more detailed with an open line-by-line coding in order to identify not only broad topics but also actors, arguments and framings related to offshore wind energy. In both cases, I developed the codes while reading the articles and did not apply codes I had worked out beforehand. Some samples of the initial coding process are provided in Table 1.

Table 1: Examples of initial coding

Monstervindturbiner […] Jeg er enig med ham i hans begrunnelser for at Norge ikke trenger slike fugledrepere som også er naturødeleggere og ulønnsomme kraftprodusenter sammenlignet med vannkraft. Og hvorfor skal nordmenn betale for billig strøm til EU? Dessuten nødvendiggjør oppsettingen bygging av brede veier frem til alle turbinene. Kanskje helikoptre kan gjøre jobben? Men grøfter til kablene trengs i alle fall. For vindturbiner i sjøen blir kablene en plage for fiske og skipsfart, og i områder begrenses ankringsmulighetene. Men for all del. Norges fagkunnskap for vindturbiner bør fortsatt utvikles, slik at vi kan bygge og i hvert fall selge vindturbiner til land som ikke har den langt mer effektive vannkraft.	turbines killing birds turbines destroying nature / not profitable Norway vs. Europe area conflict – fishermen, shipping Norway vs. other countries developing for technology export
Energimangel i Midt-Norge […] Mange steder i Norge fører det til protester og demonstrasjoner når kraftledninger skal bygges, og vindmøller skal reises. De fleste vil ha miljøvennlig kraft, men ønsker samtidig at selve installasjonene skal være usynlige. De vil ikke ha utsikten sin ødelagt. Det kan ikke være lett å tilfredsstille alle disse ønskene samtidig. Her hvor jeg bor, utenfor Frøya et en god plass. Her vil kun en promille av Norges befolkning kunne se vindmøllene. Her er det god plass også for andre typer energiproduksjon. F.eks. biodrivstoff. Plass til å bygge havmøller. Hvis det også i tillegg blir satt i gang et gasskraftverk på Tjeldbergodden, så ville kraftsituasjonen i Midt-Norge se mye lysere ut. Alt dette kan sees i sammenheng i en langsiktig samfunnsutvikling. Vi her ute er glad i vår vakre natur og ønsker at det skal være muligheter for at det skal bo mennesker her også i framtiden. Mulighetene for å bruke kysten, både til energiproduksjon og til matproduksjon, er stor. Dette bør utnyttes i en verden som hungrer etter både mat og energi. Nå har Mausund velforening et enstemmig vedtak fra årsmøtet på at de ønsker en slik satsing på vindmøller i sitt nærmiljø velkommen. […] Vi ønsker å delta i mulighetene samfunnet byr på. Det være seg kulturelle aktiviteter, idrettsaktiviteter og jobbmuligheter både på Frøya og i Trondheim. Med satsing på vind- og havmøller her ute kan dette bli en realitet. En drøm vil gå i oppfyllelse for oss her ute. Fastlandsforbindelse og nye arbeidsplasser. Norge kan produsere mer fornybar og co2-fri energi, uten konflikt med lokalmiljøet. Her kan det bli muligheter til å forske på flere typer energi fra havet. Elektrifisere deler av Nordsjøen.	employing NIMBY visual pollution solution for Mid-Norway's energy crisis beautiful nature and OWE not mutually exclusive local development local community supporting OWE employment local development no conflicts electrification of oil installations

I then grouped the codes referring to arguments towards offshore wind energy into larger categories of "pro" and "contra" arguments. The supportive arguments were subsumed under four categories: (1) economic benefits, (2) environmental friendliness, (3) moral responsibility, and (4) prevention of resistance. The opposing arguments were also clustered in four categories: (1) high costs, (2) visual impact and biodiversity conservation, (3) opposition to energy export, and (4) area conflicts.

Following the initial coding was a focused coding, which implies a further and more thorough investigation of very frequent or significant codes. Focused coding is used to "sort, synthesize, integrate, and organize large amounts of data" (Charmaz, 2006, p. 46). In this phase, also some theoretical concepts chosen on base of the initial coding may be used to approach the empirical data. For example, after finding that different concepts of nature are employed in the news media discourse, a second reading of the articles inspired by literature on the subject focused more thoroughly on contested natures.

To enable comparison across articles and facilitate the writing process, I created a chronological overview of the data including relevant quotes and codes.

Table 2: Snapshot of data display

Adresseavisen	17.04.2010	Nils A. Røkke Direktør for klimateknologi, SINTEF	"Det vi må gjøre er å satse på utvikling av norsk industri og kompetanse så vi kan levere varer og tjenester til den utbyggingen av offshore vindkraft som er i full fart nå". "Ved å satse på prosjekter som norske Hywind og Sway, to nye konsepter for flytende offshore vindkraftanlegg, kan vi bidra til å løse klimaproblemet og skape verdier her i landet".	Positive attitude Technological development Climate change
Sogn Avis	13.04.2010	Erling Sande (Sp)	"Havenergi representere ein tilnærma ubegrensa kraftreserve. Potensialet er enormt". "Satsing på havbasert energi gjer gode mogleheiter for norske bedrifter og kompetansemiljø". "Noreg skal halde fram å vere ein energinasjon, også når oljen tek slutt".	Wind resources Positive attitude Economic and technological development
Hordaland Folkeblad	06.04.2010	Kristin Guldbransen Frøysa, Norcowe	"Ho ser eit stort potensial i utviklinga av havvindkraft, men understrekar at teknologien ikkje er mogen enno".	Resources Potential for development Positive attitude
Adresseavisen	03.04.2010	Tor Arne Strøm, Ap Nordland	"Norge innehar stor industriell kompetanse når det gjelder installasjoner og løsninger offshore. I tillegg til dette er vi en stor energinasjon. Vi må sørge for at denne kompetansen gjør oss verdensledende innenfor fornybar energi. Vi kan skape tusenvis av arbeidsplasser og stor verdiskaping innenfor dette området i fremtiden. Arbeiderpartiet lever etter mantraet å skape og dele. Derfor er havenergiloven sosialdemokrati i praksis"!	Perspective Ap Positive attitude Jobs Competence oil and gass

As illustrated here, central to grounded theory methods is a continuous interaction of the researcher with the data. "[G]rounded theory includes reasoning about experiences for making theoretical conjectures and then checking them through further experience" (Charmaz, 2006, p. 103). Hence, it can be characterized as abductive (Dey, 2004). Data analysis involves both inductive and deductive processes in the continuing moving back and forth between data collection and analysis and between generating codes through empirical analysis, choosing theoretical concepts based on the coding and returning to the data with the chosen theoretical concepts.

Interviewing scientists

The second set of agents of socialization this thesis investigates is offshore wind scientists. As we have seen, in the ambiguous and uncertain situation of offshore wind energy in Norway characterized by a lack of political support, socialization is largely left to scientists and industry actors. Also the strong Norwegian policy focus on research and development of offshore wind energy through the two national research centers and the increasing pressure on scientists from science policy to engage in socializing their research suggest that scientists are relevant potential agents of socialization to address.

What is an offshore wind scientist? Clearly, it is a label, which I gave to scientists who in one way or another were involved with research on offshore wind technology and energy. The scientists I interviewed for this thesis were associated with two Norwegian research centers for environment-friendly energy research (FME), NOWITECH and NORCOWE. However, their daily work life was spent in different university departments or research institutions as electrical or mechanical engineers, physicists or meteorologists and as PhD candidates, researchers or professors (see appendix 1 for an overview of all interviewees). Hence, they were many other things than offshore wind scientists. This is particularly true for the senior researchers, who all were involved in research on other topics than offshore wind energy as well; interestingly it was not uncommon that they also did petroleum research.

The research centers, then, could be described as meeting places where the scientists come together from their different universities, departments and institutions and meet as offshore wind scientists. Often, this did happen in the form of conferences or seminars. Particularly in the first year of my PhD I visited quite a few offshore wind conferences and seminars. Through listening to the scientists' presentations and discussing their posters I gained a first insight in the topics of their research. I was particularly alert towards any mentioning of policy and publics, which, although being rare, provided some food for thought and background for the following interviews. Further, being at these seminars and conferences enabled me to establish first contacts with potential interviewees. Other interviewees were later

contacted through email and telephone. Given that the research centers had lists of all associated researchers, getting interview partners was rather easy.

The interviews, then, were a combination of two focus groups (with 4 and 5 participants), two one-on-two interviews and 22 one-on-one (or two-on-one) interviews; one of the latter was a telephone interview. Hence, in total 35 scientists were interviewed. Seven interviews including the two focus groups were conducted together with my colleague Robert Næss, one interview was carried out by Robert Næss alone and another by Alexandra Klimek and Marie Komissar already in 2010. The remaining 17 interviews I conducted alone. The interviews were semi-structured with the same interview guide (see Appendix 2 and 3 for the interview guide) used in each interview (except for the one conducted in 2010). However, the guide was handled very flexibly, particularly in the focus groups. The interviews covered two major topics: the scientists' perspectives on offshore wind energy in Norway and their views on the role of publics and media.

The original plan was to have more than two (or four, since the two-on-one interviews also were planned as focus groups, however some participants did not show up) focus groups in order to learn how scientists negotiate the relevant issues related to offshore wind energy. It is often advised that focus groups should be composed of participants sharing some common ground so that different perspectives can emerge (Barbour, 2007; Macnaghten & Myers, 2004). The common ground as offshore wind scientists and different backgrounds from different departments seemed a good starting point for focus groups. However, the limited number of scientists willing to participate in focus groups and the practical issues of finding a date and place convenient to all participants led us to proceed with individual interviews.

Focus groups, arguably, should have a different dynamic than one-on-one interviews. However, as the participants in the focus groups did not show major disagreements and ambivalences and different perspectives also were produced in the one-on-one interviews, focus groups and individual interviews had similar effects in terms of the display of multiple narratives. Also, both focus groups and individual interviews are interactions where meanings are constructed and realities

produced (Holstein & Gubrium, 1995; Rapley, 2004). Czarniawska (2004) describes interviews as a site for the production of narratives. Hence, the narratives of scientists' imagined publics and socialization strategies that I discuss in Chapter 3 and Chapter 4 of this thesis could be described as product of the interview situation. However, one could argue that the interviewer tends to have a more prominent role as co-producer of realities in individual interviews than in focus groups.

Holstein and Gubrium (1995) introduce the term "active interview" to highlight the co-production of meanings by the interviewee and interviewer. They describe the objective of the active interviewer "to provide an environment conducive to the production of the range and complexity of meanings that address relevant issues" (Holstein & Gubrium, 1995, p. 17). Further, the authors suggest narrative analysis as suitable for the analysis of active interview data. Also my analysis of the interview data, which I will outline in the next section, was informed by my interest in the narratives produced in the interview situation.

Creating and analyzing narratives

There is scholarly disagreement about how "narrative" should be defined and what "narrative analysis" involves (Gubrium & Holstein, 1997; Squire, Andrews, & Tamboukou, 2013). Unlike for other qualitative methods, such as grounded theory methods, there are no general guidelines or rules for how to do narrative analysis. Squire et al. (2013, p. 14) state that "it's challenging to convey the nuts and bolts of narrative research." Instead of providing general methodological guidelines, most often scholars provide examples from their own work on narratives to demonstrate narrative analysis; these approaches, though, may differ considerably. What most scholars do agree on, however, is that a narrative or a story (the term story is often used interchangeably with narrative) requires linkages or relations between elements (Gubrium & Holstein, 1997; Polkinghorne, 1995; Riessman, 2008). Gubrium and Holstein (1997, p. 147) argue that "[n]arratives need not be full-blown stories with requisite internal structures, but may be short accounts that emerge within or across turns at ordinary conversations, in interviews, or interrogations, in public documents, or in organizational records." The authors refer to narratives as

"meaning-making device[s]" (p. 147). Narratives are used by individuals or groups for sense-making.

My analysis of the interviews was guided by two sets of questions; one concerned with the scientists' constructions of publics and the other with the scientists' constructions of their own role in the socialization of technology. Approaching the data with narrative analysis allowed me to consider each interview as scene where narratives are produced. Hence, instead of assigning one way of constructing publics or one construction of socialization to one interviewee, I was able to find different narratives in one interview and thus point to contradictions and ambivalences within interviews. Squire et al. (2013, p. 2) argue that "we frame our research in terms of narrative because we believe that by doing so we are able to see different and sometimes contradictory layers of meaning." Narrative analysis enables to emphasize complexity, ambiguity and contradictions.

Furthermore, narratives could be described as enactments of the self; identities are constructed and negotiated through narratives (Andrews, Sclater, Squire, & Tamboukou, 2002; Riessman, 2008). Andrews et al. (2002, p. 102) refer to stories as "creative spaces in which […] selves could take shape again and again". Coffey & Atkinson (1996) mention that actors construct their identities in relation to other actors. Returning to the interview data, we could therefore argue that the scientists' narratives about publics also involve constructions of their own role as scientists; scientists construct the selves by constructing others. In addition, narrative analysis emphasizes the context in which the narratives are produced (Coffey & Atkinson, 1996).

Polkinghorne (1995) differentiates between two kinds of narrative inquiry: analysis of narratives and narrative analysis. The first kind, analysis of narratives, refers to an approach, which is mainly based on classification or "paradigmatic reasoning," as Polkinghorne calls it. Here, data are collected as narratives, the paradigmatic analyses of which "result in descriptions of themes that hold across the stories or in taxonomies of types of stories, characters, or settings" (Polkinghorne, 1995, p. 12). The second kind, narrative analysis, involves what Polkinghorne refers to as "narrative reasoning," i.e. recognizing diversity and context. Narrative analysis

could thus be described as a synthesizing of data into stories. Polkinghorne (1995, p. 12) summarizes the differences of the two approaches as follows: "[A]nalysis of narratives moves from stories to common elements, and narrative analysis moves from elements to stories". As we will see below, I could argue that my analysis of the interviews involved some of both kinds of analysis.

Due to my prime interest in the content of narratives rather than structures, my analysis of the interviews could be characterized as thematic analysis (Riessman, 2008). Contrary to analyses based on grounded theory methods that fragments data into categories (Coffey & Atkinson, 1996), my analysis aimed to regard the whole interview as unit of analysis. Hence, after interviews had been transcribed (I transcribed twelve interviews myself, the remaining fourteen were transcribed by hired assistance), the first step was to read through the interviews and write summaries of each of them in order to keep the stories intact.

However, soon I found out that most interviews had produced several often contradictory narratives. Hence, instead of regarding the interview as one narrative, I regarded it as space for different narratives. I created a table with an overview of interviews including references to the narratives related to the main research questions. This made it easier to compare across interviews and to identify dominant and minority narratives. However, the narratives presented in papers 2 and 3 (see Chapter 3 and 4 of this thesis) are constructed or synthesized from different interviews in order to illustrate as many relevant aspects, patterns of argumentation and linkings as possible. So, in that way, the analysis could be described as both an analysis of the interviews as narratives and as a synthesis of different elements from different interviews to narratives.

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To summarize, this thesis deals with two agents of socialization of offshore wind technology: news media and scientists. Hence, two sets of data were drawn upon to address these different socialization agents: newspaper articles and interviews with scientists. In addition, field notes taken at offshore wind energy conferences and seminars as well as policy documents on renewable energy and

science policy served as background for the analyses outlined here.

Looking back, of course, there are additional issues that could have been raised and additional sets of data that could have been included in this thesis to address the socialization of offshore wind technology. For example, although the media analysis was carried out in the first half of 2011, it could later have been extended to include at least one more year (2011) in order to serve as a better background and context for the interviews, which were conducted in 2011.

The scientists interviewed represent a large proportion of offshore wind scientists in Norway and I consider the number of interviews as adequate to address the issues investigated in this thesis. However, what about other agents of socialization than news media and scientists? Bijker & d'Andrea (2009) mention also civil society organizations and political administrations as potential agents of socialization. Further, my media analysis reveals that for example politicians, industry actors and environmental organizations were actively using newspapers as arena for socialization. Hence, in hindsight, it would have been interesting to look at other agents of socialization as well.

Moreover, to add to the story of socialization it would have been interesting to look into the domestication of offshore wind technology beyond analyzing media as site for domestication and hence as partial representation of public debate. How do publics (PiPs and PiG) make sense of offshore wind? Among many other exciting things, this would enable relating scientists' imagined publics to "real" publics and to the publics' imagined publics. Part of this work is ongoing; together with colleagues several focus group interviews were carried out with publics across Norway. However, time did not allow this to be included in this thesis. Hence, also this thesis has its limits regarding time and space, choices had to be made and boundaries set. Nonetheless, in total, I regard the data gathered and analyzed as sufficient to illuminate the questions raised in this thesis.

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Chapter 2: Dingpolitik at Sea: Offshore wind energy in the news media discourse

Abstract

This paper investigates the news media discourse on the emerging offshore wind technology. Offshore wind energy is commonly regarded as a solution to implementation problems onshore, as it is "out of sight, out of mind." However, does moving renewable energy offshore really prevent controversy? Drawing on the perspectives of "Dingpolitik," i.e. a politics of things, and "Naturpolitik," the paper finds that both supporters and opponents make sense of offshore wind energy within economic, environmental, and moral frameworks. Values and concerns are contested, while the technology, in its physical form, goes largely unacknowledged. Hence, the paper suggests that the debate over offshore wind energy represents a twisted Dingpolitik, wherein the Ding – the technology itself – is blackboxed.

Keywords: offshore wind energy, media analysis, Dingpolitik, Naturpolitik, Norway

Introduction: News media as a meaning-making arena

The development of new renewable energy is frequently accompanied by conflicts related to its high land-intensiveness relative to conventional energy production. Hirsh and Sovacool (2013) argue that new land-intensive renewable energy makes electricity production and distribution visible, whereas these processes have been largely invisible to most people, due to the concentrated and remote placement of conventional power plants. Having energy production in view forces people "to ponder […] that their electricity-based lifestyles require new sources of energy" (Hirsh & Sovacool, 2013, p. 723f), and may thus lead to opposition. Particularly in the context of onshore wind power, controversies over natural and environmental consequences affecting biodiversity and landscapes have been widely observed (Devine-Wright, 2009; Ellis et al., 2007; Solli, 2010; Toke, 2005; Warren et al., 2005; Wolsink, 2007).

However, it is commonly assumed that moving renewable energy production offshore, and thus back to "invisibility," would prevent such controversies (Haggett, 2008), as offshore energy production promises to be "out of sight, out of mind." By analyzing the news media discourse on offshore wind energy in Norway, this paper investigates whether controversy can really be prevented in this way.

Globally, the deployment of offshore wind energy is expected to increase greatly over the following decades. Thus far, development has mostly been in Europe, but other countries, including the US and China, are expected to also contribute to the development of this energy. A main motivation for offshore wind energy is climate change mitigation. In addition, concerns for energy security, good wind conditions and free space, the opportunity to site power plants close to major coastal cities, less impact on the environment and humans, and less public resistance than onshore are noted drivers for offshore wind development (Kaldellis & Kapsali, 2013; Timilsina et al., 2013; Veum et al., 2011).

A development of Norwegian offshore wind energy could not only increase renewable energy production in Norway, but also supply renewable energy to other European countries. However, the current situation of offshore wind energy in

Norway is ambiguous and uncertain. The country, with its long coastline, has excellent offshore wind potential, but its energy situation is characterized by the export of oil and gas. In addition, abundant clean and inexpensive hydropower represents a kind of "gold standard," against which other energy production is measured (Sørensen, 2007). Thus, policymakers regard the development of offshore wind energy one option among many, and there is less drive behind its development in Norway than in other European countries.

Only one offshore turbine, Hywind – a floating pilot – has been installed in Norway. The first commercial offshore wind power plant, Havsul, was planned to operate by 2015. However, it was put on hold in December 2012 due to lack of political support. While there is quite a strong focus on research and development of offshore wind technology, future implementation remains uncertain. Hence, in the context of an emerging technology such as offshore wind in Norway, which is characterized by many uncertainties, an analysis of how the news media make sense of the technology is particularly relevant.

News media are important for the sense-making of emerging technologies. They present an arena for information and debate, not only for journalists, but also for other actors. News media also serve as a reference point for the public. They communicate information about issues such as renewable energy, and frame and ascribe meaning to these issues (Cox, 2010; Hansen, 2010; Lester, 2010). Media can be described as being at the interface between science/technology and the public.

This paper pursues its research questions by analyzing the news media discourse on offshore wind energy, examining newspaper articles published between 2000 and 2010. How is offshore wind energy made sense of? Which actors are involved in the media debate, and how do they argue?

Haggett (2011) argues that discussion of offshore wind energy can be seen as a continuation of the onshore debate. Many issues, such as participation, trust, environmental and visual impact, and local context, are relevant to both offshore and onshore debates. The continuous importance of aesthetic values and visual impact to public attitudes is particularly emphasized (Gee, 2010; Haggett, 2008; Waldo,

2012). Wolsink (2010) argues that public attachment to seascapes may have the same role as public attachment to landscapes. Also, contested environmental values play into offshore wind controversies (Firestone & Kempton, 2007; González & Estévez, 2005). Thus, research challenges the common belief that siting wind turbines offshore will solve implementation problems encountered onshore.

The few prior studies of the media discourse on offshore wind energy also suggest a dominance of aesthetic issues. Based on his analysis of the newspaper coverage of a proposal for offshore wind development in the Nantucket Sound, Massachusetts (US), Thompson (2005, p. 259) claims that "the newspapers fell well short of facilitating high-quality public debate" because they failed to report sufficiently on most social and environmental issues, beyond aesthetics. He also argues that the newspapers mainly overlooked the link to global climate change, focusing instead on local aspects of offshore wind energy. Kuehn (2005) studied the reception of offshore wind farms in Denmark, and finds that local newspapers mainly presented negative attitudes towards offshore wind, including aesthetic concerns and high electricity prices, while propositions for local employment opportunities through the wind farms were given less attention.

The dominant focus on aesthetic issues and on local, rather than global, environmental concerns, makes media discourse on offshore wind comparable to that on onshore wind. For example, Stephens et al. (2009) observe that US media coverage of onshore wind energy seldom linked the technology to global warming. Furthermore, Wolsink (2000) presents a Dutch case in which an onshore wind project was formally opposed due to noise. However, the regional and local press focused more on landscape and visual issues, than on noise.

Offshore wind energy in Norway has been given little scholarly attention so far. Thele's (2008) study of the controversy over the planned Havsul near-shore wind farm is an interesting exception. He found the controversy to mainly pertain to conflicting definitions of nature. Similar observations have been made about wind energy on land. Bye and Solli (2007) observe that the public perception of onshore wind in Norway has changed from the view that it is an environmentally friendly energy to the opinion that it is a controversial technological intervention in nature.

Rygg claims that arguments both for and against onshore wind energy are locally embedded. Opponents point to the need for nature conservation. Supporters, in contrast, have emphasized employment opportunities and economic benefits, thereby turning wind turbines "into modernization hybrids, representing a tempting opportunity for the inhabitants" (Rygg, 2012, p. 175).

News media as an arena for "Dingpolitik" and "Naturpolitik"

The study of environmental media can be regarded as a subfield of environmental communication. Cox (2010, p. 20) defines environmental communication as the "pragmatic and constitutive vehicle for our understanding of the environment as well as our relationship to the natural world; it is the symbolic medium that we use in constructing environmental problems and negotiating society's different responses to them." Thus, the way we communicate about environmental issues, such as offshore wind energy, influences our perceptions of these issues. News media is an important arena where such communication takes place.

News media can be regarded as a mediator between science and the public (Bucchi, 2008). They provide a space for relevant actors to deal with issues of concern and express their perspectives. Cox (2010, p. 208) describes the media as an "important public sphere within which many voices and claims to rationality compete." The relationship between news media and the public is complementary: on the one hand, the media have a responsibility to engage the public; on the other hand, citizens, themselves, have a responsibility to engage (Dahlgren, 2009). Likewise, Lester (2010, p. 165) states that "media invite their audiences […] to respond" in different ways; public response or engagement can, for example, involve interest, affect, or participation.

However, as studies on media effects (i.e. the influence of media on public attitudes and perceptions) show, it is difficult to establish a direct link between the media and public perceptions (Cox, 2010; Hansen, 2010). Hansen (2010, p. 169), for example, argues that demonstrating the specific ways in which the media influence publics "has proven a more elusive task." However, the media may have agenda-setting power (Ader, 1995; Cox, 2010; Hansen, 2010; Olausson, 2011). The media

might not strongly influence what people think, but they do tell people what to think about. This is especially prevalent in relation to unobtrusive, as well as global and national (as opposed to local), issues (Hansen, 2010). Another important function of the media is to provide frameworks, within which the information presented can be made sense of (Cox, 2010; Hansen, 2010).

In this context, audiences should not be conceived of as passive recipients of news media. In contrast, they actively use media in conjunction with many other sources in their social lives, to make sense of environmental issues. Hansen (2010, p. 181) states that:

> *The media and media coverage of environmental issues are best conceived of as a – continuously changing – cultural reservoir of images, meanings and definitions, on which different publics will draw for the purposes of articulating, making sense of, and understanding environmental problems and the politics of environmental issues.*

Olausson (2011) criticizes research on climate reporting for "media-centrism," on the basis that it has assumed a central role of the media in shaping public understanding without empirically supporting that claim. Instead, she argues, the media are just one of several resources for the meaning-making activities of the public, constituting an overall framework for sense-making that people actively fill with their own experiences. However, she acknowledges that the media are "the primary intermediary between science, politics, and the citizens" (Olausson, 2011, p. 295). Boykoff (2009, p. 448) expresses it as follows: "[media] coverage does not determine engagement but shapes their possibilities."

News media do not mirror the public debate, but they provide an edited arena that influences science, as well as the public. They are very complex and diverse, influenced by varied interests and constructed of complex interactions with different actors (Dahlgren, 2009; Hansen, 2010). Lester (2010, p. 60f) proposes that we view news media as "a deeply contested site where issues develop and agendas are set." Hansen (2010), for example, comments on the media's gatekeeping role, emphasizing their control of the selection of issues, sources, and arguments that enter their domain. Factors constraining the media include, among others, organizational, cultural, economic, and political factors, and professional norms and

values (Cox, 2010; Hansen, 2010; Lester, 2010).

To summarize, the media are an important source of knowledge and opinions of science and technology. They play a central role in the construction of meaning, and they represent, although partially, public concerns (Boykoff, 2009; Hansen, 2010; Lester, 2010; Ryghaug, Sørensen & Næss, 2011; Skjølsvold, 2012). In this paper, I regard news media as an arena for "Dingpolitik" and "Naturpolitik," wherein "things" and "natures" are made sense of and contested.

The concept of Dingpolitik, as introduced by Latour (2005), refers to a changed way of approaching politics. Rather than "Realpolitik," Latour argues that we should use the term Dingpolitik, which implies a turn to *things* – a focus on the objects of politics rather than political procedures. The procedures of authorization and legitimization are only "half of what is needed to assemble. The other half lies in the issues themselves" (Latour, 2005, p. 16). These objects – or issues – of politics gather different opinions and emotions, as well as various interested parties, around themselves. For each object of politics, different actors, opinions, and procedures are generated. Latour (2005, p. 15) claims that these objects "bind all of us in ways that map out a public space profoundly different from what is usually recognized under the label of 'the political'."

Hajer (2003) elaborates on similar ideas concerning the creation of a public space for deliberation and political activity. However, he does not concentrate on the object of politics as a trigger for political activity, but, instead, focuses on the policymaking around such objects. Hajer (2003, p. 109) asserts that "policymaking can function as a public 'stage' where deliberation on goals and means can and indeed does take place." Using offshore wind energy to exemplify this idea, the policy initiative of establishing an offshore wind power plant would create what Hajer calls "communities of fate," composed of actors who are affected by the policy initiative and therefore become political actors within this limited frame.

Latour (2005), however, places the object of policymaking in the center of his analysis, creating an object-oriented democracy. Central to an object-oriented democracy is consideration of both the objects of politics (what is to be considered)

and the relevant actors (who is to be concerned). Latour further argues that objects of politics should not be seen as *matters of fact*, but as *matters of concern*. He calls for a movement "Back to Things." "Ding" describes a place or assembly where concerned people meet around an issue, and it refers to "the issue that brings people together because it divides them" (Latour, 2005, p. 23). However, in addition to this participatory democratic aspect, Dingpolitik can also refer to profiting, fighting for one's own interests, or gaining public acceptance (i.e. the advocacy aspect of public engagement). In my analysis, I regard offshore wind technology as an "object of politics" – a matter of concern that is expected to gather publics. At the same time, I pursue Hajer's (2003) argument that policy initiatives around such objects can act as triggers for engagement.

As mentioned above, several perspectives towards wind energy are closely connected to issues of "Naturpolitik." An aspect of Dingpolitik, Naturpolitik refers to the ways in which nature is conceptualized by different actors. Macnaghten and Urry (1998) show that nature has multiple, often contested, meanings; it would therefore be more appropriate to speak of "natures," in plural. The authors emphasize that natures and environments are produced by social practice and discourse. Morton (2007, p. 21f) considers nature "an arbitrary rhetorical construct, empty of independent, genuine existence behind or beyond the texts we create about it." Particularly in examinations of controversy, different meanings and constructions of nature that are employed to support arguments and attitudes can be discovered and analyzed.

Castree and Braun (1998) distinguish between two perspectives of nature. The first is based on a culture–nature dualism. Representatives of this perspective aim to protect nature from intervention by humans. The second subverts the culture–nature dualism and stresses the linkage and integration of humans and nature. "From this perspective, human intervention in nature is thus neither 'unnatural' nor something to fear or decry" (Castree & Braun, 1998, p. 4). In short, nature is conceptualized differently depending on context, and filled with a diversity of meanings.

This paper investigates the discourse on offshore wind energy in the Norwegian news media. Using Dingpolitik as a starting point, I analyze how the technology is made sense of and contested in the media, and which actors and perspectives are included. As noted earlier, offshore wind controversies may be considered a continuation of onshore wind disagreements, wherein media discourse is dominated by aesthetic concerns and lacks references to global issues such as climate change. In addition, previous studies of wind energy in Norway point to the importance of Naturpolitik. Does this also apply to Norwegian media discourse on offshore wind energy? Does the media discourse engage with Dingpolitik or Naturpolitik, or both?

Method

This paper is based on an analysis of Norwegian newspaper articles published between 2000 and 2010. With a large number of titles and regular readers, newspapers hold a strong position in Norway (Østbye, 2008). The articles used in this paper were collected from the online archive Retriever[18], through searches containing the main Norwegian terms for offshore wind energy.[19] Due to the relatively small number of articles about offshore wind energy, and since wind energy issues – especially those pertaining to particular developments – are often discussed locally, I included all Norwegian newspapers in my search, including small, local newspapers. After manually removing irrelevant articles (such as those that only mentioned offshore wind energy in discussion of other topics, and commercial or job advertisements) from the sample, a total of 654 articles remained.

In my analysis, the term "discourse" is used in its everyday sense as talk, speech, conversation, or communication. Thus, the method of data analysis used to study the newspaper articles is not discourse analysis. Rather, I complemented a qualitative analysis inspired by grounded theory methods with quantitative data. Articles were counted in order to provide an overview of, for example, the

[18] www.retriever.no.

[19] The Norwegian search words were: *vindkraft til havs* and *offshore vindkraft*.

proportion of positive and negative arguments and the change in the number of articles over time. However, since I was interested in meanings, rather than just the spread and relative strength of arguments in the data, the qualitative analysis was most important.

The qualitative analysis was inspired by Charmaz' (2006) constructivist version of grounded theory, due to its strength in identifying categories and clusters of arguments in play. Because of the rather large sample, the analysis was conducted in two steps. In order to gain an overview of the development of the media discourse, I first coded the 443 articles from 2000 to 2009 with an open coding – that is, I did not apply predefined codes, but instead developed codes while reading the articles. The article was the unit of analysis, and the aim was to identify the main topics of the debate and determine if and how these changed over those years.

The 211 articles from 2010 were analyzed in more detail. In order to identify actors, arguments, and framings, I began with an open line-by-line coding of the articles. I then grouped codes referring to arguments towards offshore wind energy into larger categories of "pro" and "contra" arguments. The category "economic benefits," for instance, subsumed codes such as "developing supply industry," "emphasizing big international markets," "local development," and "potential for industrial development." Following the initial coding, I investigated some codes (which were chosen mainly because of their significance in the data and on the basis of previous studies and theory) further, with a focused coding. To develop an overview of the material and enable quantification, a table was created to list each article with its corresponding codes and important quotes. In the process of data analysis, findings, ideas, and questions were jotted down as memos. The theoretical framework presented in the previous section inspired further questions, with which I approached the data. Thus, my analysis can be characterized as abductive (a movement between induction and deduction): generating concepts through induction, choosing a theoretical framework based on those concepts, and returning to the data with the chosen theoretical framework (Dey, 2004).

The quantitative data, which complement the qualitative analysis, were also produced in two steps. The Retriever search provided an exact number of articles per

year containing the respective search words, which I used to illustrate how the number of published articles about offshore wind energy changed between 2000 and 2010. In order to establish the proportion of negative and positive arguments in the 2010 articles, I coded the articles on the basis of the line-to-line codes, whether they included only positive, only negative, or both positive and negative arguments. I then counted each category.

The analyzed articles were written by journalists or were letters to the editor and feature articles written by public contributors. Of the analyzed articles from 2010, more than one third (36 percent) were letters to the editor or feature articles. This points, already, to some public engagement with the issue at that time.

Although news articles, letters, and feature articles are different types of newspaper features, I decided to combine them in my analysis because I was interested in how newspapers, in general, made sense of offshore wind technology. As mentioned, news media provide an arena for debate not only for journalists, but also for other actors. All three types of newspaper features are involved in the provision of meaning with respect to offshore wind technology. Moreover, I did not analyze the media discourse as a representation of public views; rather, I acknowledged that the data present a particular debate of offshore wind energy, and reflect the media's gate-keeping role. However, the importance of the media in the public construction of meaning legitimizes the use of such data.

The results of the media analysis are presented in the following three sections. I first demonstrate how the media discourse developed between 2000 and 2010, in order to provide insights related to the volume of coverage as well as the emergence of some main arguments. I follow with a detailed analysis of the actors and arguments in the year 2010.

An evolving controversy: How media discourse developed from 2000–2010[20]

> *The petroleum resources are being used up, and the risk for a global energy crisis truly exists. Norway has unique possibilities to contribute to curb the crisis by developing offshore wind power, the world's fastest growing energy form.*[21]

News media discourse on offshore wind energy in Norway emerged in parallel to the worldwide growth of the energy form. Figure 1 illustrates the increase in the number of articles mentioning offshore wind energy from fewer than ten articles in 2000 to 250 articles in 2010.[22]

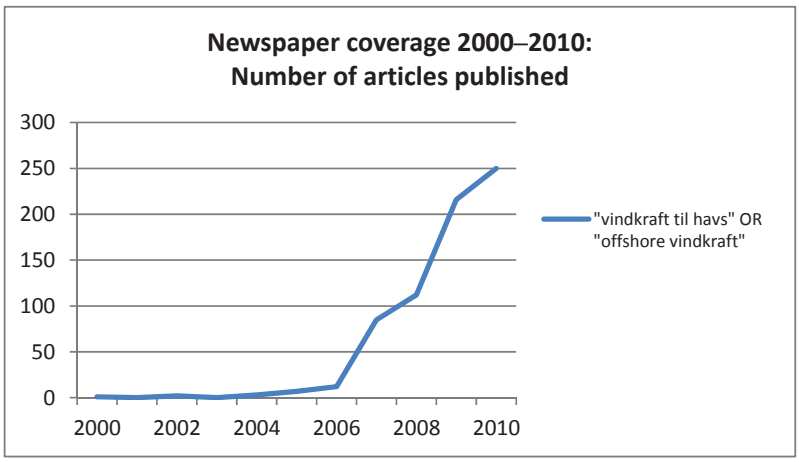

Figure 1: Number of articles containing the search words *vindkraft til havs* or *offshore vindkraft* in Norwegian newspapers between 2000 and 2010. Source: retriever.no.

In particular, the steep curve upwards after 2006 reflects the new focus on offshore wind in Norwegian energy policy, research, and industrial development at that time. While offshore wind was increasingly on the agenda, was the emerging technology accompanied by an evolving controversy? How controversial was offshore wind energy in early newspaper discourse? To answer these questions, I present the main features of the media discourse between 2000 and 2010.

[20] All newspaper quotes in this paper were translated from Norwegian to English by the author.
[21] *Dagens Næringsliv*, January 22, 2005.
[22] These figures were retrieved before irrelevant articles and advertisements were removed from the data.

The starting phase of newspaper discourse between 2000 and 2005 was characterized by references to the huge potential of offshore wind energy. Big, floating, offshore wind power plants situated far from the coast to solve the problems experienced with onshore wind power plants were imagined: "Here is the solution for those who think that windmills destroy the landscape: Hydro pursues to put up the first floating windmill in 2007."[23]

The increased number of published articles from 2006 onwards can also be explained by the public disclosure of plans for the first commercial offshore wind power plant, Havsul. Contrary to imaginings of floating, far offshore sites, Havsul was planned as a bottom-fixed near-shore wind power plant. Many contributors were critical of Havsul. Beyond concerns of noise, danger for birds, and consequences for tourism and fishery, the dominant argument against Havsul referred to the wind farm's visual impact. In contrast, some supporting voices pointed to the wind farm's sustainability and potential contribution to reducing carbon emissions and mitigating climate change.

In 2007, offshore wind energy became a relevant issue for politicians and the media on a national level. A global perspective was added, through references to a global market for the technology and the possibility that Norway might become a leading actor in technology development. Offshore wind energy was seen to offer a potential technological leap.

The European perspective was added to the newspaper discourse in 2008. Through a combination of offshore wind and hydropower, Norway was imagined to be able to act as "Europe's battery." Expectations were so high that offshore wind energy was referred to as "Norway's new oil." However, this enthusiasm was curbed through criticism referring to the technology's expense and to possible area conflicts. In 2009, offshore wind energy was additionally discussed in the context of electricity prices. Apart from this focus on electricity prices, the arguments in 2009 did not differ much from the ones in 2010, which I present in more detail in the following two sections.

[23] *Adresseavisen*, November 4, 2005.

In sum, media discourse began with technology optimistic statements about future possibilities. Social aspects became relevant in the local controversy over Havsul. A national debate emerged when topics such as electricity prices and energy export were included. Thus, the emerging technology was accompanied by an evolving controversy encouraging the engagement of "PiPs," or "Publics in Particular" (i.e. interested stakeholders, as opposed to the "PiG," or "Public in General") (Michael, 2009). Rödder and Schäfer (2010, p. 257) distinguish between routine and mediatized phases of media coverage of science, wherein "phases of mediatization are characterized by an increase in coverage and by more pluralistic debates." The year 2006 marked the beginning of such a mediatized phase of offshore wind energy, represented by an increase in the number of articles published and the participation of a diversity of actors in the controversy.

One view of this controversy is as a pro and contra debate uncovering utopian and dystopian visions of the innovation. However, these pro and contra arguments were not balanced in the media coverage. Of the 211 newspaper articles from 2010, around 50 percent were found to present mainly supportive arguments, while only around 10 percent were found to present mainly skeptical arguments. The remaining articles were found to present either a balance of supportive and skeptical arguments, or "neutral" information about new laws or technology development.

A wide range of actors participated in this controversy; that is, they were either given voice by journalists in news articles or allowed into the debate via letters to the editor or feature articles published. My analysis identified a group of actors in support and a group in opposition to offshore wind energy. However, not every participating group and individual was easily defined as a supporter or an opponent. There were some "in betweens," which I, following Bell et al. (2005), labeled "qualified supporters." By this I mean that they supported offshore wind energy only when certain conditions were met. In the following two sections I present the supporting and opposing groups and their main arguments, reflecting how they made sense of offshore wind energy.

A new green industrial adventure: Offshore wind energy supporters

> *In the next couple of years we have a unique chance to take floating offshore wind energy as the next big industrial adventure in Norway.*[24]

The supporting group was found to engage in the media debate with high expectations of offshore wind opportunities and the benefits for Norway. Representatives of offshore wind related industries and research institutions were included in this group, and they focused on technological and industrial developments and associated business opportunities. A second, very active, supporting group consisted of politicians from nearly all parties. This group pointed to the necessity of developing renewables to prevent climate change and to the potential of offshore wind for generating industrial development. However, some local politicians could also be characterized as qualified supporters. These politicians supported offshore wind development only when certain conditions, such as extra income tax for the affected community, were met. A part of the environmental movement that was more technology-oriented and focused on climate change mitigation was also in support of offshore wind energy. However, environmental organizations only provided qualified support, tying the development of offshore wind to conditions such as the protection of biodiversity. A few supporters lacked institutional affiliation and focused on the potential positive effects on local development. In addition, some local initiatives expressed support for offshore wind energy in connection with their protest against onshore wind power plants. Collected, the arguments employed by the supporting actors can be divided into four categories: (1) economic benefits, (2) environmental friendliness, (3) moral responsibility, and (4) resistance prevention.

The first category of arguments in favor of offshore wind energy in Norway referred to the expected national economic benefits, emphasizing the considerable advantage that the technological development of offshore wind energy could bring to Norwegian industry. In these arguments, Norway was considered a potentially leading industrial actor in the European supply industry. As the research director of Aker Solutions stated: “There is a giant market out there and we are well prepared to

[24] *Bergens Tidende*, December 11, 2010.

supply this market with equipment."[25]

Although Norway has limited experience with wind energy, supporters emphasized the country's abundant experience with offshore oil, gas, and marine technology. A Labor Party member wrote: "Norway has big industrial expertise when it comes to installations and solutions offshore. In addition, we are a great energy nation. We have to make sure that this expertise will make us world leading within renewable energy."[26]

Offshore wind was also considered a solution for Norwegian industry in a post-oil era. Some thought that offshore wind energy had the potential to become Norway's next industrial adventure and to create new jobs.[27] Supporters also pointed to possible positive local consequences of offshore wind farms, such as new jobs and additional sporting and cultural activities, in addition to advantages for the national economy.[28]

The second category of supporting arguments centered on the environmental friendliness of offshore wind, mainly in relation to climate change. Most Norwegian politicians and some members of the environmental movement considered the development of offshore wind energy a strategy for reducing CO_2 emissions and for meeting the EU directive of increasing the proportion of new renewables in the energy mix. A Labour Party member wrote that "the world has to solve the climate crisis and at the same time billions need access to more energy to get out of poverty. We won't manage this without big technological leaps. Offshore wind technology can be an important Norwegian contribution."[29]

This official statement also refers to the third category of arguments, which employed the moral perspective. Norway has greater wind resources than most countries, and offshore wind conditions are considered better and more stable than conditions onshore. Accordingly, some supporters felt that Norway should use these resources to contribute to solving global energy challenges.

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[25] *Fædrelandsvennen*, November 29, 2010.
[26] *Adresseavisen*, April 3, 2010.
[27] *Adresseavisen*, April 3, 2010; *Nationen*, October 20, 2010; and *Trønder-Avisa*, July 5, 2010.
[28] *Adresseavisen*, November 30, 2010.
[29] *Trønder-Avisa*, July 17, 2010.

Furthermore, electricity from offshore wind power plants was thought to not only be used for the electrification of oil platforms or to meet the increased needs of electric vehicles. According to some supporters, Norway could become Europe's green battery, by combining hydro and wind power. This energy export was seen from an economic as well as a moral perspective:

> *The country is not only rich on energy. We do also have a high level of technological competency to find out how Norway best can exploit and interconnect the renewable energy resources. With our oil wealth on top of this, we have a moral responsibility to deliver green energy to the world.*[30]

These supporting arguments expressed a belief in progress informed by technological optimism. The first category (economic benefits) dominated the debate and represented the self-interests of Norway as a nation, of local communities, and of industrial and R&D actors. Similar to what Rygg finds in relation to onshore wind, offshore wind technology was conceptualized as a "modernization hybrid" (Rygg, 2012, p. 175), promising industrial development and new job opportunities. The second category (environmental friendliness) corresponded with more altruistic thinking – however with arguments that were mainly directed towards nature. Hence, this second category exemplified a Naturpolitik perspective, focusing on abstract concepts like sustainability and climate. The third category, focusing on Norway's moral responsibility, shifted the emphasis to altruism, arguing that Norway should be willing to bear costs for the global benefit.

Supporters also emphasized that placing wind turbines offshore would prevent public resistance; this is reflective of the fourth category of arguments. Because offshore wind power plants would be out of sight and far from people's homes and recreational areas, supporters believed that conflicts with the local population would be avoided: "Gradually most wind parks will end up far at sea, where they just bother the seagulls."[31] This argument for offshore placement was

[30] *Aftenposten*, June 15, 2010.
[31] *Bergensavisen*, November 1, 2010.

frequently made in the context of opposition towards onshore wind power plants.[32] Haggett (2008, p. 292) describes this phenomenon as follows: offshore wind energy "is seen as a good thing not just in its own right, but because it may be the answer to many of the problems encountered with onshore developments."

To summarize, supporters made sense of offshore wind energy within economic, environmental, and moral frameworks.

Expensive turbines, endangered birds, and area conflicts: Offshore wind energy opponents

As mentioned above, only 10 percent of the newspaper articles from 2010 included merely arguments that opposed offshore wind energy. The aim of this section is to identify the opposing actors and analyze their arguments and sense-making of offshore wind energy. On the basis of controversies over onshore wind, we would expect the opposing actors to have engaged mainly with Naturpolitik.

Similar to the supporting group, the opposing group consisted of PiPs (publics in particular) representing various interests. Among the political parties I identified in the debate, only the small Coast Party (without national influence) expressed a skeptical outlook. However, as mentioned above, there were local exceptions to the general positive attitude among other political parties. This opposition was directed towards the placement of particular offshore wind power plants that was considered to conflict with local interests. Also, a part of the environmental movement was critical towards offshore wind energy, more generally. Representatives of the Norwegian fishing industry also participated in the opposition; they took a clearly negative position, focusing on potential area conflicts. Further skeptical statements came from tourism or recreational organizations, and from a few individuals with no institutional affiliation.

Supporters mostly presented a range of arguments in favor of offshore wind. Opponents tended to concentrate on a few arguments that lay within their particular

[32] *Adresseavisen*, October 29, 2010; *Adresseavisen*, October 28, 2010; *Bergens Tidende*, October 1, 2010; *Fosna-Folket*, September 28, 2010; *Stavanger Aftenblad*, June 18, 2010; and *Fædrelandsvennen*, April 22, 2010.

areas of interest. I observed four categories: (1) cost, (2) visual impact and biodiversity conservation, (3) opposition to energy export, and (4) area conflict.

The first category consisted of arguments that the costs of wind turbine production, installation, and maintenance would be too high to be profitable without heavy subsidies. Opponents argued that offshore wind energy could not compete with other energy forms, be they modern gas power plants[33], hydropower[34], or onshore wind power[35]. The technological optimism observed among the supporters was not shared by the opponents.

The second category consisted of arguments emphasizing the visual and environmental impacts of offshore wind energy and the sentiment that Norway's extraordinary landscape should be protected from visual pollution. Wind turbines were thought to potentially destroy views to the open sea, which is advertised as a main tourist attraction.[36] In this context, the aim of the opposition was nature conservation. Norwegian nature and landscapes play a special role in the Norwegian identity and Norway's international image. Thus, dimensions of place attachment and identity were at stake in arguments of nature conservation. However, it is important to note that, in contrast to most other categories of arguments, which referred to far offshore sites, arguments connected to visibility mainly referred to near-shore sites that would be visible from the coast.

In addition, opponents declared a danger for biodiversity – in particular birds and sea animals. Very polemically, the writer Gjelsvik wrote: "The windmill parks will also make up a holocaust for the natural environment. Where should the birds go in a renewable paradise?"[37] Furthermore, the planned Havsul wind power plant was criticized by the Norwegian Society for the Conservation of Nature for being placed in a migration corridor for seabirds and the feeding ground for South Norway's biggest seal colony.[38]

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[33] *Stavanger Aftenblad*, March 19, 2010.
[34] *Bergens Tidende*, December 23, 2010.
[35] *Teknisk Ukeblad*, June 24, 2010.
[36] *Andøyposten*, October 14, 2010.
[37] Bergensavisen, December 4, 2010.
[38] *Klassekampen*, November 25, 2010.

The third category opposed the supporters' moral arguments for offshore wind. Although most opponents welcomed Norway's involvement in offshore wind technology and the potential for supplying a global offshore market, specific plans to erect offshore wind farms in Norway and to export energy to other countries were criticized. Due to Norway's hydropower resources, opponents saw offshore wind farms as unnecessary, and felt that Norwegian taxpayers should not provide Europe with highly subsidized green energy.[39] Such arguments created a division between Norway and the rest of Europe, as well as between rural coastal areas and cities like Oslo and Bergen, where decisions affecting rural areas are often made.[40]

The fourth category, area conflicts, consisted of arguments mainly connected to the fishing industry. According to a regional fishing association, the places chosen for offshore wind power plants tended to be the best areas for fishing.[41] This area conflict created opposition, even within political parties that were generally supportive of such developments, such as the Conservative Party, whose mayor from the island of Andøy commented:

> *Concerning the area conflict with the fisheries, I am sure that Andøy as well as Vesterålen will speak completely in line with the opinion of the Norwegian Fishing Association; that is to say that this type of installations [offshore wind farms] is not compatible with fishing activities because it will close a considerable area of the shelf.*[42]

Such opposition indicates the symbolic importance of the Norwegian fishing industry. Other area conflicts suggested by opponents were with the petroleum, shipping, and military surveillance industries.[43]

In summary, the scope of the opposing arguments was local, national, and partly European, relative to the supporting arguments, which focused mainly on the national and global levels. The opposition category relating to costs and subsidized energy export included national, as well as individual, interests. The area conflicts

[39] *Bergens Tidende*, December 23, 2010.
[40] *Nynorsk Pressekontor,* October 15, 2010.
[41] *Nynorsk Pressekontor*, October 15, 2010; and *Stavanger Aftenblad*, March 6, 2010.
[42] *Harstad Tidende*, December 1, 2010.
[43] *Bergens Tidende*, December 23, 2010.

category represented the local interest of opponents. Only the Naturpolitik perspective of nature conservation included altruistic thinking towards nature. However, the global and moral responsibility articulated by supporters was absent in these opposing arguments.

The different scope of supporting and opposing arguments in the media discourse analyzed here contrasts with Rygg's (2012) findings of local perceptions of onshore wind energy in Norway, which indicate that both supporting and opposing arguments have local references. One explanation for this difference in findings may be that offshore wind energy is in an emerging state, with no installations in Norwegian waters. Thus, apart from a few contributions around particular planned wind farms (such as Havsul), wind turbines, in their physical form, were largely absent from media discourse.

Conclusion: Contested concerns

The news media are an important reference point for public sense-making and for ascribing meanings to environmental issues. It could be claimed that the media construct virtual futures for, e.g., emerging technologies. This paper has analyzed the Norwegian news media discourse on the emerging offshore wind technology.

Moving renewable energy production offshore is commonly believed to prevent controversies about area use and environmental consequences. However, previous studies claim that the debate over offshore wind energy can often be seen as a continuation of the onshore debate, with an emphasis on aesthetics (Haggett, 2011). Offshore wind energy technology is not always out of sight, and seascapes are as valued as landscapes (Wolsink, 2010). The findings of this paper demonstrate that offshore wind energy, in the news media, was mainly made sense of within three frameworks: economic, environment, and moral. Supportive, as well as oppositional, engagement was most frequently triggered by economic issues. Supporters emphasized economic benefits, while opponents referred to the high costs of the technology. Thus, economics emerged as a privileged frame of interpretation.

Engagement was also triggered by concerns over nature. Supporters constructed offshore wind as an environmentally friendly technology, while opponents considered it a danger for biodiversity and a visual disturbance. In addition, there were area conflicts. Hence, both supporters and opponents engaged with Naturpolitik to strengthen their arguments. The idea of nature as a "landscape" and "as threatened and in need of protection" was contrasted to ideas of nature as "providing resources and life support essential to human survival" and "the environment" (cf. Macnaghten and Urry 1998, p. 74). This corresponds to Castree and Braun's (1998) distinction between the view that nature should be preserved and protected from human destruction, and the view that humans and nature are integrated, which approves of human intervention. Thus, the analysis unveiled a conflict between a "traditional" nature conservation perspective and a technology-oriented, climate-focused sustainability perspective. These different concepts of nature represent one explanation for the divided opinions on offshore wind energy. However, aesthetic concerns and the value of nature experiences related to near-shore developments, only.

Engagement was also triggered by moral issues. Supporters emphasized Norway's moral responsibility to invest in new renewables, while opponents were skeptical of energy exports subsidized by Norwegian taxpayers.

In addition to these three frameworks of interpreting offshore wind energy, the strategic argument that offshore wind development would be "out of sight, out of mind" was very common. This argument focused on the Ding of offshore wind energy by emphasizing future technological possibilities. It also focused on nature, which was not to be destroyed – at least not "in sight." At the same time, the "out of sight, out of mind" argument was a strategy for non-involvement to avoid public resistance. Offshore wind could be a pure technical solution without public participation, without Dingpolitik. The media analysis indicated that this strategy was working – at least to a certain degree. Most articles introduced supportive arguments, while the opposing arguments were comparatively few. Onshore wind opposition groups supported offshore wind developments. Hence, the expectation of preventing controversy by moving renewable energy offshore was partially met.

In this way, the Naturpolitik did not disappear, but shifted to an emphasis on sustainability, climate, and biodiversity. Hence, in contrast to earlier studies of media discourse, global aspects were drawn upon in both a Naturpolitik and moral framework. In addition, area conflicts appeared to be important. This suggests that the offshore debate has a different Dingpolitik than the onshore and near-shore debates, with different actors and concerns gathered around the issue or object of politics; the controversy remains, but with a changed focus.

Furthermore, we have seen that in the offshore wind debate analyzed here, values and concerns were contested, but facts were not. Following Latour (2005), matters of concern were controversial, not matters of fact. The debate was different from that of climate change, wherein scientific facts are contested and deficit thinking can be found (in the sense that people lack the facts needed to change their attitudes and behavior) (Tøsse, 2013). In the offshore wind debate, the opposing minority was not accused of lacking knowledge, but seen to express conflicting values and interests.

The growing media discourse on offshore wind energy enables different actors to gather around the Ding of offshore wind technology and thus attempt to gain public opinion to make way for the "right" political decisions. However, the Ding – the technology – was quite absent from and abstract in the debate analyzed here. There was, for example, no discussion of design choices. Hence, the news media discourse illustrated a twisted Dingpolitik, wherein the Ding, itself, was not an issue of concern. Thus, using the concept of Dingpolitik in a study of the news media discourse invited a focus on the significance of the technology, itself, and revealed how it had become blackboxed. Latour calls us to consider matters of concern, in addition to matters of fact. In this paper, we have observed that to achieve a Dingpolitik debate about offshore wind energy, the dominant focus on matters of concern – what may be achieved by offshore wind turbines – should be corrected with a concern for the shaping of the technology, and thus for matters of fact.

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Chapter 3: Sublime technology and object of fear: Offshore wind scientists assessing publics

Abstract

The development of offshore wind energy is often connected to expectations that the public will be positive or at least indifferent to the technology. Because turbines are placed at sea – out of sight, out of mind – they are expected to avoid public resistance experienced onshore. This paper examines offshore wind scientists' constructions of the public(s) by identifying narratives in the research communities. It is based on 26 semi-structured interviews with scientists at two national research centres on offshore wind energy and technology in Norway. It finds that, although the dominant narrative of these scientists conveys a positive public, expectations of public resistance and constructions of public sentiment as NIMBY ('not in my backyard') are present in the research environments. This continued presence of narratives of irrational public resistance in the scientists' imaginings could be understood as act of othering the public with the possible implication of a disembedded technology development. The paper concludes by asking whether the persistence of constructions of resistant publics mirrors a pessimistic engineering mindset.

Keywords: Offshore wind energy, imagined publics, Norway, NIMBY

Introduction

"This is a historic day. Offshore wind energy may become the next adventure for the Norwegian industry and energy sector".[44]

With these enthusiastic words, Norway's former Minister of Petroleum and Energy, Terje Riis-Johansen, in the summer of 2009, introduced a new act with respect to offshore renewable energy. A public debate followed this optimistic political rhetoric. It was dominated by supporting views of offshore wind energy (Heidenreich, forthcoming). Particularly its economic benefits were highlighted. Industrial actors emphasised the potential for Norwegian industry to become a leading actor within the supply industry in a growing international offshore wind market. In addition, the optimistic rhetoric included expectation of a positive public. Since turbines were to be placed far out at sea and thus would be 'out of sight, out of mind', the problems with public resistance would be avoided. Hence, in many contexts, offshore wind technology was portrayed with enthusiasm and fascination. It could, accordingly, be described as a technological sublime (see Nye, 1994).

Against this backdrop, in 2009, two national research centres on offshore wind energy, NOWITECH[45] and NORCOWE[46], were established with the aim of becoming international leaders in developing technological designs mainly for deep water. Thus, a fairly large number of scientists were engaged in the development of a technology, which supposedly would be received positively by the public. This paper analyses whether these scientists' constructions of the public(s) were similarly optimistic by identifying and examining narratives found in interviews with scientists associated with the two national research centers.

Noticeably, the tailwind, in which the two research centers were founded, soon turned into a slight headwind when in March 2011 the new Minister of Petroleum and Energy, Ola Borten Moe, declared that: "There is no point in spending many tax billions to build a wind farm offshore only because it has to be offshore".[47] In other words, developing offshore wind energy in Norway was argued

[44] Press release 82/09, Ministry of Petroleum and Energy, 26.06.2009
[45] Norwegian Research Centre for Offshore Wind Technology
[46] Norwegian Centre for Offshore Wind Energy
[47] Stavanger Aftenblad 17.03.2011 (my translation)

to be too expensive. The research centers responded by emphasizing their focus on developing cost-effective solutions for offshore wind energy. Still, the high initial investment costs make offshore wind energy dependent on political support.

Thus, the current situation of offshore wind energy after 2011 appears ambiguous and uncertain. On the one hand, Norway focuses on research and development of offshore wind technology, an implementation of which promises industrial development. On the other hand, industry representatives complain of a lack of necessary political support (Hansen & Steen, 2011), which is demonstrated by the fact that no commercial offshore wind farm has been built yet.

This ambiguity related to developing offshore wind energy in Norway needs to be understood in the context of the country's particular energy situation, which is characterized by two distinctive features. First, nearly all electricity production comes from inexpensive and sustainable hydropower representing a gold standard against which new energy production is measured (Sørensen, 2007). Second, Norway has a large offshore oil and gas industry, which is of significant economic importance. The oil and gas industry is competing with offshore wind in terms of resources and manpower, while at the same time holding expertise that readily may be transferred to offshore wind energy. Besides, although produced far at sea and "out of sight", Norwegian oil is very present in public debate.

In addition to this particular energy situation, Norway has a history of controversy about energy infrastructure developments, such as hydropower, onshore wind energy or recently, the power lines in the Hardanger region of Norway, which also may play into the scientists' imagined offshore wind public(s). These controversies stand out due to the prominent role attributed to nature conceptualized as pristine and in need of protection from human intervention (Bye & Solli, 2007).

Earlier research on scientists' imagined publics has mainly focused on emerging fields such as nanotechnology and biotechnology. A very common finding is that scientists imagine publics as ignorant and inadequately informed about science and technology (Besley & Nisbet, 2013; Blok et al., 2008; Michael & Birke, 1994; Powell et al., 2011). Furthermore, publics are frequently "othered" by

constructing their concerns as irrational and emotional in opposition to factual, rational and objective science. For example, in his study about the function of the discourse of scientists working in the controversial field of crop genetics, Burchell (2007, p. 145) finds that scientists constructed the public as contingent 'others'. Their 'beliefs and actions are seen to derive from personal shortcomings, inclinations and self interest', in contrast to the rational empiricist selves of the scientists.

In the context of renewable energy, Walker et al. (2010) find that industry and policy development actors expected that 'the materialisation both of negative responses and of active opposition is a "real and present danger" for RET [renewable energy technologies] development' (Walker et al., 2010, p. 937). Fears of public hostility are often related to the NIMBY ('not in my backyard') concept as a narrative of irrational public resistance. A potentially hostile public is linked to specific developments in specific localities, and contrasted with a generally supportive public. Generalisations of the public are made to present it as positive towards renewable energy technologies, while accounts of hostile, opposing publics are more differentiated (Walker et al., 2010). Moreover, Cass and Walker (2009, p. 65) find that their interviewees described opponents' responses as 'abnormal, involving passion, anger and "strong feelings"', while support was construed as normal. The expectation of a negative public attitude and hostility towards technological development is found particularly prevalent related to wind energy (Walker et al., 2010).

This paper deals with academic scientists, who arguably have different experiences with publics than the industry and policy actors referred to above, since they, for example, do not directly take part in planning and licensing processes where public hearings are obligatory in Norway (Gjerald, 2012). Hence, it is interesting to learn how academic offshore wind scientists navigate between expectations of public negativity towards wind energy in general, and the promises of offshore wind energy to be a technology, which they supposedly are free to develop without consideration of public resistance. What standing does the NIMBY narrative and other stories of public resistance (which should have been resolved by

moving the wind turbines offshore) have in the scientists' constructions of the public(s)? In the following section, I introduce the theoretical considerations guiding my analysis of offshore wind scientists' imagined publics.

Imagined publics

This paper draws upon two concepts – 'imagined lay persons' (ILP), as introduced by Maranta et al. (2003), and NIMBY ('not in my backyard') – within the broader theoretical approach of Public Engagement with Science and Technology (PEST). Walker et al. (2011) propose a framework for understanding public engagement related to renewable energy technologies (RET). This framework has four characteristics: (1) it is symmetrical, investigating both public engagement with the respective technologies as well as RET actors' (actors who support, develop or implement the technologies) engagement with publics; (2) it focuses on expectations and anticipations that influence the engagement of both publics and RET actors; (3) it is dynamic in acknowledging development and changes in expectations and engagement over time; and (4) it recognises the contexts in which these interactions take place, like policy, regulations, place and history. In this paper, I draw upon the notion of symmetry by redirecting focus from the frequently analysed public engagement with science to scientists' engagement with publics. I also focus on anticipations and expectations by investigating the scientists' imagined publics while at the same time acknowledging their dynamics and situatedness.

The concept of 'imagined lay persons' (ILP) was introduced by Maranta et al. (2003). The authors observe that face-to-face dialogue or interaction between experts and lay people is often absent. Nonetheless, experts form imaginings or constructions of lay people, often implicitly, which are integrated into their work, especially in the context of application. Woolgar (1991), for example, shows how the design and production of new microcomputers could be understood as a configuration of future users. This includes not only a construction of the identity of the users, but also definitions and constraints of the users' future actions. Using the metaphors of 'machine as text' and 'user as reader', Woolgar (1991, p. 69) claims that 'the text might be said to be designed (perhaps implicitly, perhaps

unconsciously, but always within a context of conventional resources and expectations) for the reader'.

The imagined lay persons are functional constructions that experts need to shape technical solutions that are to be used by lay people or, as Maranta et al. (2003, p. 151) put it, 'conceptions of lay persons as they are manifested in the products and actions of the experts'. Thus, experts not only deal with technical solutions and organisational procedures, but they are also 'lay person makers' (Maranta et al., 2003, p. 152). Their imaginings of the public become actors with agency that potentially may be performative and influence the development and implementation of technology, decision-making processes and future interactions with publics. Thus, the imagined public might have greater long-term influence than the 'real' public (Walker et al., 2010).

Scientists, policymakers or industry stakeholders may imagine the public in many different roles. Earlier studies find the public construed as a customer, a consumer, a neighbour, a citizen, a 'man on the street' or a fuzzy generalised public collectivity (Besley and Nisbet, 2013; Burningham et al., 2007; Cotton and Devine-Wright, 2012). Michael (2009) differentiates between PiPs (publics in particular) and the PiG (public in general). PiPs are stakeholders with a particular interest in a scientific or technological issue, while the PiG is the generalised public collective. Similarly, Maranta et al. (2003) differentiate imagined lay persons according to how experts assemble them as addressees of their engagement activities. While individualised ILPs are addressed as individuals (e.g. through science centers), representative ILPs are expected to represent a specific part of society (e.g. as participants in experiments such as consensus conferences). The generalised ILPs are addressed as a collective, similar to the PiG. The generalised ILP must be thought of in very general terms, so that all lay persons in the collective are accounted for. Thus, generalised ILPs 'are more pure results of the concepts and theories that the lay person makers hold than with other ILPs' (Maranta et al., 2003, p. 160).

Walker et al. (2010) propose to include the idea of the public as a phantom (Latour, 2005; Lippmann, 1993 [1927]), as it is ungraspable and slippery or, as

Latour (2005, p. 38) puts it, 'this fragile and provisional concept', in the attempt to understand imagined publics. The authors aim to analyse how the phantom public becomes imagined and is made real and influential, adding, however, that 'we should not expect all to become transparent and self-evident, or to diminish the capacity for continual reformation and reimagination' (Walker et al., 2010, p. 945).

In addition, Walker et al. (2010) comment on the democratic implications of analysing imagined publics. Since literature on public engagement mainly deals with formal or staged engagement events, the incorporation of imagined publics can be seen as a virtual form of public participation. Thus, learning about scientists' imaginings of the public may not only help us to understand technology design, implementation and public engagement activities, but also give the public a voice, although partial and generalising.

According to Maranta et al. (2003, p. 154), the deficit model of the imagined lay person (i.e., 'the ignorant lay person who is curious and eager to know all about science') is the standard. However, Irwin (2006) argues that this knowledge deficit model increasingly competes with a trust deficit model; in addition to public ignorance, public mistrust of science is constructed as problem. This is articulated in science policy, for example on the European level, where a rebuilding of trust in science is mentioned as an important motive for public engagement (European Commission, 2002). Also the recent Norwegian science policy white paper describes trust in science as cornerstone for knowledge-based decision-making in a functioning democracy (St.meld.nr.18, 2012-2013). At the same time, though, the importance of scientific knowledge to the public is emphasized. Hence, Norwegian scientists are requested to communicate their research to a wider public in order to increase both public knowledge and trust in science.

Scientists' imagined publics are culturally and institutionally embedded. Constructions of publics are implicated in the contexts in which scientists operate. However, Wynne (1995, p. 364) argues that although scientific cultures differ, there are 'fundamentally similar issues of the legitimation of science not only as instrumental knowledge but as a corresponding universalist culture'. He claims that deficit models of publics are functions of a 'culture of scientism' (Wynne, 2006, p.

214). Similarly, Irwin (1995) refers to a science-centered worldview, within which publics are constructed as ignorant and irrational. This worldview 'does provide a powerful and frequently reiterated case for the centrality of scientific reasoning to social development' (Irwin, 1995, p. 14).

Accordingly, Wynne (2006, p. 219) argues that 'scientific knowledge unwittingly performs its imagined publics in normative ways'. He holds a scientific culture, which lacks self-reflection, presents scientific knowledge as universal and certain, and continues to reproduce entrenched modes of thinking such as the deficit model, responsible for existing public alienation and mistrust of science. Uncertainties and contingencies are removed from this official representation of science (Delamont & Atkinson, 2001; Wynne 1992). Further, Wynne (1992, 1995) emphasizes a culture of control as characteristic of science. In this dominant scientific culture, legitimate public concern is reduced to questions of scientifically measurable risks while other concerns or alternative perceptions of risk are dismissed as irrational or ignorant (Gregory & Miller, 1998; Irwin, 2006; Wynne, 2006). As we have seen, earlier studies find that constructions of publics as irrational are often contrasted to rational science. Hence, we can argue that imagining publics involves boundary work (Gieryn, 1983). Constructions of the 'other' (publics) are also constructions of the self (scientists).

As noted, actors connected to the development of renewable energy technologies commonly imagine the public to be resistant. Bauer (1995, p. 13) argues that, in an engineering context, resistance to technology traditionally is considered 'deviation from the Rational writ large'. Engineers claim rationality. Thus, resistance to their technologies is seen as irrational. In addition, Bauer points out that resistance often is directed towards new technologies, emphasising that '"Newness" makes a difference' (Bauer, 1995, p. 20). This could be linked to the concept of 'resistance to change', which, according to Dent and Goldberg (1999), exists as a mental construct and largely unquestioned truth in organisational life. Also in this context, resistance is portrayed as irrational and deviant (Ford et al., 2008).

The NIMBY (not in my backyard) concept exemplifies the portrayal of such irrational resistance. It refers to public resistance against the building of prisons, kindergartens, airports or wind turbines, claiming that people generally are supportive of such developments, but for selfish reasons become hostile when they are built close to their homes. It is important to note that the NIMBY concept mainly is used pejoratively, as it alleges that people are irrational with double moral standards. Wolsink (2012, p. 86) claims that 'accusing someone of NIMBY-ism is a direct insult'. Commonly, NIMBY is employed to explain the gap between high general support and strong local opposition. It has been widely used in the context of opposition towards renewable energy projects, particularly wind energy.

During the last decade, the use of the NIMBY concept to explain public opposition has been strongly criticised (see e.g. Aitken, 2010; Devine-Wright, 2009). It has been highlighted that the concept contains negative assumptions about the public, including 'an unproblematic agreement that various developments are required, but that for selfish, irrational, and parochial reasons people are willfully and ignorantly preventing the siting of necessary development in the local vicinity' (Haggett, 2011, p. 504).

Additionally, it has been shown that the main assumptions underlying the NIMBY concept – the proximity hypothesis (i.e. that people are more negative when developments are closer to their homes) and the decreasing property value hypothesis (i.e. that development is opposed primarily because residents fear a devaluation of their property) – cannot be generally confirmed (Wolsink, 2012). Actually, many studies indicate that people living close to the respective sites have the same or even more positive attitudes than people living farther away (Jones and Eiser, 2010; Ladenburg, 2008; Warren et al., 2005).

To summarise, it has repeatedly been claimed that the use of the NIMBY concept to explain public opposition is misleading and inappropriate (Burningham et al., 2006; Devine-Wright, 2011a). Consequently, mainstream academic thinking has abandoned NIMBY as an analytical tool (Devine-Wright, 2011b; Wolsink, 2012). However, the concept still lingers on – partly even in academic writing (as shown by e.g., Burningham et al., 2006; Wolsink, 2012), but mostly in the media and among

planners, developers and policy-makers (Cotton and Devine-Wright, 2012; Mcclymont and O'hare, 2008). Wolsink (2012) describes NIMBY as an unquestioned 'self-evident truth' within institutionalised technocratic thinking in the field of renewable energy deployment, to see issues of social acceptance mainly in NIMBY terms.

As noted, earlier studies of imagined publics observe a presence of expectations of public resistance. Concepts of irrational resistance, for example a NIMBY public, seem to persist in many areas of society, despite criticism from social science. However, offshore wind energy could be an exceptional case where scientists are not concerned with public resistance, since the technology is 'out of sight' and thus also 'out of mind'. Hence, I expected the offshore wind scientists to construct the public either as positive or indifferent towards offshore wind energy, or the public to remain a 'phantom,' in the sense that the scientists would not consider it necessary to deal with or to care about the public at all.

Method

The paper is based on 26 semi-structured interviews conducted with offshore wind scientists associated with the two Norwegian centres for environment-friendly energy research dealing with offshore wind energy: NOWITECH and NORCOWE. These research centers host scientists in a range of mostly engineering sciences, from electrical, mechanical, civil and transport engineering to physical oceanography, marine technology, wind energy modelling and meteorology. Their positions range from PhD candidates to research managers and professors.

The interviews were a combination of four focus groups and 22 individual interviews; in total with 35 scientists. This represents a high proportion of the total number of offshore wind scientists in Norway. Although focus groups should have a different dynamic than individual interviews and are mainly used to provide data about disagreements, negotiation and a variety of perspectives, in this case, focus groups and individual interviews functioned quite similarly. There were no major disagreements between participants in the focus groups and the ambivalences that emerged were, for the most part, also found in the individual interviews (see the next

sections for an illustration of those ambivalences). Interviews lasted between 35 and 80 minutes and were partly carried out with a colleague. All interviews were transcribed and anonymised. Interviewees were grouped according to their position (e.g. PhD candidate, research manager, etc.) and given pseudonyms. 20 interviewees were Norwegian; 15 were of other nationalities.

Data analysis was informed by my interest in interviewees' narratives about publics. Gubrium and Holstein (1997, p. 147) refer to narrative as a 'meaning-making device [...] [which] assembles individual objects, actions, and events into a comprehensible pattern'. Narratives are used by individuals or groups as instruments for sense-making. Moreover, narratives are constructions of the self (Andrews et al., 2002). Thus, as mentioned above, narratives of scientists' imagined publics also include constructions of their own role as scientists.

Narrative analysis allows addressing complex and ambiguous issues (Mitchell & Egudo, 2003). Hence, using narratives enabled me to highlight ambivalences in scientists' imagined publics and to show how the scientists constructed and drew upon different and contradictory discourses about publics. Furthermore, narrative analysis emphasizes the situatedness of narratives and facilitates the consideration of contexts (Coffey & Atkinson, 1996).

Riessman (2008, p. 5) writes that 'stories demand the consequential linking of events or ideas'. Thus, instead of taking single arguments or short quotes out of the interviews to answer more general questions (as is done, for example, in grounded theory informed methods), I looked for series of arguments and attempted to analyse how narratives about the public developed during the interviews, as this would also enable me to detect inconsistencies and contradictions within the narratives.

A thematic analysis of the data was carried out by writing summaries of each interview, where relevant statements, arguments or episodes were extracted and ordered. These summaries were then examined to find patterns, similarity of arguments and differences between interviewee narratives. However, like Polkinghorne's (1995) understanding of narrative analysis as movement from

elements to story, the narratives used as demonstration in this paper were synthesized from several interviews in order to include as many relevant aspects and linkings as possible. These narratives about scientists' imagined publics are, of course, co-constructions of interviewee accounts, my questions and my reactions to their accounts (Riessman, 2008).

The majority of the scientists interviewed were employed by Norwegian universities, but a few worked for other research institutions. Thus, although the association to the two research centers provided an institutional context regarding offshore wind energy, presumably the scientists' everyday working context, i.e. the university departments and research institutions where they were employed, may be regarded as least as influential for the scientists' narratives of imagined publics. Furthermore, although the research centers facilitated contact to the industry, potential public engagement activities were largely left to the individual scientists. As mentioned above, in Norway scientists are increasingly expected to communicate their research to the public. However, a large majority of the interviewed scientists, both PhD candidates and senior researchers, did not engage in science communication activities related to offshore wind energy.

The interviewed scientists varied according to their position, discipline, age and nationality. Hence, we may expect also scientists' imagined publics to vary along these parameters; for example senior researchers to construct publics differently than PhD candidates due to their supposedly greater experience within public engagement. Surprisingly, though, no noticeable differences or pattern related to these parameters were found. Hence, in the narratives presented below I do not differentiate between interviewees according to these parameters.

It is important to note that most interviewees did not mention the public without being explicitly asked. When talking about the future of offshore wind energy or challenges connected to the development and implementation of this technology, interviewees focussed mainly on the political framework and technology development (see Walker et al., 2010 for a similar observation about their interviewees).

In the next three sections, I present the narratives of scientists' imagined publics related to how scientists assessed public attitudes towards offshore wind energy.

Out of sight, out of mind: the narrative of the positive public

As expected, the offshore wind scientists were keen to put all worries about public resistance aside by arguing that siting wind turbines far out at sea would place them away from public concern. All interviewees agreed that there would be fewer conflicts when siting wind turbines offshore than on land, as it was believed that the public would be positive towards the technology when they would not have to see the turbines. Research Manager Foss pointed out: 'Offshore. So I think that people think, "Ok, get them out at sea so that I don't have to see them, then it will be fine". And it's not more complicated than that, I think' (Interview 25).

Similarly, PhD Candidate Smith started her story by saying that people generally are negative towards wind turbines, though if the turbines were to be placed out of sight, people would be positive. Referring to her own experiences of talking to people about her research, she explained: 'I feel that most people have the attitude that if you say you work with wind mills, then it is "Ugh" until you say that you work with offshore floating wind mills, then it's "Oh yes, then we don't have to see them, that's nice"' (Interview 8). According to Smith, a realisation of wind parks in Norway is only possible far offshore.

> *So it's like, if you want a wind park in Norway, then I think it depends on that you have a technological development which makes it possible to remove them [the wind turbines] out of our sight, that you can move them so far out that we don't see them. But that'll be big technological steps to take.* (Interview 8)

Research Manager Berg also considered removing turbines from sight a solution: 'The advantage, aesthetically, is that if you go far out at sea there is no one except for those in boats who see it. […] Nobody sees it. So who cares?' (Interview 5). However, according to Berg, it is not just overcoming public resistance due to visual disturbance, but also due to environmental and biodiversity issues. He

referred to the controversy about endangered seabirds, especially, the sea eagle, which has been important in the context of onshore wind energy in Norway (Solli, 2010) and argued that this conflict, though not the problem, could be avoided by moving turbines far out at sea.

> *When it [the bird] falls in the sea then nobody will see it. So the problem will be of the same magnitude [as on land], but it won't be in the focus. […] Seen a little cynically, you could say that it is easier with offshore wind mills. First, they are out of sight. And second, everything that possibly dies out there, nobody will see.* (Interview 5)

However, not all interviewees construed a positive or indifferent public based solely on the assumption that offshore wind energy would prevent conflicts related to visibility and environmental issues. Professor Antonsen, for example, imagined the public to be entirely positive towards offshore wind energy mainly because it is renewable and may result in economic advantages. He also thought that the public would be interested in and fascinated by the technology itself, somewhat in the sense of the technological sublime.

> *I suppose people think that it sounds fun, a little exciting. Oh, imagine that you can, especially when it starts to get floating, imagine that you can manage to get it working. […] And if you start to tell people how much energy you actually can get out of a large wind park, then I think they'll be amazed. […] So I think people really appreciate it.* (Interview 23)

To summarize, in this section, I have presented the scientists' narrative of a positive public. Drawing on experienced or mediated stories about conflicts mainly about onshore wind energy, the interviewed scientists imagined offshore wind energy to generate comparatively less or no conflict. Their narrative was characterized by technological optimism; technological improvements were believed to solve the problem of public resistance. Offshore wind was constructed as sublime technology to be developed without considering public concern. However, taking into account the expectations of a hostile public identified in earlier studies, did the scientists really consider offshore wind energy an outright solution to potential problems emerging from public resistance?

New jobs and high electricity prices: the narrative of economic concerns

In addition to constructing the public as concerned with issues of visibility and thus positive towards offshore wind energy, there were other issues, which the scientists believed might affect public opinion towards the technology. Mirroring policy debate on offshore wind energy with its focus on costs, economic arguments were very frequently included in the scientists' conceptualisations of public sentiments. While expectations of new jobs and industrial development were seen to generate positive views, some interviewees believed that people would be negative because offshore wind energy would lead to much higher electricity prices.

The cost of developing and implementing offshore wind energy was a dominant topic in many interview accounts. In this context, the public was mainly conceptualised as a mass of energy users. Professor Dahl, for example, mentioned users as potential opponents. 'Opponents will be the users who realise that this will get enormously expensive. […] Everybody, who sees the costs realistically, will be an opponent of offshore wind in Norway' (Interview 6).

Dahl linked his story of the user who is unwilling to pay more for electricity to the question of whether offshore wind energy should be used to strengthen Norway's position as Europe's 'green battery'. This could be done by combining offshore wind energy and hydropower, using Norway's hydropower plants as storage facilities and selling hydropower to European countries when demand is high. However, Dahl argued that people are sceptical of this idea, again because of expected costs. 'Who is going to pay for this? Would you pay for this? […] How it is now, it will be us, the users in Norway, who have to pay to get permission to be a battery' (Interview 6). Here, Dahl identified with the users and constructed himself as part of the public.

Later, Dahl qualified his negative remarks by arguing that public attitude depends on the way technology is presented. If Norway were to be a battery for an environmentally friendly Europe, the public would probably be positive towards the idea of combining offshore wind energy and hydropower for this purpose. However, if people were to find out how expensive this would be, they would be against it. 'If

you find out that this will lead to the costs for our energy increasing to one fifty,[48] why on earth should we pay for all the others?' (Interview 6). In this manner, Dahl constructed the public as potentially negative, drawing on an economic framework of cost concerns.

Some interviewees saw the economic issues differently, in particular those concerning the public attitude towards Norway as a green battery. PhD candidate Evensen argued this proposal could be seen as economically beneficial for Norway in the future (e.g. when Germany would be in so much need for renewable energy that it would cover the costs and pay for offshore wind in Norway). 'When it is profitable, it will be easier to sell this argument, I think, because you create jobs in Norway […] and you add value for Norway the same way as we do with oil today. We don't extract oil for ourselves' (Interview 15).

Also other interviewees mentioned the potential for industrial development and new jobs as crucial to peoples' attitudes. Research Manager Berg said: 'When there would come industrial jobs out of this, people would have a whole different attitude towards this. Then it would have been lucrative' (Interview 5). Similarly, Research Manager Sunde stressed that:

> *Then the other thing comes in that it creates jobs probably also here in Norway. You will get an industry; you have some areas, which you have developed within the oil and gas industry and that you can build on further. So you can work with a prepared supply industry. It creates jobs during construction but also during operation. It will create jobs along the coast. […] So I believe it will be a positive thing.* (Interview 24)

In sum, as in media discourse and policy debate, economic concerns were prominent in scientists' imagined publics. This focus may also derive from the research centers focus on developing cost-effective technology.

[48] 1,50 NOK ≈ 0,20 EUR per kWh. Although varying significantly depending on region and season, in 2011 (when the interviews were conducted), average price per kWh was 0,45 NOK excl. tax and grid rent and 1,02 NOK incl. tax and grid rent (SSB).

Making the public NIMBY: the narrative of the negative public

The narrative of economic concerns already points to publics constructed as potentially resistant towards offshore wind energy. Thus, although all interviewees imagined the public to be positive or indifferent towards offshore wind energy because wind turbines would be out of sight, most interview accounts were also characterised by some ambivalence. A fear of public resistance, as suggested by earlier studies of imagined publics, was present in 21 of the 26 interviews. How were these fears articulated?

In addition to relating potential public resistance to a fear of high electricity prices, most interviewees also mentioned visual disturbance and environmental consequences of wind turbines. According to Research Manager Bakke, 'if you ask people on the street, they either don't really have an opinion about it or they've a very strong opinion that it destroys the horizon, the birdlife and animal life' (Interview 10). People were believed to be sceptical of offshore wind because it is not *natural* to have turbines at sea. Among some interviewees there was also fear of protests by environmental organisations, mainly because of the consequences for seabirds. However, ambivalence became evident when it was mentioned that it would be much easier to gain public acceptance for offshore than onshore wind energy. On the one hand, issues of visibility and environmental consequences were taken to be irrelevant and the public imagined as positive because the turbines would be out of sight. On the other hand, the same turbine was a source of fear for public resistance.

A few scientists drew upon environmental issues to construct a positive public. Offshore wind is considered environmentally friendly, renewable and 'green', and this was thought to influence public opinion positively. Thus, as with onshore wind energy (see Bye and Solli, 2007), an ambivalent construction of people's perception of wind energy was found in the scientists' accounts. Wind power was green renewable energy climate change but also a threat to biodiversity and conservation of nature (mainly connected to birds and seascapes).

To strengthen their case about a sceptical public, many interviewees referred to public opposition to onshore wind energy and new power lines. The stories Bakke

told about a hostile public included her own experiences of talking to people about wind energy, as well as stories she had heard from other people. One was about a family who wanted to build a wind turbine on their farm but met strong protests from the local community. Like many other interviewees, Bakke also referred to the controversy over power lines in the Hardanger region in Norway, a tourist destination known for its beautiful fjord landscape, as a prime example of excessive public opposition to technology that invades nature and landscapes. Several interviewees also drew upon the role of untouched wild nature in Norwegian identity as an explanation for public resistance. As Research Manager Sunde put it, 'it's caused by nature. I mean, nature in the Norwegian national soul, in my opinion' (Interview 24).

Another frequent explanation for an imagined negative public attitude was that Norwegians are spoiled because of Norway's special energy situation. Norway does not have the same need for renewable energy as other European countries. In Norway, 99% of electricity production is by hydropower and is therefore already 'green'. As Research Manager Bakke pointed out, 'We are spoiled with cheap electricity, and we have the oil. We have hydropower which is cheaper to develop […]. So, all these interventions are kind of "Uhhh"' (Interview 10). PhD Candidate Smith argued more generally that: 'Norwegian people are very spoiled. You don't want to see things. You want that it's very safe, it should be environmentally friendly and you should not see it. You should not hear it either' (Interview 8). Interviewees also argued that people generally oppose new things and are resistant to change. Researcher Arnesen added that she has the impression that people in general are tired of hearing about environmental issues (Interview 21).

These explanations were also used to construct a particular Norwegian public in opposition to the imagined publics of other European countries (with Denmark used as the main reference). The latter publics were conceived as having a more positive attitude, partly due to a more pragmatic way of approaching the issue as opposed to Norway's more idealised approach. In one focus group, interviewees elaborated on the idea that Norwegians are negative towards the materialised wind turbine but positive towards it as an idea or symbol.

Consider the following exchange:

> PhD Candidate Sandvik: *They like it [offshore wind energy] as an idea or concept. […] People know very little about what it implies to have an electricity supply, which to a large degree consists of wind turbines. The Danes know about that. And it is much more pragmatic than here. […] But the romance about wind turbines is very alive here.*
>
> PhD Candidate Evensen: *But what they did there [in Denmark], are things which belong to the industry. It is because we don't have an industry.*
>
> PhD Candidate Sandvik*: I just think that a wind turbine is put in a completely different light in Denmark, isn't it, how extremely pragmatic... And it's simply the fact that people don't know that much about it which leads to that people can idealize it in that way. […] It has absolutely not been pragmatic in Norway so far.*
>
> PhD Candidate Riise*: I just wonder whether this is why it has been so successful in Denmark. Because it's just been like all other industries. It's just something we do because we have to do it like that. Instead of having a very idealistic thinking about us saving the world.* (Interview 15)

In these accounts, interviewees imagined a general public, or PiG (Michael, 2009), by referring to 'the Norwegians', 'people', 'the man in the street', 'ordinary people', etc. In addition, some specific publics, or PiPs (Michael, 2009), were mentioned as potential opponents – for example, the fishing industry, because of possible area conflicts at sea, and environmental organisations, because of potential negative environmental consequences.

Local community initiatives were also mentioned as possible opponents and the strong Norwegian regional emphasis with respect to politics was seen as a hindrance for developing offshore wind energy.

> *In many ways Norway is governed by regional policy concerns. We really want to have all these regions and all outskirts, and we want to keep them as long as possible. This is a state initiative we wish to have. So, all local communities get very strong in such debates about interventions in their area. It gets very close and opinions quickly become very outspoken. Although we are very few people in this country, we manage to make big headlines about those things*. (Interview 10)

The problem of Norwegian local democracy for implementing offshore wind was also discussed in one focus group. PhD Candidate Riise stated: 'It has been

possible to complain about decisions so that in the end those who wanted to develop got fed up because it costs money to keep the process going. […] The local democracy can be a hindrance. It is a little bit beyond the pale, but I actually believe that' (Interview 15). PhD Candidate Evensen added that people do not know their own good, and referred to the (in his view) exaggerated opposition against the pylons in the previously mentioned Hardanger area. Later he told a story about a local coastal community where people threatened to blow up offshore windmills if they were built. Also, PhD Candidate Smith referred to her own experienced local protest: 'If you read the local newspaper where I come from, then what happens there is that they want to stop the development of wind mills and they want to destroy everything' (Interview 8).

In as many as 14 of the 21 interviews, in which the public was imagined to be potentially resistant, interviewees referred to the NIMBY narrative to explain opposition. As PhD Candidate Olsen put it: 'Basically people don't want to have it in the backyard of their area' (Interview 2). Research Manager Berg connected NIMBY to peoples' concern for the environment: 'It is the environmental part of this that everybody thinks that wind power is alright, but that it somehow doesn't suit here where I live. What was it the American called this? Yes, NIMBY, not in my backyard' (Interview 5). In half of the 14 interviews suggesting a NIMBY narrative, the term NIMBY, or 'not in my backyard', was mentioned directly, while it was paraphrased in the others. NIMBY was used across academic disciplines, position, age and nationality.

In one focus group discussion, the NIMBY concept was also used to explain Norwegian public resistance as opposed to the widespread use of wind turbines in, for example, advertising, as a symbol of a positive future. PhD Candidate Sandvik: 'It is strange that people think it [the wind turbine] to be aesthetic, but at the same time nobody wants to have it in their neighborhood' (Interview 15). The NIMBY narrative was often told simultaneously and seen as consistent with the argument that placing turbines offshore is a solution to problems of public resistance. PhD Candidate Smith: 'It is very strange, but as long as it isn't in your backyard it is somehow great. As long as you don't see it, it is great' (Interview 8).

Even though the NIMBY narrative is widely drawn upon by, e.g., media and policymakers to explain public opposition in other countries (Burningham et al., 2006; Devine-Wright, 2011b; Wolsink, 2012), some interviewees used the concept to construct a particular Norwegian public in opposition to other countries' publics. Research Manager Sunde commented, 'Here in Norway, people in general are "not in my backyard". […] This is strange. In Germany, I got the impression that the farmers are proud to have a wind turbine in their backyard' (Interview 24).

Interestingly, one interviewee criticised the focus on public NIMBY opposition by saying that locals, in particular, are positive towards these kinds of new developments in their area. Professor Helland claimed that the focus on local opposition for reasons of visual disturbance or intervention in nature is exaggerated, and that this opposition is mainly put forward by those who do not experience the new developments at close range (Interview 18).

To summarise, an expectation of public resistance and a construction of the public as NIMBY were found in a majority of the interviews. This narrative of the negative public could be described as involving some degree of cultural pessimism as the public was imagined as morally and intellectually deficient. Although the interviews were about offshore wind energy, interviewees extensively referred to stories about experienced or mediatized opposition to onshore wind and pylons to make their point. It seemed as if they were transferring existing narratives about public attitudes to onshore wind energy, offshore. In that way, they constructed also offshore wind energy as an object of fear for the public.

Conclusion: Are scientists pessimists?

This paper analyses offshore wind scientists' constructions of the public(s) by identifying narratives within the offshore wind research communities in Norway. With Woolgar (1991), it could be claimed that the scientists' imagined publics have a configuring force in the sense that they construct identity and constrain action of the public. Maranta et al. (2003) describe 'imagined lay persons' as functional constructs. Imagined publics may be performative in that they affect the design of

the technology. Moreover, Walker et al. (2010) argue that imagined publics may have greater influence than 'real' publics.

While earlier studies about imagined publics find widespread expectation of a resistant public, I expected offshore wind energy scientists either to imagine a positive or indifferent public or not to take the public into account at all, because turbines are to be placed far out at sea and thus 'out of sight, out of mind'. My analysis shows that most offshore wind scientists constructed ambivalent narratives about the public. On the one hand, scientists wanted to believe in offshore wind as sublime technology. They imagined huge floating turbines far out at sea, hoping the technology to be developed and implemented without having to consider the public. As Haggett (2008, p. 292) claims, offshore wind energy 'is seen as a good thing not just in its own right, but because it may be the answer to many of the problems encountered with onshore development'. However, scientists did not dare to fully believe in this promise, and constructions of a resistant public entered into their accounts. Only a few interviewees told a simple story based on only one of the identified narratives. Most told a more complex, messy and partly contradictory story. In their accounts, they moved back and forth between narratives. Thus, the 'phantom public' becomes 'real' and influential in most scientists' constructions while at the same time keeping its ambiguity and 'slippery qualities'.

The ambivalence may be explained with reference to the particular Norwegian energy context. On the one hand, there has been an official rhetoric enthusiastically describing offshore wind energy as technological sublime, which led to the establishment of the two offshore wind research centers of the interviewed scientists. On the other hand, the interviewed scientists continuously referred to Norway's history of public resistance to energy infrastructure, which, as we have seen, influenced their imagined offshore wind publics.

Furthermore, accounts addressing public attitudes about far offshore (out of sight), near shore and onshore wind energy were often mixed without their differences being made explicit. In the 'out of sight, out of mind' narrative, interviewees often referred to 'real offshore'. The difference between near shore and 'real offshore' was largely defined by distance and visibility, rather than by

technology (e.g. bottom-fixed vs. floating). Hence, a distinction between near shore (as in sight) and offshore (as out of sight) would have been fruitful in this context (Bailey et al., 2011; Haggett, 2008; Wolsink, 2010).

In addition to aesthetics, an economic framework was prevalent. This made offshore wind scientists largely imagine the public as mainly concerned with their self-interests. People were thought to support offshore wind when out of their sight and when it benefits their economy by creating jobs. They were thought to oppose offshore wind because they do not want it in their backyards or fear higher electricity bills. In contrast, constructions of the public as concerned with more common or altruistic values connected to, e.g., the potential of offshore wind to contribute to climate change mitigation or its dangers for biodiversity were seldom mentioned by the offshore wind scientists. This economic focus may be explained through the focus on cost-effectiveness in the research centers and economic issues prominently featuring in policy debates about offshore wind energy.

A construction of the public as positive towards offshore wind energy was nevertheless predominant in many of the ambivalent narratives. However, accounts of a resistant public and NIMBYs abounded in the interviews. Like in earlier studies observing the persistence of NIMBY arguments (Burningham et al., 2006; Devine-Wright, 2011a; Wolsink, 2012), interviewees used the concept to describe the public, even though NIMBY-related worries were unsubstantiated according to the scientists, as expressed in the 'out of sight, out of mind' narrative. It is particularly significant that the NIMBY concept persists even in the context of offshore wind energy, where it could be expected to be resolved because turbines are placed at sea. Thus, although the NIMBY explanation for public resistance has been abandoned by social sciences (Burningham et al., 2006), the concept 'has become a common shorthand' (Devine-Wright, 2011a, p. 61) in other areas of society. In the offshore wind research community studied here, it was used in an act of othering to construct an irrational resistant public in contrast to scientists' rational selves. Hence, offshore wind scientists' imaginings of publics involved boundary work. This is in line with Wynne's (1995, 2006) and Irwin's (1995) descriptions of a dominant scientific institutional culture or science-centered worldview, which produces deficit models

of publics.

The imagined publics described here also portray a disembedding of the development of offshore wind technology. The dominant 'out of sight, out of mind' narrative was celebrating the idea of scientists not having to deal with the public because they would be either positive or indifferent. The NIMBY narrative constructed a resistant public as irrational 'other'. By othering the public as irrational, the scientists delegitimise opposition. Thereby, they provide a space to develop the technology without having to consider the public's opinion and values. Walker et al. (2010) mention the potential to regard the incorporation of imagined publics as virtual public participation. However, in this case, the imaginings of the publics produced exclusion rather than inclusion, an othering of publics from the development of the technology. The implications of these ambiguous imagined publics for the design of the technology need further study.

This paper contributes to existing literature on imagined publics through the observation that the motor for scientists' constructions of publics is to balance between technological optimism and cultural pessimism, between offshore wind as sublime technology and an object of fear. As we have seen, the policy context, Norway's particular energy situation and the country's experience with energy infrastructure controversies play into the narratives about offshore wind publics. Also the institutional context of the research centers, e.g. the focus on cost-effectiveness, may have influenced the imagined publics. Particularly, the perceived resistance towards onshore wind energy seemed to be transferred to offshore technology, in contrast to observations of a public largely positive towards onshore wind energy (Karlstrøm, 2010; Rygg, 2012). Besley and Nisbet (2013, p. 656) suggest that scientists' misperceptions of public opinion may be a result of 'pluralistic ignorance and false consensus – a failure to realize when one's own opinion is in the majority or minority, respectively'. Furthermore, scientists blamed negative media coverage for causing public resistance even though it is mainly positive (Heidenreich, forthcoming). Thus, scientists themselves could have been victims of the "hostile media effect", i.e. that people with a strong interest in an issue 'tend to view even favorable coverage as slanted against their goals and point

of view' (Besley and Nisbet, 2013, p. 656).

To conclude, constructions of publics involve constructions of the scientists' selves. Considering the surprisingly high prevalence of constructions of negative publics, the question could be raised whether the scientists' constructions of ambivalent publics mirror a pessimistic engineering mindset. The presence of the narrative of a resistant public could point to a general (unconscious) insecurity or fear among scientists and engineers, especially related to wind energy, to be criticized or to fail because of public protest.

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Chapter 4: Outreaching, outsourcing, and disembedding: How offshore wind scientists consider their engagement with the public

Abstract

The role of scientists as socialization agents (i.e. actors who contribute to the embedding of technology into society), has been increasingly emphasized in science policy, as well as in scholarly fields such as science communication and public engagement with science. Through an analysis of scientists' narratives of science–public relations, this paper investigates scientists' socialization strategies, and how scientists, themselves, interpret their role as socialization agents. The analysis is based on semi-structured interviews of 35 offshore wind scientists, finding a diversity of narratives related to the questions of whether socialization of technology is needed and which socialization strategies scientists should pursue. The public education narrative was dominant. However, instead of pursuing the socialization strategy of educating the public in order to overcome anticipated resistance, many interviewees referred to the difficulties of being outreaching scientists, and held the view that others should be responsible for public education, that it should be outsourced. Another common narrative was that of disembedded technology development; no need for the socialization of technology. More ambitious socialization strategies, such as upstream engagement and the design approach (i.e. the adjustment of technology to overcome anticipated resistance) were minority narratives. Thus, despite the importance attributed to scientists for the socialization of science and technology, most interviewed scientists did not embrace their role as socialization agents.

Keywords: Socialization of technology, socialization strategies, scientists, offshore wind technology, Norway

Introduction

Over the past decades, public authorities have shown concern over public resistance to new technologies. Concurrently, science communication has largely been viewed as a "'technical fix' to impose social consensus" (Bucchi, 2013, p. 908). Hence, policymakers have increasingly expected scientists to engage with publics and contribute to the socialization of technologies, in order to manage anticipated resistance (Neresini & Bucchi, 2011). This paper investigates the ways in which scientists view their role in the socialization of offshore wind technology.

The "socialization of technology" refers to processes of embedding new technologies into society. A low degree of embeddedness may explain many of the obstacles met when science and technology are implemented, which is why "agents of socialization" are needed to engage in such processes. Arguably, scientists should be important socialization agents (Bijker & d'Andrea, 2009). Since the late 1990s, this important role of scientists has been emphasized in science policy. For example, in the European Charter for Researchers (European Commission, 2005), all researchers are asked to disseminate their research to society in order to increase the public understanding of science.

Furthermore, academic studies (e.g. within the fields of public engagement with science and science communication) increasingly address science–public relations and highlight the importance of scientists' communication with society. Within the approach of "upstream engagement" (Rogers-Hayden & Pidgeon, 2007; Wilsdon & Willis, 2004), scientists are expected to actively engage with publics very early in the process of technology development, in order to timely address relevant public concerns, particularly in the context of emerging technologies.

This paper investigates how scientists may meet such expectations. To what extent do they consider themselves socialization agents? What kind of socialization activities do they see as necessary? The paper illuminates these issues through an analysis of interviews of scientists working with offshore wind power. Offshore wind power is an emerging technology of renewable energy that promises minimal interference with the public in terms of visibility, but nonetheless depends on public support for realization, not the least due to high initial investment costs.

The interviews were conducted in Norway, where offshore wind technology encounters ambiguity and uncertainty regarding its implementation. First, Norwegian policymakers have alternative options for sustainable energy sources. Second, nearly 100 percent of electricity production is from hydropower, which sets high standards for environmental friendliness. Third, Norway still opts to produce oil and gas offshore, and the oil and gas industry competes with offshore wind in terms of resources and manpower. At the same time, offshore wind energy has been enthusiastically described as "Norway's new oil"[49] and "Norway's next industrial adventure."[50] Presumably, this context should motivate scientists to engage with the public.

Scientists' role as socialization agents has been particularly highlighted in the context of emerging technologies in Norway. The importance of science communication for making science more available to the public, for increasing public knowledge about science and technology, and for facilitating public debate and participation has repeatedly been mentioned in science policy white papers (St.meld.nr.18, 2012–2013; St.meld.nr.20, 2004–2005; St.meld.nr.30, 2008–2009). This should also motivate scientists to engage in socialization. However, previous research raises doubts regarding scientists' actual willingness to engage with the public in addition to finding a diversity of engagement practices. What does this entail?

Scientists as socialization agents and their potential strategies

Bijker and d'Andrea (2009, p. 62) conceptualize the socialization of technology as a broad notion that includes any "processes involved in the production, use and circulation of scientific research and its products in an inseparable connection with its social context." The authors contextualize their approach to socialization by referring to a changed – that is, more entangled, complex, and intensified – relationship between science and society. This is also described by the notion of "Mode 2" knowledge production (Gibbons et al., 1994). However, at the same time,

[49] Minister of Petroleum and Energy Åslaug Haga in NTBtekst 05.02.2008.
[50] Minister of Petroleum and Energy Terje Riis-Johansen in *Kommunal Rapport* 26.06.2009.

Bijker and d'Andrea (2009) observe that many researchers are hesitant to adapt to this intensified science–society relationship, and stay rather isolated from society. Hence, the authors describe socialization processes as weak, particularly in Europe. Likewise, Neresini and Bucchi (2011) note that a culture of public engagement is lacking in European research institutions.

Several studies find that scientists explain their hesitation to participate in science communication and public engagement activities as the result of limited capacity, such as a lack of time and reward. Involvement in public engagement activities is not perceived to be suitable for all scientists, and is even thought to have potentially negative effects on some scientists' reputations and career progressions (Kyvik, 2005; McDaid, 2008). However, Poliakoff and Webb (2007) find that scientists' attitudes towards public engagement, the extent of their previous engagement activities, and the perceived extent of their colleagues' activities influenced their intentions to engage with publics, as well as their own perceived capability. Furthermore, 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, p. 28).

As mentioned above, Bijker and d'Andrea (2009) explain many hindrances met by science and technology in society with a lack of socialization. Nielsen and Heymann (2012) extend this claim by showing that engineering communication affects the implementation, as well as the development, of technology. Further, Bijker and d'Andrea emphasize scientists' role as socialization agents in their six areas of socialization: scientific practices, scientific mediation, scientific communication, evaluation, governance, and innovation. The concept of a "socialization agent" is very broad, including all actors "involved in activities that somehow contribute to the social embedding of science and technology" (Bijker & d'Andrea, 2009, p. 72). Accordingly, scientists as socialization agents can pursue many different socialization strategies.

Earlier research indicates that scientists mainly pursue socialization strategies that can be described as public education or dissemination. Callon (1999), for example, describes the "public education model" as the most common way of

thinking about science–public relations. Through this perspective, scientific and lay knowledges are viewed as two separate spheres. Scientific knowledge is presented as objective, factual and value-free truth that is superior to other knowledges (Holliman & Jensen, 2009; Irwin, 2008). Moreover, scientists portray the public as ignorant and thus skeptical of science and technology. Deficits in the public's scientific knowledge should be eliminated, in order to establish trust in science and prevent peoples' resistance towards new technologies (Callon, 1999; Stilgoe & Wilsdon, 2009). The public education model is also referred to as the "deficit model."

Despite extensive criticism of the public education model and an increasing focus on dialogue and public participation, a wide range of studies (Barnett et al., 2012; Besley & Nisbet, 2013; Blok et al., 2008; Braun & Schultz, 2010; Burningham et al., 2007; Davies, 2008; Devine-Wright & Devine-Wright, 2005; Michael & Brown, 2005; Powell et al., 2011) claims that the deficit model persists in constructions of science–public relations. Scientists construct their own roles as public educators in a one-way science–public relation, with the public as passive recipients. Hence, scientists usually conceptualize socialization within a rather narrow framework, at least in cases where they are involved as socialization agents.

Besley and Nisbet (2013) find that most scientists imagine the public as uninterested and unknowledgeable about science and also as irrational, emotional, and self-interested in their thinking about science and technology. Burningham et al. (2007), for example, in their study on constructions of publics within the chemical industry, find that the scientists believed the public to lack knowledge and be passive receivers of information. The chemical experts in their study depicted environmental concerns and the concerns of their neighbors as selfish or incorrect.

Similarly, Burchell (2007) shows how scientists in the field of crop genetics legitimated their actions and beliefs by claiming that they were based on objective methods and grounded in natural conditions; in contrast to characterizing the public's views "as based on a mixture of subjective and personal inclinations and the malign influence of the media and NGOs" (Burchell, 2007, p. 159). According to Cass and Walker (2009) and Cook et al. (2004), such othering of publics is often

based on characteristics like emotional and irrational.

Maranta et al. (2003) claim that the deficit model is the standard model of the "imagined lay person." The imagined lay person is a functional construct that may be performative and potentially influence the design and implementation of technology, and scientists' engagement with publics. However, Walker et al. (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, p. 938).

Davies (2008) observes that scientists' constructions of science communication parallel the deficit model, as the purpose of both seems to be the education of lay people. Also, Tøsse (2013) observes how climate scientists aimed to educate the public, pursuing a communication strategy characterized by political robustness, which "supplements the concept of social robustness by introducing the need to cope with a communication situation characterized by social, economic, and political conflict" (Tøsse, 2013, p. 50). Besley and Nisbet (2013) find that scientists often blame the news media for the public's misunderstandings and lack of knowledge. Several studies have shown that scientists tend to view the general media coverage of science more negatively than their own experiences with the media (Peters et al., 2008).

Clearly, the public education or deficit model is a common construction of science–public relations. However, it has also been widely criticized for overlooking that lay people actively deal with scientific knowledge instead of passively receiving it, and that lay knowledge is not inferior to scientific knowledge, but qualitatively different (Bucchi, 2008; Irwin, 2009). Science communication should not be considered a one-way, top-down process. Instead, critics propose alternatives, which can be roughly divided into dialogic and participative approaches.

The dialogic approaches emphasize the value of lay people's participation in scientific discussions, focusing on a two-way, more symmetrical relation between science and publics (Bucchi, 2008; Irwin & Wynne, 1996). Both scientific and lay knowledges are conceptualized as "socially and culturally contingent" (Bucchi &

Neresini, 2008, p. 451). Callon (1999) calls this approach the "public debate model." Contrary to the public education model, the dialogic approach holds that lay people do not passively receive scientific knowledge, but actively debate science. However, scientific and public knowledges are still regarded as two separate spheres.

Participative approaches, in contrast, try to overcome the separation between scientific and lay knowledges. Public participation is not viewed solely as a response to science. Publics may also actively engage with science and technology by participating in decision making, policy making, and knowledge production (Bucchi & Neresini, 2008). Callon (1999) calls this the "co-production of knowledge model." In this context, the concept of "upstream engagement," for example, refers to an early engagement of publics in science and technology development to ensure timely public participation and enable "scientists to reflect on the social and ethical dimensions of their work" (Stilgoe & Wilsdon, 2009, p. 22).

Thus, we may expect socialization strategies to be dialogic and participative. Davies (2008) finds that only a minority of scientists depicts publics as complex, and considers communication as not only a one-way process, but also a debate. However, she argues that even these minority discourses "remain bounded by a framework of the ultimate primacy of scientific knowledge" (2008, p. 429). Still, the different approaches to science–public relations may be present simultaneously, often in hybrid forms (Bucchi, 2008; Davies, 2009; Irwin, 2008).

Similarly, Holliman and Jensen (2009, p. 48) find that deficit thinking "is being conflated with dialogue approaches under the umbrella definition of public engagement." However, most of the scientists they interrogated were thinking in terms of the deficit model, while only a few thought in terms of dialogue approaches, and there was only "some indicative evidence" (Holliman & Jensen, 2009, p. 48) of participative approaches. Accordingly, Bauer and Jensen argue that a movement from dissemination to more dialogic formats "remains, however, a claim that is never really demonstrated" (Bauer & Jensen, 2011, p. 9).

To summarize, science policy, as well as normative theory, emphasizes the responsibility of scientists to act as agents of socialization and to engage with the

public. However, previous studies indicate that scientists manage this responsibility in different ways. First, there seem to be two main communication strategies. One emerges from the deficit model and aims to educate the public. The other is related to an ideal of more interactive dialogue, and may reflect ambitions of upstream engagement. Second, while some scientists are reported to actively engage with the public, many studies find, as we have seen, that scientists and engineers are reluctant to participate in such engagement. They may, for example, be doubtful of their own skills in communicating or in dealing with news media, or they may claim a lack of capacity. Since offshore wind developments in Norway are vulnerable to political support, one might expect that offshore wind scientists would feel some pressure to engage with the public in order to elicit support. On the other hand, scientists might find reasons not to do so, either because they believe some of their colleagues may already meet the challenge, or because they are reluctant to take on such engagement tasks.

Thus, the expectation is, first, a considerable diversity among offshore wind scientists with respect to the ways in which they talk about public engagement and their role in such engagement. Of particular interest is the way in which scientists place themselves with respect to the deficit versus the dialogue model. To what extent have the recent policy efforts in Norway to promote the dialogue model of engagement been influential? Finally, there is the issue of how the offshore wind scientists imagined their public in the ambiguous context of offshore wind development in Norway. How important is this construction to their thinking about public engagement with regard to offshore wind?

Method

This paper is based on interviews with 35 scientists associated with the two national centers for environment-friendly energy research on offshore wind energy in Norway: NOWITECH and NORCOWE. The scientists' positions ranged from PhD candidates to professors. The majority was 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. In the

following, I refer to them as (interviewed) scientists or interviewees, and I use their position and a common last name (e.g. PhD candidate Hansen), to provide anonymity.

The interviews were semi-structured, using an interview guide employed flexibly according to the way conversations unfolded. The original plan was to conduct focus group interviews to learn about how the relevant issues were discussed. Four focus groups were carried out; however, two of these focus groups had only two participants. Because of the limited number of available informants, it was not possible to get more participants for the focus groups. Hence, the rest were one-on-one interviews (or two-on-one, as some interviews were done with a colleague). Focus groups, arguably, should function differently to one-on-one interviews, as they provide more data about positions and disagreements between interviewees. In this case, however, the participants in the focus groups did not disagree significantly about the relevant issues. In addition, ambivalences and positions also emerged in the one-on-one interviews. Thus, individual interviews were similar to focus groups, regarding the display of multiple narratives.

In total, 35 scientists were interviewed. This represents quite a large proportion of the offshore wind scientists in Norway. The interviews lasted between 35 and 80 minutes in length, and all interviews were transcribed. Of the interviewees, 20 were Norwegian and 15 were foreigners. Interviews were conducted in Norwegian, English, and German. For this paper, quotes from Norwegian and German interviews were translated into English.

Most interviewees, in focus groups as well as in one-on-one interviews, did not tell a single unambiguous story about science–public relations. Interview accounts were messy and vague with different, sometimes contradictory, constructions. Thus, I was interested in the different narratives about science–public relations within interviews, rather than the attribution of a single construction to one interviewee. This interest in narratives shaped my data analysis, in that I regarded the interviews as a whole, in order to analyze the way in which the narratives developed.

I analyzed the data by reading and writing summaries of each interview. These summaries included and ordered relevant arguments, episodes, and representative quotes. On the basis of the summaries, I created a table with an overview of the interviews containing key words related to the main research questions. This enabled me to better compare across interviews and to identify dominant and minority narratives. For a richer presentation of the narratives in this paper and to illustrate the different patterns of argumentation, I chose to use examples and thus construct the narratives from different interviews.

The term "offshore wind scientist" is my construction, and my "imagined" offshore wind scientists were certainly performative in the processes of preparing and conducting the interviews, and analyzing the data. Hence, the narratives about the ways in which scientists conceptualized science–public relations in the context of offshore wind energy and how they viewed their own roles as socialization agents are co-constructions (Holstein & Gubrium, 1995). In the following sections, I present five narratives of scientists' socialization strategies, starting with the most ambitious.

The ambitious socialization strategies: Narratives of upstream engagement and design against resistance

Above, I presented scientists' potential socialization strategies for embedding offshore wind technology into society: the public education strategy and dialogic and participative strategies. I also presented the possibility of scientists' reluctant take on socialization tasks. I found some versions of all of these strategies in my interviews.

The dialogic and participatory approaches correspond with current developments in science policy and theoretical approaches to public engagement with science, and are often referred to in a normative way as the "best" or "most ambitious" socialization strategies. I begin by considering traces of these formats among my interviewees, although these were only mentioned by a few.

Upstream engagement means that the public should be involved in the early stages of technology development. Only 2 out of 35 interviewees mentioned such engagement. One of them, Research scientist Holm, considered this strategy useful to gain acceptance from relevant stakeholders (such as the fishing industry) early on, in order to prevent resistance later. Thus, upstream engagement was to be used pragmatically to prevent public resistance and conflict, rather than used idealistically to enable democratic participation. Professor Nielsen came closer to the latter when he emphasized the general value of early public 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 energy] so that people could express their opinions" (Interview 22).

Some scientists presented another ambitious strategy through a narrative of design against resistance, extending public engagement into the actual design of technology. This strategy was based on a construction of publics as potentially resistant, and can be characterized as a preemptive effort to avoid conflict. The strategy did not include direct communication with publics. Its main feature was the integration of anticipated public concerns in the design of the technology. However, most of the scientists did not consider the public relevant to technology development. As research scientist Holm put it: "It is about getting a good technological solution and then you will see; can society accept it or not" (Interview 13). The public was not considered an "engineering issue" (see Walker et al. 2010).

In contrast, Research manager Sunde's argued that public concerns did indeed play into the design of the technology, for example in the choice of having three, instead of one or two, blades, and with a tower instead of a jacket construction. These designs were caused by concerns regarding esthetics and public acceptance.

> *It is 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 looked like old Western style. It didn't look well. It gets much nicer with a tower that is round. […] This is how it developed. From people's acceptance of onshore solutions, I think. (Interview 24)*

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 (hahaha), no” (Interview 24). This suggests that concerns with respect to the public were ambiguous.

Despite this general reluctance to consider public concern 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. Although research scientist Holm argued that potential public concerns should not constrain technology design, he 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).

PhD candidate Nilsen demanded more investment in technology development in order to overcome the challenges of public resistance. “First, I think for instance, 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). He also mentioned that it is important that wind energy technology has an environmentally friendly design. “We should make the design of the wind turbine very friendly to the environment, I mean to aquaculture. […] If we could achieve that, the fishermen would be very happy” (Interview 3). Likewise, Professor Dahl proposed that wind parks be designed with corridors to accommodate the fishing industry.

As PhD candidate Nilsen pointed out, replacing onshore with floating offshore technology seems an obvious example of design intended to prevent potential public resistance. The argument that wind turbines would be “out of sight, out of mind” was typical (Heidenreich, forthcoming). As scientific manager Antonsen put it: “It is in itself a motive to go offshore that you avoid a great deal of the environmental conflicts” (Interview 23).

Public education: Narratives of the outreaching scientist

The public education model was, as expected, a dominant construction among the interviewed scientists, who explained negative public attitudes by pointing to knowledge deficits. It was argued that people's attitudes towards offshore wind energy were based on feelings. Accordingly, it was important to inform the public about facts.

Research manager Bakke described the public as having a knowledge deficit and lacking acceptance of offshore wind energy. She believed that information about offshore wind energy would help counter peoples' negative attitudes. Furthermore, she argued that the opposition against offshore wind energy to be not well reasoned but intuitive and spontaneous:

> *I believe most people don't really think about it. They think that a wind park destroys the environment. […] 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)*

Through such public education narrative, offshore wind scientists constructed the public as irrational and emotional "others" (see Cass & Walker, 2009; Cook et al., 2004 for similar observations). This othering happened mostly in the context of discussions of the environmental consequences of offshore wind energy and, in particular, the potential dangers for seabirds. Senior researcher Monsen explained that "there are people who believe that wind power plants somehow are bird killers; that it is like when the birds fly they get injured. If you see a wind park, it is somehow like a guillotine for birds. They picture almost a massacre. Created by the media" (Interview 26).

Unsurprisingly, the news media were often accused of being the source of these "wrong" stories or myths about offshore wind energy among the public. PhD candidate Tangen claimed:

> *People think that wind turbines are like these massive bird murdering machines. But they really don't kill that many birds. I just, I think, that side of the story gets told more than the other side. Like, ok, they kill a few birds, but what about a coal power plant. How many birds does that kill, for example? […] 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)*

Research manager Berg, however, argued that public discussion would be less emotional in the context of offshore, rather than 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 the public. 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. Very often a myth is developing about this or that industrial actor as a danger for the environment. And in many cases it is definitely so that facts are much nicer than myths. (Interview 5)*

Through such reasoning, the scientists argued that the public 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.

Most interviewees did not find it necessary for the public to know much about offshore wind technology. However, some were convinced that people should understand the function of electricity prices and the electricity market, and how Norway would benefit from developing offshore wind energy. In addition, they should know facts about environmental consequences. It was such knowledge that would make public sentiment more positive. As Professor Lund stated: "I would say that [...] the understanding of the energy price, to start to educate people so that they understand that the prices will be different in some years. […] The whole society must be geared towards renewables. I believe this for sure" (Interview 7). In one focus group, the discussion went as follows:

> *PhD candidate Lindgren: I feel like this with the electricity prices, how it [the market] works and how they go up or how power trading works though. This is something I didn't really understand before recently when I actively started to acquaint myself with the topic. And what most people believe is that we scale down the reservoirs to be able to sell a lot of power so that we don't have anything ourselves. But what they don't see is that Norway makes a profit by having a power trade. And I feel it is important to get people to understand that.*
>
> *PhD candidate Sandvik: It is tax money, simply.*
>
> *Lindgren: Yes.*

Sandvik: Yes. This is important. But nobody sees this. How much could the Norwegian society get richer by a wind turbine? It would have been tip top to get that properly illustrated.

This is similar to Davies' (2008, p. 417) argument: "It is better to communicate 'big ideas' or key principles than detailed research."

However, not all scientists who claimed that the public needs knowledge about offshore wind energy argued from the deficit model. Some scientists mentioned other reasons for pursuing a public education strategy. First, interviewees referred to the general value of knowledge. Interviewees believed that, as citizens, people ought to know about important and socially relevant issues such as renewable energy. Second, interviewees believed that, since they fund the research as tax payers, the public has a right to be informed about the use of their money. PhD candidate Olsen argued: "After all, the money comes from the people. And it is quite a lot of money that is invested in that area. So people, I think, have the right to know what is done with the money. So I think it is our responsibility to disseminate the information to the people" (Interview 2).

To summarize, in more than two thirds of the interviews and focus groups (19 out of 26) the interviewees mentioned that the public needs more knowledge about scientific facts. This claim was mostly expressed through the deficit model. Some scientists had other reasons for providing knowledge to the public, such as a belief that the public has a right and a duty to know. In general, interviewees put a varying degree of emphasis on the importance of scientific facts in the public debate. While some held strong opinions about the need for facts, others were more cautious. Some started to reflect on the need for knowledge dissemination to the public (see below for further discussion). Nevertheless, the deficit model narrative was present in many interview accounts. How did the scientists see their role as socialization agents through this perspective?

Some mentioned that scientists are responsible for science communication and should provide the public with necessary knowledge. They believed that scientists should bring facts into the public debate, which currently was seen as 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). Also, other interviewees mentioned that scientist should communicate research to the greater public audience.

Mass media were seen to be the main channel for providing information, but other channels were also mentioned, like as school visits and participation in local debates or lectures. Research manager Bakke elaborated the importance of mass media: "Somehow you wish to reach out. And this [the mass media] is the only way you can inform people to get accept that this [developing offshore wind energy] is a way to go, that people get the information they need to make up their mind that this seems ok" (Interview 10). She presented public outreach as a task of the two Centers for Environment-friendly Energy Research. PhD candidate Hansen argued similarly. However, rather than presenting the deficit thinking as his own, Hansen portrayed it as a request from the research center: "They [from the research center] mentioned to us that as scientists we must transfer our knowledge to the media, to the society [because] if they don't know they will think negatively about our activity" (Interview 1).

Not engaging in public education: Narratives of the difficulty of being an outreaching scientist

Only a small group of the interviewed scientists actually said they engaged in public education activities (mainly by writing feature articles for newspapers). 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, like Professor Antonsen: "As a scientist you should communicate. So I think this is something we could be better at" (Interview 23). Senior researcher Tveit thought that technologists were bad at communicating: "We are doing it way too little. […] We are not good enough to use the media. […] It is typical for technologists that we somehow don't see a purpose in going out in the media to be misunderstood" (Interview 19). Also Researcher Arnesen was self-critical:

> *We should to a larger extent see it as our responsibility to influence the public opinion. This doesn't just apply for wind research, but research in general where we complain a lot about a public opinion being wrong and reactionary and such, but we can't expect that the public has the same information like we. So we have to blame ourselves for our lack of presence. (Interview 21)*

As illustrated here, statements emphasizing the need for public education often went hand in hand with constructions of a resistant public. Still, only a low level of public engagement activity was reported by interviewees.

A common explanation of this low level of activity was difficulties when encountering the public sphere. These difficulties were attributed to a lack of time and resources, like limited resources at universities, and a system that rewards publications in international journals over engagement with media and the publics; "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'" (Professor Dahl, Interview 6).

Furthermore, scientists were nervous about communicating their research through the media. They would need to simplify, and they could be misquoted or misunderstood, which might harm their reputations;

> *It's not without risk to involve yourself, and I know that many refuse to do it because of that. They don't dare to enter the debate because it is a tough debate and you get put on the spot, so 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. (Researcher Arnesen, Interview 21)*

Arnesen also mentioned linguistic differences between the scientific and public/political fields:

> *We almost don't speak the same language. Politicians always have to express themselves with full certainty and be very convincing and never in doubt, while scientists will be reluctant to say something categorically. They will always say, 'Yes but,' and 'You have to take into consideration,' and 'This only applies in this case.' […] You have to be very careful. We can easily make matters worse, just because we don't speak the same language. And when a normal reader reads what we say, it will be perceived in a completely different way. It will sound as if we don't know, as if we are not sure. (Interview 21)*

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:

> *We don't have special research or expertise on economics or media or politics or such things. In this way, it is like what I have 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)*

Thus, many scientists, referring to the difficulties of educating the public in line with Tøsse's (2013) findings about political robustness, concluded that science dissemination should be outsourced. How was this argued?

Others should educate the public: Narratives of the outsourcing scientist

In part because of the difficulties mentioned above, many of the interviewed scientists did not want to engage in science communication, like Professor Antonsen: "We didn't make any particular decisions about or have intentions to enter the public debate" (Interview 23). Rather, this group of scientists argued that "others" should act as mediators between themselves and the public.

One reason for this reservation was that the specific technological details of their work were difficult to communicate beyond colleagues while many interviewees claimed to feel incompetent in commenting broader issues related to offshore wind. PhD candidate Amundsen phrased it like this:

> *I'm working in a particular technological area and my opinion could be understandable or valuable only to people who are standing on that same platform. I don't think that common people can understand much when I describe the benefits [of the technology] or something like that. (Interview 9)*

Therefore, he proposed other people to engage in science communication: "Of course there are other people who maybe can translate the technical effect into general life. And they will perhaps do a better job talking to people" (Interview 9). PhD candidate Hagen identified these "others" as politicians and social scientists: "I think people who work in social science should be the ones who inform the people about the advantages [of offshore wind energy]" (Interview 4). In one focus group of PhD candidates, this was discussed as follows.

Interviewer: Who'se 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 mean I have a thousand small technical issues which are of interest to a small community of researchers, right. But I mean that's not the kind of things that we share. […] [I]f there's the opportunity to write an article for a local publication I would probably do something like that. But – I mean...

Vik: It's not our job.

Miller: Yeah, it's not really our job. In a way that's true. (Interview 16)

Furthermore, the scientists questioned the impact of their contributions on public debate. As research manager Foss pointed out: "Scientists have little possibility to influence the public opinion in this area. We can talk, and 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).

In particular, some of the interviewed non-Norwegian scientists (though not all) stated that they were "separated from society" (Interview 1). This argument was used as an explanation and reason for not communicating with publics, like PhD candidate Jonsen in one of the focus groups:

I'm never going to have that much of a contact with the Norwegian society, with the Norwegian people, because of the language barrier and other cultural barriers that can never be bridged. […] So a huge chunk of people will get influenced and inspired by offshore wind energy, and never able to inspire other Norwegians. (Interview 16)

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). He added that this disconnect is even greater when the research group consists only of foreigners: "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).

As we have seen, the public education narrative was common in the offshore wind scientists' interviews. Thus, a divide was constructed between the emotional and irrational public others and the factual, rational scientists. It was thought that

scientific facts should be communicated to the public mainly through the media, but the scientists held different views about who should initiate this communication. Both the narrative of the outreaching scientists and the narrative of the outsourcing scientists were presented as strategies to manage the public knowledge deficit and thus prevent resistance. In the narrative of "not doing public education," scientists widely pointed out difficulties associated with science communication, which appeared to be particularly challenging for the non-Norwegian interviewees. Does this suggest that all of the interviewed scientists agreed about the need for the socialization of offshore wind technology?

Narratives of a disembedded development of technology

The socialization narratives presented in this paper have mainly focused on strategies of dealing with anticipated public resistance. However, whether these strategies include public education, upstream engagement or the design of technology to prevent public resistance, they were presented by interviewees as something that they, as scientists (or others), "should" do, rather than something already happening in the context of offshore wind energy. This reported lack of action challenges the assumed importance of addressing the public.

Scientists' dominant narrative about offshore wind energy in Norway was usually brought to light through questions about the future of offshore wind energy in Norway or the challenges for developing and implementing offshore wind energy. It did not refer to the public as significant for the development and implementation of offshore wind technology. Rather, the public was largely absent in that narrative. Scientists considered the development of technology (with the primary focus of reducing costs) and a lack of political framework and support as the main challenges for the successful development of offshore wind energy in Norway.

Interviewees challenged the need for addressing the public as part of technology development by not mentioning the public in the dominant narrative of offshore wind energy or through active questioning about the assertion that the public needs knowledge about offshore wind energy. "(S)cientists agree the public knows too little about science but disagree on whether this presents a problem"

(Besley & Nisbet, 2013, p. 648).

This ambivalent stance was developed mainly within the narrative of the public education model. Some scientists started to question its premises and whether it represents a useful way of thinking about publics. In one of the focus groups, PhD candidate Sandvik referred to the many uncertainties connected to offshore wind in Norway when reflecting on the assertion that the public should engage with or know about offshore wind energy. He 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?" Discussing whether the public needs knowledge about offshore wind energy, PhD candidate Jonson argued: "They really don't need to go into details of technology, but they need to know that this is for their own benefit" (Interview 16). Similarly, research manager Sunde responded to a question about what people should know:

> *This is a difficult question. I am almost tempted to answer 'nothing' (hahaha). […] So what people should know, I rather believe they should know more about the environmental aspects. Somehow, that it [offshore wind] is a green or regenerative type of energy source and they should know about how many consequential damages one can expect or if they don't have this, that it actually isn't harmful to have them standing close to your home or in the neighborhood. (Interview 24)*

Other ways of questioning the need for the broader public to be engaged or informed included arguing, as Professor Rønning did, that only the local population directly affected by plans for development should be informed (Interview 14); or claiming, as research scientist Holm did, that the public only needs to be informed of any serious negative consequences for society and the environment.

> *If there are things that have great consequences for society then I think that all should know about possible consequences. […] Similarly, I expect that an industry as offshore wind also should have this openness, if it somehow has big negative consequences for the environment or the surroundings. But I somehow don't see anything like that. (Interview 13)*

The narrative of questioning or challenging the need for informing or involving the public is a narrative of disembedded technology development. This narrative argues that development of technology happens outside the social context, without clear links to society and public concerns. Consequently, there is really no need for socialization efforts. This narrative was often presented with the narrative of a positive public. When the public was considered positive towards offshore wind

energy, the interviewed scientists saw less need for the technology to be socialized through their efforts.

Because the interviews constructed the public as a relevant issue for scientists, they invited scientists to be supportive of the socialization of offshore wind technology. Thus, the interviewees would likely aim to present themselves as "good scientists" living up to the expectation of being agents of socialization. Consequently, the strong presence of the disembedded technology development narrative is notable.

Conclusion: Taking cover in the ivory tower

This paper analyzed Norwegian offshore wind scientists' narratives about their engagement with the public. Starting from the concept of the "socialization of technology" (Bijker & d'Andrea, 2009), which refers to the processes of embedding technology into society, it discussed the degree to which scientists view themselves as socialization agents, and investigated which socialization strategies scientists pursue.

The analysis of the scientists' narratives shows the expected diversity. Scientists provided five different narratives of public engagement, and thus five socialization strategies: (1) narratives of upstream engagement and design against resistance, (2) narratives of the outreaching scientist, (3) narratives of the difficulties involved in being an outreaching scientist, (4) narratives of outsourcing scientists, and (5) narratives of non-engagement due to a perception of offshore wind development as disembedded. Narratives 3, 4 and 5 were the most frequently mentioned. Moreover, very few of the scientists who referred to upstream or outreach engagement described themselves as active socialization agents. In fact, most scientists presented these strategies as something they "ought to do," rather than something they were actively doing.

Also, as expected, the public education approach (or deficit model) was the most common element of the narratives. The normative move towards dialogic and participative approaches found in scholarly and policy circles left few traces. The

only socialization strategy loyal to the normative ideal, upstream engagement and design against resistance, were seldom mentioned in the interviews.

What about the other four strategies? The narratives of the outreaching scientist live up to the expectation that scientists should be socialization agents. The narratives of the difficulty of outreach, which often follows the narratives of the outreaching scientist, is seemingly in line with the expectation that scientist should engage with socialization. However, the scientists who used this narrative did not engage in outreach. Similarly, the outsourcing strategy bows to the idea of the socialization of technology, but not to the idea of scientists as active agents of socialization. In contrast, the disembedding narrative denies the need for scientists to engage in socialization. Overall, the main observation was that the effect of the expectation that scientists should engage in socialization was bad consciences and excuses for inactivity.

The scientists' perceptions of the public played an important role in these outcomes. The narrative of the outreaching scientist was often linked to an imagined resistant public, while the narrative of disembedded technology development tended to be accompanied by reference to an imagined positive public. Thus, the deficit model was discarded by many interviewees who perceived the public as positive but lacking any significant role in the development of offshore wind technology. Consequently, these scientists could be considered disembedded and without responsibility to engage with the public.

This raises issues with respect to their scientific culture because it seems as if the offshore scientists mainly wished to design and develop their technology without considering the social context or engaging in socialization of the technology. This may be attributed to limited capacity, but also to scientists doubting the impact they would make should they make an outreach effort. The scientists saw their role as being an insignificant part of a big machine, and thus lacked the motivation to contribute. As such, they disclaimed responsibility. The increasing pressure on scientists to act as agents of socialization seems ineffective. Most of the interviewed scientists preferred to overlook expectations that they would act as socialization agents. Rather, they took cover in the ivory tower.

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Appendix 1: List of interviews

	When?	Who? (Pseudonym)	Position/Field	Nationality
1	June 2011	Hansen	PhD candidate/Physical Oceanography	Non-Norwegian
2	July 2011	Olsen	PhD candidate/Electric Power Engineering	Non-Norwegian
3	July 2011	Nilsen	PhD candidate/Electric Power Engineering	Non-Norwegian
4	July 2011	Heitmann & Hagen	PhD candidates/Electric Power Engineering (2)	Non-Norwegian (2)
5	August 2011	Berg	Research Manager/Physicist	Norwegian
6	August 2011	Dahl	Professor/ Mechanical and structural engineering and Materials Science	Norwegian
7	August 2011	Lund	Professor/Mechanical and structural engineering and Materials Science	Norwegian
8	August 2011	Smith	PhD candidate/Mechanical and structural engineering and Materials Science	Norwegian
9	August 2011	Amundsen	PhD candidate/Mechanical and structural engineering and Materials Science	Non-Norwegian
10	August 2011	Bakke	Research Manager/Marine Biology	Norwegian
11	August 2011	Strand	PhD candidate/Meteorology	Norwegian
12	August 2011	Paulsen	PhD candidate/Meteorology	Non-Norwegian
13	August 2011	Holm	Research Scientist/Marine	Norwegian

			technology	
14	September 2011	Rønning	Professor/Mechanical Engineering	Norwegian
15	September 2011	Langmo, Riise, Evensen, Lindgren & Sandvik	Phd candidates (5)/ Electrical Engineering (2), Energy and Process Engineering (1), Marine technology (2)	Norwegian (5)
16	September 2011	Vik, Miller, Stone & Jonson	PhD candidates (4)/Marine technology (1), Civil and Transport Engineering (2), Electrical Engineering (1)	Non-Norwegian (4)
17	September 2011	Herman & Tangen	PhD candidates (2)/ Engineering Design and Materials (1), Civil and Transport Engineering (1)	Non-Norwegian (2)
18	September 2011	Helland	Professor/Electric Power Engineering	Norwegian
19	September 2011	Tveit	Senior researcher/Energy research	Norwegian
20	October 2011	Engen	Research manager, physicist	Norwegian
21	October 2011	Arnesen	Researcher/Physicist	Norwegian
22	October 2011	Nielsen	Professor/Meteorology	Non-Norwegian
23	October 2011	Antonsen	Professor/Physical Oceanography	Norwegian
24	October 2011	Sunde	Research Manager/Materials and Chemistry	Non-Norwegian
25	October 2011	Foss (telephone interview)	Research Manager/Energy research	Norwegian
26	2010	Monsen	Research Manager/Electrical Engineering	Norwegian

Appendix 2: Interview guide Norwegian

Personlig bakgrunn

1. Bakgrunn. Utdanning/Arbeid.
2. Hvilke OWE aspekter jobber du med?

Perspektiver på teknologien

3. Hvordan ser du på offshore vindkraftens fremtid? Tror du dere lykkes her i Norge? (Hvorfor/hvorfor ikke?)
4. Hva er de største utfordringer med offshore vindkraft generelt? (teknologi, kostnader etc.)
5. Hva tror du kan muligens forhindre at dere lykkes med teknologien her i Norge? Er det forskjellig fra andre land – hvordan?
6. Hvilke aktører ser du som støttespillere? Hvem som motstandere? Hvordan ser du på regjeringens og politikernes rolle?
7. Hva er argumentene for offshore vindkraft? Og mot offshore vindkraft? Hvordan vurderer du disse argumentene?

Public & Media (innledning: artikkel om mediedekningen)

8. Hvordan fremstilles offshore vindkraft i mediene? Hva synes du om den måten offshore vindkraft er omtalt i mediene på?
9. Hva betyr det for ditt arbeid/din forskning når teknologien diskuteres i mediene? Diskuterer dere dette for eksempel blant kollegaer? Hvordan? Hva er deres synspunkter?
10. Er du eller dine kollegaer engasjert i måten offshore vindkraft blir omtalt i mediene? Hvordan? Hvorfor/hvorfor ikke? Hva tror du er viktig å si om offshore vindkraft? Til hvem?
11. Hva tror du folk flest tenker om offshore vindkraft? Offentlig opinion (positiv, negativ, ambivalent, uinteressert)? Hvorfor?
12. Forventer du offentlige reaksjoner/engasjement når offshore vindkraft skal implementeres? Eller allerede i nå i teknologiutviklingsfasen? Hva slags reaksjon/engasjement (motstand, understøttelse)? Fra hvem? Med hvilke argumenter?
13. Forbereder dere som forskere/institusjon dere på offentlige reaksjoner/engasjement? Hvordan? Har dette innflytelse på måten dere tenker teknologien / design av teknologien på?
14. Synes du folk vet nokk om OWE? Hva skulle de vite mer om? Hvorfor bør folk vite mer? Har dere som forskere/forskningsinstitusjon en rolle i dette?

Appendix 3: Interview guide English

Personal background

1. Background. Work/Education
2. What aspects of OWE are you working with?

Perspectives on the technology

3. What are your views regarding the future of OWE? Will Norway succeed (why/why not)?
4. What are the main challenges with OWE? (Getting it to work, costs…)?
5. What are the main obstacles to success for OWE in Norway? Is this different in other countries – how?
6. Who do you see as the main supporting actors of OWE? The main opponents? How do you perceive the role of the Norwegian government and politicians?
7. What are the arguments in favor of OWE? Against OWE? What do you think about these arguments?

Role of Media & Public (introduction: writing about media coverage)

8. How is OWE portrayed in the news media in Norway? What do you think about the way news media cover OWE? Is this fair?
9. Does it mean anything for your work when OWE is debated in the media? Are you discussing this among colleagues? How? What are the main views?
10. Are you or your colleagues engaged in the way the news media cover OWE? How? Why/why not? What do you think is important to say about OWE? Who do you see as your audience?
11. How do you think the public opinion in Norway is towards OWE (positive, negative, ambivalent, indifferent)? Why?
12. Do you expect public reactions/involvement when OWE is going to be implemented? Or already now in the technology development phase? What kind of involvement (support, resistance)? By whom? What kind of arguments do you foresee?
13. Do you as scientists involved with OWE prepare for public involvement/reactions? How? If yes, does this has influence on the way you think about the technology/design of the technology?
14. Do people know enough about OWE? What should they know more about? Why should people know more? Do you as scientists have a role in this?