

Climate Change Communication in Norway

Marianne Ryghaug, NTNU, Norwegian University of Science and Technology, dept. of interdisciplinary studies of culture.

Tomas Moe Skjølsvold, NTNU, Norwegian University of Science and Technology, dept. of interdisciplinary studies of culture.

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Summary and Keywords

Climate change research, activities, and initiatives in Norway started relatively late, by international comparison. From the beginnings in the early 2000s, research has mainly followed two paths: First, media studies, typically focusing on traditional newspaper representations of climate change and the surrounding debate, and second, research on public perceptions of climate change. Initially, the research field was dominated by media studies and science and technology studies (STS). As climate change and related controversies made headlines during the mid-2000s, the authorities implemented several engagement activities and research programs to improve climate change communication, typically aiming at public education on climate change. Teaching the public about climate change as a scientific phenomenon along the lines of the “knowledge deficit model” was a favored strategy.

Research on climate change media coverage indicated that the issue was reported in the same way as other news stories: the journalistic principles of newsworthiness often led newspapers to cover global warming as a contested phenomenon, in which harsh scientific controversy was played out. Thus, the Norwegian media framed the issue similar to U.S. newspapers, giving voice to both concerned climate scientists as well as climate skeptics (representative of “balanced” reporting). Studies of public perceptions of climate change demonstrated that public opinions were largely influenced by this “balanced reporting”: although most people believed the climate threat was real, the many accounts of scientific controversy made people uncertain, and many people questioned the urgency of the issues. This was, of course, not only a result of the media accounts, but also of what the public interpreted as political inertia. Following this, a debate about the ethics of journalism surfaced, and the media increasingly downplayed the controversy angle. Recent research indicates that this may have had

paradoxical consequences; downplaying controversy has made climate change less newsworthy, and it has thus been given less priority by Norwegian media.

Recently, more disciplinary groups have become interested in climate change communication, from psychology to linguistics, political science, and philosophy. Accordingly, research trajectories have multiplied, and at least two new strands surfaced: how science is communicated in traditional and new social media and the use of climate change knowledge in so-called “climate change services.” The latter strand of research typically also relates to climate change adaptation work, to a greater extent than the earlier works, where the focus has mainly been on mitigation.

Keywords: climate change communication, Norway, expertise, media studies, public perception, professional use of knowledge

Introduction: The Norwegian Context

Without looking closely, Norway might appear similar to any other Northern European country. It has a small population of around 5 million inhabitants, and it is politically stable with a substantial welfare state, as are its neighbors Sweden and Denmark. The Norwegian media landscape can be characterized by what Hallin and Mancini (2004) called a Democratic Corporatist Model, where public, government-funded broadcasting is essential (Aalberg, van Aelst, & Curran, 2010) and the consumption of printed newspapers and broadcasted news is high, and deemed important for citizens’ knowledge on politics (Jensen, 2013). The consumption of online news is high and dominated by online versions of printed newspapers and public broadcasts (Sjøvaag, Stavelin, & Moe, 2015).

While Norway is similar to comparable countries in many ways, it differs distinctly in terms of access to energy resources. On the one hand, much of its economy is built on exports from its substantial oil and gas reserves in the North Sea (Skjølsvold, Ryghaug, & Dugstad, 2013). On the other hand, large hydroelectric resources have contributed to a widespread popular perception of renewable energy affluence. The cold climate produces an appreciation of access to relatively cheap and abundant energy (Aune, 2007; Aune, Ryghaug, & Godbolt, 2011).

With this as a backdrop, climate science communication, public understanding of, and public engagement with climate science in Norway is a particularly interesting field of study. In other contexts, economic interests associated with the fossil fuel industry have been quite successful in creating fertile soil for public displays of and successful dissemination of climate skepticism (e.g., Oreskes & Conway, 2010). Could it be that the pervasiveness of the Norwegian petro-industrial complex (Moe, 2015; Ryggvik, 2009) creates a public discourse dominated by skepticism toward climate scientific knowledge claims? On the other hand, we could hypothesize that increased knowledge about the potential threats of climate change, as well as a strong Norwegian history of environmental concern (e.g., Asdal, 2011), could open to public criticism the comfort-oriented energy culture and the Norwegian oil-industrial practices. These issues have puzzled Norwegian scholars working in the area of climate science communication. An overview of Norwegian research efforts in the field will be presented.

The role of climate science and climate communication in Norway is covered with a particular focus on how climate scientists view their role as communicators of climate science.¹ Studies of climate communication in the media are examined, along with research on how the general

public has perceived the climate change problem. Questions are asked about how climate science has been perceived and explored by professional audiences and what its role has been in the implementation of practical adoption and mitigation policies and strategies.

Norwegian Climate Science Communication and the Crisis of Trust

Since the early 1990s, scholars have increasingly been interested in the relationship between “science” and “the public.” A key concern has been the notion of trust. According to the traditional PUS (Public Understanding of Science) model of science communication, information about climate change or climate science is transported to an audience in order to generate information, acceptance, and trust, or to guide action. This model, however, has proved to be not very effective for informing or convincing the broader public, and it has its limitations as a guide for action (see, e.g., Gregory & Miller, 1998 for an overview of the respective literature). In many contexts, it has been replaced by more dialogical models of science communication, such as PEST (Public Engagement with Science and Technology) (see, e.g., Moser, 2016, for an overview). For this reason, ideas such as those of “socially robust science” (Gibbons et al., 1994; Nowotny, Scott, & Gibbons, 2001) have become central. Here, the production of trust is taken seriously through advocacy for more public science communication, open and transparent scientific practices, and the inclusion of the public in deliberations about scientific processes and results.

The issue of public trust is particularly pertinent when the political implications of science are potentially large, such as in the case of climate science. A good example of this could be seen in the wake of the so-called Climate Gate affair (e.g., Grundmann, 2013; Ryghaug & Skjølsvold, 2010), where leaked email communication among climate scientists publicly displayed relatively closed and nontransparent scientific practices. The public reaction to the incident as a “scandal” involving large scale “fraud” was by some read as a symptom of a crisis of trust in climate science. Regardless of whether such a crisis of trust was real, the result was a call for more open and transparent climate scientific practices, which could possibly contribute to increasing public understanding of them (Hulme & Ravetz, 2009). The call for openness and transparency was, further, part of a wider trend in European science policy, where public engagement, dialogue, and deliberation were sought to boost public trust in science (Tøsse, 2013).

Norway is no exception in this respect. Several Norwegian scholars have scrutinized to what extent Norwegian climate scientists have followed such a strategy of “opening up” and making their practices more inclusive to deal with climate skepticism and allegedly declining trust in climate science. This, however, is not a simple task, in part because of the complex typology of knowledge elements, knowledge producers, and knowledge users involved in climate science, as well as the complexity of the climate change phenomenon itself. This is something that renders climate change communication particularly demanding (Ryghaug & Sørensen, 2008). The strategies pursued by Norwegian knowledge producers, such as climate scientists, to communicate climate science to different audiences will be examined.

The Climate Change Experts' View on Climate Change Communication

As noted, many have argued that climate scientists should choose a strategy of openness to increase trust by achieving social robustness (Hulme & Ravetz, 2009), and it has been noted that open, democratic approaches have risen in prominence among both policy makers and scholars (Pearce, Brown, Nerlich, & Koteyko, 2015). However, much previous research suggests that climate scientists instead tend to choose an alternative strategy: that of closing up to preserve control (Tøsse, 2012). Senja Post (2016) has identified similar dynamics for German climate scientists. This strategy can partly be explained by the way scientists view the public, through deficit models of public understanding of science, where the key problem according to the scientists involved often is seen as filling “gaps” in public knowledge (Tøsse, 2012).

One example of a study looking at these dynamics focuses on the dialogue strategies of climate scientists as they target researchers in other fields, policy makers, public authorities, and industry (Ryghaug & Sørensen, 2008). It reveals that climate scientists consider popularization of research results and facts to be their most important task. The study also reveals that among “users” of climate science, few policy actors, public authorities, and representatives from the energy industry questioned or doubted the trustworthiness of climate scientists and their conclusions. Rather, they tended to see climate science as being “rock solid” (Ryghaug & Sørensen, 2008, p. 169). The study also illustrates that many of the larger research institutions involved in climate science had developed deliberate strategies and put substantial effort into reaching their diverse target audiences through diverse dissemination efforts. However, interviews with politicians showed that politicians themselves often acted as translators in a quest to make climate science more easily comprehensible to the public (Ryghaug & Sørensen, 2008; Tøsse, 2012). Engineers working to develop climate technology used climate science as a backdrop and as an argument for why their technological efforts were needed. Apart from that the links between climate science and the climate technology research were very weak (Ryghaug & Sørensen, 2008; Tøsse, 2012).

Overall, the study indicates that the development of technical and political “solutions” to the climate change problem was largely decoupled from the actual climate science, which served only as a premise for the debate. The more policy oriented professions, on the other hand, served a role as mediators between climate science and policy by delivering language and concepts that translated (Callon, 1986) the overall problem (as conceptualized by climate science) to more concrete tools that can be used to handle the problem (Ryghaug & Sørensen, 2008).

While the study discussed previously focuses broadly on communication strategies, a related study by Sunniva Tøsse (2012) focuses on climate scientists' views on media and science communication and their strategies for dealing with journalists and climate deniers. Tøsse discusses how climate scientists weigh their concerns over the ability to control how a message is received and interpreted against the ideals of openness and transparency when considering how to best communicate with the public through the mass media. Drawing on scholarly calls for openness and public engagement, and particularly the concept of “socially robust knowledge,” she argues that socially robust knowledge neglects the challenges of “mediaization” (Schäfer, 2008) of climate science and proposes that the climate scientists’

strategy can better be described as attempts to achieve “politically robust” communication (Tøsse, 2012, p. 79).

In an article where she explores the climate scientists’ media strategies in a charged context of reception, she reveals that climate scientists apparently considered the general public to be their primary target audience (Tøsse, 2013). However, in addition to the general public, attention to journalists, “climate skeptics,” and environmentalists guided the climate scientists’ media strategies—as they in fact were considered to pose different challenges for climate science communication. The challenge with respect to journalists was their perceived “unreflexive application of media norms, as well as journalists’ lack of knowledge about science in general and climate science in particular” (Tøsse, 2013, p. 43). Climate skeptics seemed to indirectly influence the communication strategies of climate scientists, primarily by, according to the scientists themselves, increasing the difficulty of getting the message across to the general public. From the scientists’ point of view, skeptics were confusing the public, and at the same time making the scientists’ task of determining what to say to the press, and in what way, even more demanding, as the skeptics were “readily accusing climate scientists of exaggeration and of underplaying uncertainty,” a strategy that made it crucial to balance the act of popularizing and staying scientific, according to the climate scientists. They said that environmentalists made this balancing act even more intricate because, while climate skeptics were seen as eagerly accusing climate scientists of exaggeration and scaremongering, environmental activists were often seen as the ones who were overstating the scientific certainty or exaggerating by pointing to the most extreme scenarios.

In a related paper about the climate scientists’ perception of their own role in society, Tøsse (Tøsse, 2012, p. 55) discusses whether typical external pressure on climate scientists to become more directly and politically relevant and to communicate their insights more broadly might have interfered with their academic work. One of her hypotheses was that the scientists might experience what some have called an epistemic drift (Elzinga, 1997), that is, replacement of internal criteria of quality with external criteria of relevance. Tøsse finds that the scientists navigate between what is labeled “relevance work” and “objectivity work.” Relevance work refers to the kind of activities scientists may engage in for their research to be considered useful or socially significant, for example, public communication and outreach. Objectivity work designates the efforts of scientists to do research according to the pertinent scientific standards of their field in order to be considered objective in the sense of producing reliable results. The climate scientists found relevance work to be important and rewarding and engaged in such endeavors mainly through mere dissemination to the public, policy makers, and relevant groups of professional users. However, objectivity work was still seen as the dominant form of activity. Doing relevance work did not represent a pressure or a lure to relax scientific norms, rather the opposite, according to the scientists. Relevance work was seen as dependent on objectivity work, while the importance of objectivity work was understood as the adherence to professional norms and reinforced by experiences from doing relevance work. Thus, there was no sign of experiences of so-called epistemic drifts going on in this study.

In sum, studies of climate scientists suggest that they find public communication of results to be an important task, and that in doing so, they target diverse audiences. However, relatively little in the studies described suggests that climate scientists in Norway have opened up much in order to mitigate what some commentators have called a crisis in trust. This is maybe not so surprising, given that this “crisis” seems to have decreased. Further, there appears to be only weak links between climate scientists and other climate-related science fields and practice fields. As we have seen, climate scientists in general think that communication and

dissemination of their work and results is an important and meaningful endeavor. The application of this kind of communication in Norwegian news media and how climate science is communicated to the public will be examined.

Climate Change in the Norwegian Media Landscape

Early 2000s: Controversy and Dramatic Coverage

The early phase of research on how the Norwegian media covered and communicated climate change focused on the early 2000s and was dominated by academics in the fields of media studies, science and technology studies (STS), and media sociology. There were some relatively clear trends in the results coming out of this work. In what we believe to be the first systematic study of journalistic coverage of climate change, Marianne Ryghaug (2006) analyzed how eight different newspapers covered the climate change issue (2002–2005). She combined this with interviews of journalists and climate scientists involved in climate communication. The analysis indicates that climate change was reported on mainly through the mobilization of two different types of what Ryghaug calls “dramas,” a term that focuses more on the narrative aspects of the way that newspapers report than the notion of frames. On the one hand was the *nature drama*, where spectacular natural events were linked to climate change. Typically, the nature dramas would focus on catastrophic images, portraying what was seen as examples of local impacts of global warming on localized nature. Examples of such stories involved imminent floods, rising sea levels, and drowning polar bears.

On the other hand, much coverage was anchored in another type of drama that focused on the science of climate change. Such stories were typically written as what Ryghaug called *scientific dramas*. Stories focusing on the science of climate change in this period tended to focus on disagreement and controversy between scientists, and controversy between scientists and other societal groups, notably “climate skeptics.” As an example, it was quite common in this period to see coverage that questioned how much of the observed climate change could be attributed to human action and emissions and how much could be attributed to natural variation. Through interviews, Ryghaug was able to confirm that journalists indeed tended to prefer polarization and disagreement when reporting on climate change. This was not because the journalists were skeptical toward the messages of scientists and scientific reports, but because the journalistic norm of “balanced coverage” when it came to any issue also spilled over into the climate change coverage. These observations fit well with results from studies of how the climate change problem has been reported elsewhere in the same period (e.g., Boykoff & Boykoff, 2004).

Other analysts (Krøvel, 2014) have suggested that this tendency to report “both sides” of the climate issue in Norway in part can be traced back to curricula in journalism schools being dominated by post-structuralist theories, leaving journalists victims to relativism, unable to see nature as a phenomenon existing beyond different discursive understandings. We, however, find this explanation quite unsubstantiated. Studies indeed indicate that most journalists see anthropogenic climate change as a very real threat (Ytterstad, 2011).

It is noteworthy that the attention to the climate issue steadily increased in the Norwegian press during this period. Figure 1 illustrates how the Norwegian newspaper coverage of climate change has changed in volume since 1990.²

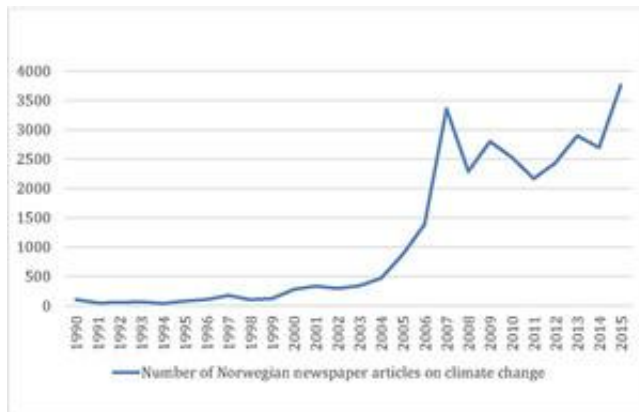


Figure 1. Number of Norwegian newspaper articles on climate change.

Since 2007: Norwegian Ambiguity

Newspaper coverage with stories of scientific dramas and nature dramas persisted as a phenomenon in the following years (Ryghaug & Skjølsvold, 2009), although it appears as if the prominence of the scientific drama decreased after 2007. Similar trends have been noted elsewhere, for example in a linguistic analysis of the *New York Times* climate coverage (Kirilenko & Stepchenkova, 2012). In Norway, this can be illustrated through a study of how Norwegian newspapers wrote about two different phenomena through four targeted case studies over a five-year period: the release of the first and second part of the IPCC Fourth Assessment Report in 2007 (WG-1, released on February 2, WG-2, released on April 6), an IPCC report on extreme weather events in 2012, and finally, the Arctic sea ice melt occurring since January 2010 (Bjørnæs & Naper, 2013). The studies covering the release of the three IPCC reports indicate a strong presence of what the authors call *the uncertainty frame*, which implies that the articles would mention “insecurities about climate science, including future predictions” (2013, p. 114). The insecurities, however, were of a different character than in the earlier discussed scientific dramas. This type of uncertainty was seldom very prominent in the articles, and it was often accompanied by statements about “rising certainty,” “almost complete certainty” or related qualifiers. Thus, the uncertainty was an echo of how scientific (un-)certainty was framed in the IPCC reports. Further, this analysis indicated that skeptical voices were largely absent from the coverage, as were duels between competing scientific voices, which would have been more in line with the scientific drama that was so prominent a few years earlier.

Reports on the melting Arctic sea also contained uncertainty but of a different type. Here, the melting process was portrayed as certain, while the effects of the sea melt were framed as uncertain. When would the sea be ice free, and what would the consequences be? A particular Norwegian trait of the reporting on this issue was the emergence of an *opportunity frame*, where melting Arctic seas were portrayed as potentially lucrative new shipping routes for Norwegians, or where warmer temperatures might lead to longer growing seasons for Norwegian farmers (Bjørnæs & Naper, 2013). This notion of Norwegian opportunities in the

Arctic as a consequence of climate change is also reflected in Norwegian policy documents (Fløttum & Espeland, 2014).

Other studies from the same period seem to confirm a “cooling” of the scientific drama toward the end of the 2000s. In an analysis of the newspaper coverage from October 2007 to April 2008, Katherine Duarte (2010) found that the voices who were present in the newspaper articles of the period largely agreed with the dominant scientific framing of the IPCC, and that skeptical voices were few and far between. This, however, should not be interpreted as an end point for the dispute of climate science in the Norwegian press. A follow-up study by Duarte (2012) illustrates how the press coverage of Norwegian newspapers is shifting and dynamic, and that the understanding of climate science as certain is fragile. Following the so-called “Climategate” incident (see Ryghaug & Skjølsvold, 2010 for an analysis), Duarte observed a rise in critical, “climate skeptic” coverage that persisted through the COP15 conference in Copenhagen in 2009. Eventually, however, the effects of the incident seem to have worn off. That said, Duarte’s analysis indicates that the climate skeptical organization *Klimarealistene* (“The Climate Realists”) were visible throughout the whole studied period.

Another insight from Duarte’s studies concerns whose voices were present in the climate-related press coverage. She indicates that those voicing opinions about climate change in the Norwegian press are a relatively homogenous group. Typically, they tend to represent the scientific and political establishment: politicians, public spokespersons, and scientists. Thus, the share of visible “skeptics” has become relatively small, and voices from grassroots organizations and other realms of civil society are largely absent. Similarly, Duarte discovered a highly gendered dynamic to the coverage: women were hardly present at all in the climate coverage of the press.

Other case studies of the Norwegian climate coverage have also focused on which voices have been given prominence, and on how climate change issues are framed in Norwegian newspapers. One example can be found in Elisabeth Eide and Andreas Ytterstad’s (2011) analysis of how two Norwegian newspapers covered the Bali climate summit in 2007. This is an analysis that focuses on a global event, and on how the distinctly domestic Norwegian perspective comes into play in such journalism. A clear finding in their analysis is that the Norwegian newspapers—much more so than comparable newspapers in other countries—mostly rely on domestic sources in the coverage of such a global event.

In Eide and Ytterstad’s (2011) account this produced the effect of “nationalizing” the coverage of a global phenomenon. One effect of this nationalization was that Norwegian leaders were able to exert hegemonic power on the way that the Norwegian press covered Norwegian participation in the summit. The outcome was a framing of Norway as a global leader in the fight against climate change, particularly through initiating technology development processes and rainforest protection schemes, schemes that would deliver greenhouse gas emissions outside Norway. This framing would allow the Norwegian oil-industrial complex to continue its domestic and international activities without much critical scrutiny from the media.

The authors found other results from the reliance on domestic sources. For instance, communities living in Norway’s coastal regions were able to use the global summit as a way to raise national and global awareness about Norwegian plans to open new offshore areas for oil drilling, and the potential consequences of this in terms of greenhouse gas emissions and negative impact on local eco systems. The result was an emerging image of the “heroic” Norwegian efforts internationally, somewhat tainted by morally dubious actions “at home.”

One could perhaps expect that this ambiguous coverage of Norway would be reflected even more strongly in the way that leading newspaper commentators tackled the theme of Norway as a climate and energy nation. However, studies suggest that this is not necessarily the case. Instead, open editorials and commentary pieces on the oil and gas industry tended to emerge in the wake of industrial events, such as oil field discoveries, conferences, or speeches by key actors in the industry. This has largely resulted in comments that have treated the oil-industrial complex very positively. Commentary related to climate, however, has largely been generated by political events, which means that the thematic link between the two topics has been limited (Naper, 2014).

A Turn to Technology

There have been other studies exploring the ambiguity of the Norwegian “climate consciousness” as torn between a self-perception of being “world leading” in environment-friendly policy and technology, while at the same time being one of the largest oil producers in the world (Fløttum & Espeland, 2014). Buhr and Hansson (2011) used a different point of entry to this debate when studying how the large Norwegian oil company Statoil, and its efforts to realize carbon-capture and storage, was covered in the Norwegian press from 2005 to 2009. Their analysis shows how a big Norwegian corporation became subject to the same ambiguity, on the one hand being praised as a world leader in clean technology development, while on the other hand being criticized for their ventures into unconventional methods for oil and gas extraction.

Arguably, Buhr and Hansson’s study is part of what we can call a technological turn in scholarly work on how the Norwegian press covers climate change, as an increasing number of studies post-2010 have focused on how the press has covered specific “green” technologies, and on the potential role of the media in a sustainability transitions perspective. Carbon capture and storage (CCS) has been given prominence here, but there have also been studies on bioenergy (Skjølsvold, 2012) and offshore wind power (Heidenreich, 2014), as well as studies about how the scientific communities have debated the sustainability of different climate technological solutions in the press (Skjølsvold, 2013). Related to carbon capture and storage, Eirik Swensen (2012) illustrates how a coalition of technology optimists has been quite successful when it comes to mobilizing the media as a venue to promote positive perceptions of this technology. This, Swensen argues, is a result of the particular Norwegian energy and climate political situation, the kind of technological fix that CCS represents can allow Norway to continue its CO₂ intensive oil-industrial practices while retaining a green self-identity (see also Klimek, 2014, for a discussion on the Norwegian media coverage of CCS). This increase in technology focus on behalf of scholars might be related to the fact that potential technical “solutions” to the climate change problem have been gaining prominence quantitatively in the Norwegian press (Haugseth, Blix-Huseby, & Skjølsvold, 2016).

Another gateway into the role of technology can be found in Jon Raundalens’s (2015) inquiry into how Norwegian journalists write about the emergence of new media technologies, for example, mobile phones. Journalists, he highlights, typically cover such technologies in a consumer-oriented fashion, seldom problematizing the environmental and climatic consequences of the escalating consumerism related to such technologies. This, he argues, should be seen in light of the working conditions of journalists, which do not facilitate critical scrutiny of such industries. This feeds into discussions about the materiality of the new media technologies of the so-called information age, which often have significant, but under-

communicated, environmental and climatic consequences (Maxwell, Raundalen, & Vestberg, 2015; Finstad & Skjølsvold, 2015).

Climate Change, Politics, and Society

The studies discussed previously all conduct some sort of qualitative or quantitative content analysis of how newspapers report on climate change, climate science, climate politics, or potential technology solutions. Some of them complement this content analysis with interviews with journalists. Recently, there has been a stream of research focusing on the role of the media and climate-related reporting as processes that are embedded in broader and interrelated societal processes. An interesting example of this can be found in a series of related book chapters published in an anthology with a partial focus on how the climate debate became part of the Norwegian election campaign in 2013 (Eide, Elgesem, Gloppen, & Rakner, 2014).

A content analysis of Norwegian newspapers in the run-up to the national election in 2013 (Eide & Naper, 2014) indicates that climate change was a less prominent issue in this campaign compared to the election of 2009. It is interesting to ask why the Norwegian press covered the climate issue less than in the past, while scientific warnings about potential consequences were increasing. One potential explanation illustrates a paradox of the way the Norwegian press operates with respect to climate change. In the early 2000s (Ryghaug, 2006), they reported on science through a science drama lens indicating controversy and dispute. Interviews conducted with journalists working with the election campaign in 2013 suggest that journalists indeed “believe” in climate science and that there was not much reason for them to give the spotlight to outspoken “skeptics.”

However, without skeptics it appears as if climate change became less newsworthy in the weeks before the election. The notion of scientific consensus or increasing security is not very dynamic or appealing to the establishment of dramatic narratives in the press; therefore, journalists reported that they would not focus on it unless it was able to gain political traction (Høiby & Ytterstad, 2014). Thus, climate change did not disappear as an issue, but it became an issue only when it was part of the dynamics of another story, such as the battle for political positions, the potential loss of oil wealth, etc. Another explanation used by many of the journalists for the reduction of coverage of the climate issue was a reference to lack of interest among the general public. The sentiment seems to be that because climate science is seemingly uncontroversial, and because the public considers other issues more important, there is no real need to cover it. Interestingly, this situation seems to have been picked up on by politicians. In interviews, they confirm that the climate issue has become substantially less easy to pitch to journalists, and that they therefore often tend to focus on other issues when communicating with the press (Gloppen, Rakner, & Vibe, 2014).

The studies cited all deal with some aspects related to how climate issues are handled in the mainstream Norwegian press. Since the early 21st century, however, some climate communication has moved out of the traditionally edited news outlets and into online arenas such as blogs and newspaper commentary fields. Broadly speaking, the Norwegian climate blogosphere is, and has been, highly polarized in the sense that there is little communication between climate-skeptic bloggers and bloggers seeking to advance climate scientific knowledge and related policy solutions (Elgesem, 2014; Ytterstad, 2008). This has produced some noteworthy consequences. Climate scientists have expressed that they began blogging in the mid-2000s, in part because of their frustration with the journalists of the era, whom they considered too concerned with “balanced” coverage, and because of the prospects of reaching

a global audience (Skjølsvold, Ryghaug, & Swensen, 2015). Research suggests that the scientific blogging of the era served as a channel to disseminate what the scientists believed to be the “basic facts” of climate science, in relatively technical and difficult prose. Climate skeptics have also tended to mimic a scientific style of arguing by referring to so-called facts, leaning on references and links when arguing about matters of concern. Dag Elgesem (2014) has noted some of the same, showing that blogging from 2007 to 2010 largely circled around the “facts” coming from natural science as skeptics tried to discredit the IPCC and its conclusions, while scientists disseminated facts. After 2010, however, Elgesem observes a shift in the Norwegian climate blogosphere, the result being an increased focus on climate politics, energy policy, and technology development. (See Table 1 for a presentation of some of the key papers with selected highlights from media discussions.)

Table 1. Key papers illustrating the development of research on Norwegian media communication of climate change

Paper	Methods	Key Results
Ryghaug (2006)	Newspaper content analysis/interviews (2002–2005)	Two main dramas in the Norwegian press: the nature drama and the scientific drama. “Balanced” coverage gave much space for skeptics.
Bjørnæs & Naper (2013)	Newspaper content analysis. Case studies (IPCC TAR4) (2007), IPCC extreme weather events report (2012), Arctic sea melt (2010–)	Less scientific controversy, uncertainty reported as in IPCC reports. Identifies Norwegian opportunity frame, where climate change opens potential for new economic activity in the North.
Duarte (2010)	Content analysis (2007–2008)	Dominant scientific voices reproduced in newspapers. Little controversy, few skeptics.
Eide & Ytterstad (2011)	Content analysis of Norwegian newspaper coverage of Bali climate summit (2007)	Norwegian newspapers rely on domestic sources, which led to “nationalizing” of global phenomenon. Norwegian policy actors set the agenda.
Buhr & Hansson (2011)	Content analysis of press coverage on Statoil’s efforts to realize carbon capture and storage.	Ambiguous coverage, praising Statoil for green tech development, while criticizing it for venturing into unconventional oil extraction.
Eide & Naper (2014)	Content analysis of press coverage in run-up to Norwegian election, (2013)	Increased scientific certainty, but reduced amount of coverage compared to earlier years. Lack of controversy makes the climate issue less newsworthy?

Broadly speaking, communication of the climate issue in the Norwegian media seems to have shifted from a focus on scientific controversy toward a more consensus-oriented coverage. Attention now shifts to studies of how the public has interpreted, understood, and made sense of the climate change issue, and some of the ways that this has been studied. How has public uptake of the climate change issue been in a country so deeply entrenched in an oil-welfare economy?

Public Perceptions of Climate Change

As has been highlighted, climate scientists tend to communicate publicly according to the traditional Public Understanding of Science, a knowledge deficit model in which the public's lack of knowledge about climate change was seen as the main challenge. The same assumption underpins many of the efforts made by Norwegian authorities to engage with the public concerning the climate issue. As climate change and related controversies made headlines during the mid-2000s (with a peak around the IPCC publication of the Fourth Technical Assessment Report in 2007), public education on climate change rose in thematic prominence. As an example, the Norwegian government launched *Klimaløftet* (the climate knowledge effort) in 2007 to educate the public on the scientific evidence of climate change. The campaign included a scientific tour featuring Norway's most prominent weather anchor. During 2007 more than 60 events were held at 40 locations, reaching more than 10,000 people. The event was subsequently broadcast on national television. Meanwhile, the Norwegian Research Council started giving attention to climate change communication, and several grants were given to research groups with different perspectives and disciplinary backgrounds. How is this reflected in studies dealing with the relationship between climate change and "the public"?

Studies of Norwegians in the early 2000s suggest that people did not lack knowledge about global warming as a human-made phenomenon. Despite this, sociologist Kari Marie Norgaard (2006a, 2006b) did not find this knowledge to lead to major changes in the way Norwegians live their lives. Her interpretation was that Norwegian communities take cultural cues to engage in hard collective emotional work, in order to create a sort of collective climate denial, which allows them to escape the consequences of their way of living. Another explanation for lack of action comes from a psychological perspective, where current Norwegian values and world views are seen as limiting the potential of change (G. O'Brien, O'Keefe, Rose, & Wisner, 2006; K. L. O'Brien, 2009).

The research on public perceptions on climate change in Norway has demonstrated that the Norwegian public accepts anthropogenic global warming as a fact but with an "undercurrent of doubt" and some hesitancy with respect to the seriousness of the issue (Norgaard, 2006a; Ryghaug, Sørensen, & Næss, 2011). Climate change is associated with many phenomena, some related to changes in natural phenomena, others more to people's beliefs, values, or attitudes. Studies of public perceptions of climate change have often been linked to studies analyzing media coverage of climate change, as reported previously. In an article analyzing how Norwegians make sense of the climate change problem in their everyday life (Ryghaug, Sørensen, & Næss, 2011), this was clearly the focus. The paper build upon Ryghaug's 2006 study of the coverage of anthropogenic global warming in eight major Norwegian newspapers, demonstrating that most of the reporting used two broad modes of narrative frames: a scientific drama and a nature drama frame. The paper then studies how these narrative frames entered into sense-making, whether the science drama contributed to producing skepticism among the public, and whether the nature drama was perceived as providing reasons to accept climate change as human-made.

Based on focus group interviews from 2006–2007 the authors demonstrated that public opinions were largely influenced by the "balanced reporting" discussed earlier. Although most people believed the climate threat was real, the many accounts of scientific controversy made people somewhat ambiguous about the urgency of the issue. This was, of course, not only a result of the media accounts but also related to what the public interpreted as political inertia.

Ryghaug et al. (2011) showed that the reception of climate science knowledge in the public was mainly shaped by what they called five sense-making devices: (1) news media coverage of changes in nature (nature drama), particularly the weather, (2) the coverage of presumed experts' disagreement about global warming (science drama), (3) critical attitudes toward media, (4) observations of political inaction, and (5) considerations with respect to everyday life. Through these sense-making devices public perception of climate change became discerned: some became acceptors, others tempered acceptors, some were uncertain, and, finally, some became skeptics. Most focus-group participants belonged to the first two categories. The news media coverage was received in critical and reflexive ways. Still, it was notable how the news media's translation of "human made global warming" into changing weather made climate change become more manageable and comprehensible to the public. The nature drama worked as an invitation to engage with the issues in ways that went beyond the expert-lay dichotomy often used in the traditional studies of public understanding of science (Ryghaug et al., 2011).

Apart from media coverage, this study also stressed the importance of everyday life and readings of climate change politics for internalizing and understanding climate science knowledge. This was analyzed more deeply in a later book chapter where Marianne Ryghaug and Robert Næss (2012) put forward a diagnosis of the problems that influence people's relation to climate change and a discussion of how people perceive the possibilities of practically addressing the issue. The authors examine if there are changes taking place in people's everyday lives, or whether there are discrepancies between attitudes and actions and the role of political messages and policy. The authors establish, in line with other studies in other countries (e.g., Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007), that there is no deficit of public knowledge about the climate change issue (Ryghaug & Næss, 2012). This, however, does not mean that everybody accepted the claims of climate scientists, politicians, and news media. As anticipated, the interviews showed that climate knowledge was critically evaluated in ways shaped by the interviewees' assessment of climate change politics and their own everyday life situations (in particular, their perception of their agency or ability to act on the problem).

The appropriation of climate change was complex. There was a widespread belief that climate change should be a cause of concern and worry, at the same time as climate change issues were fairly absent from everyday life considerations, and perceived as distant in time and space, as has been noted by many other scholars (e.g., Giddens, 2009), and less pressing than many other challenges. Translating climate change knowledge into practice was seen as problematic, as most people found it difficult to figure out what they could do and had doubts concerning their own powers to mitigate the problem. For instance, even when willing to take action, people often maintained that their behavior was constrained by the lack of enabling infrastructure and mechanisms, such as lack of reliable public transport in their locality or higher prices of environmentally-friendly goods, design of the built environment encouraging car use, lack of disincentives to pollute (e.g., higher car tax for bigger cars), and so on, as also pointed out in studies about UK citizens (Lorenzoni et al., 2007). In the same way, political actions were not positive sense-making mechanisms either, as there was an apparent failing coproduction of knowledge and politics in the area and a widespread frustration about inconsistent messages with respect to how the problem would be solved and by whom. For example, people called for efficient mitigation policies that affected their everyday lives, such as comprehensive policies for electric road transport, better and cheaper modes of public transport, political guidance concerning energy efficiency in buildings, and willingness to develop renewable energy technologies. This is also consistent with a later study where young people reported that

individual actions did “not matter much in the global context” and that the authorities did not facilitate “contributions from ordinary citizens” (Fløttum, Dahl, & Rivenes, 2016, p. 8).

The interviews provided a clear message that neither news media efforts nor governmental information campaigns could overcome the negative effects that the lack of visible political action had on people’s perceptions of the salience of the issue. Policy making was perceived to provide inconsistent arguments. On the one hand, it advocated resolving the climate change problem through near unnoticeable or at least geographically remote technical fixes. On the other hand, the public was asked to take on the prime responsibility to reduce CO₂ emissions. This unclear line of reasoning made matters worse (Ryghaug & Næss, 2012). Thus, similar to studies of the UK public (Lorenzoni et al., 2007), perceptions of limited political action by local, national, and international governments were found to be a significant barrier to engagement among many Norwegian participants.

Other studies explore people’s perceptions of climate changes from a quantitative perspective. The trend is that these studies support the idea that most Norwegians “believe” that climate changes are partly human made, that denial of climate change is not widespread in Norway, but that skepticism about its impact and seriousness are fairly common. This type of skepticism tends to turn into ambivalence (Tvinnereim & Fløttum, 2015). A study of young Norwegians and their views on climate change and the future established that young people tended to think that Norway had a responsibility to help poor countries, to mitigate the problem, and to reduce its own oil production (Fløttum et al., 2016).

Many of the quantitative-oriented studies are typically motivated by a value-based approach to the study of public opinion, stressing that existing values and political ideology are important determinants of public attitudes toward climate change, for instance showing that perception of the seriousness of the climate problem is positively correlated with high education, post-materialism, and a leftist position on the left–right scale (Kvaløy, Finseraas, & Listhaug, 2012). On the other hand, respondents with individualistic values and voters for the populist right-wing Progress Party in the parliamentary election in 2009 have been shown to be more skeptical of climate change than others (Austgulen & Stø, 2013), while respondents holding less individualistic values and those holding egalitarian values are more likely to be concerned about climate change (Aasen, 2015). Studies of the American public have shown an increasing gap between subgroups of different value orientation regarding climate change concern (McCright & Dunlap, 2011). Marianne Aasen finds a similar pattern of polarization in climate concerns in Norway from 2003 to 2011, which might be explained by increased focus on policy instruments in the political debate.

Another strand of research has been more interested in analyzing public perceptions in relation to different climate policies. In a paper analyzing whether support for international climate action is conditional on perceptions of reciprocity, Endre Tvinnereim and Erick Lachapelle (2014) demonstrate that public support for international climate action is more conditional in Norway than in the United States and Canada, suggesting that country size and dependence on fossil fuels may be more important than national traditions for multilateral cooperation in predicting support for unilateral climate action. Another example is a small survey by Lynn D. Rosentrater and colleagues (2013) of 207 undergraduate students majoring in economics or business administration in Norway that addressed how risk evaluations and understandings of climate change predicted support for different types of policies designed to reduce climate change.

Scholars from environmental social-psychology have had another focus, trying to determine the role of environmental norms and attitudes when Norwegian consumers purchase environmentally friendly technologies. As an example, such norms seem to have very small influences on the decision to buy pellet heaters. Instead, the subjective perception of the technologies' functionality seem to matter most (Sopha & Klöckner, 2011). For other technologies, the effects are clearer; environmental norms and intentions associated with environmental choices have been found to be important for the purchase of fuel-efficient cars (Nayum, Klöckner, & Prugsamatz, 2013).

Thus, Norwegian scholars have, like scholars in many other countries (Moser, 2016) studied public perceptions and attitudes in the climate issue in diverse ways. Overall, there is little support for a hypothesis that the Norwegian public is knowledge deficient. However, it seems clear that the oil-industrial complex makes its mark on the public through an undercurrent of doubt, which can also be linked to a perceived political inertia. The sentiment seems to have been: If the climate issue is such a threat, why aren't the politicians doing anything about it?

The latest opinion polls mapping Norwegian attitudes toward climate change, however, seem to end on a more positive note. In 2015 the climate change issue climbed to be the second most important issue or challenge that Norway is facing after having been in sixth place from 2010 to 2014 (and fourth and fifth place in 2008 and 2009) (TNS Gallup, 2015). Among people over 60 it is regarded as the most important challenge Norway is facing (41%). It is not easy to establish how to account for this perceived increase in salience among the Norwegian public, and there does not appear to have been any published systematic analysis of this yet. The climate issue played an important part in the Norwegian election in 2014 (where the Green Party also made it to the Parliament), which could have something to do with it, together with the fact that a large and increasing part of the population claims to have experienced effects of climate change. This last point might have to do with the greater number of extreme weather incidents forecast since 2013 (a doubling compared to 2013). Over 30% of the population claimed to have experienced consequences of climate change in their municipality.

Regardless of the increased salience of the issue, fewer people are now concerned about the consequences climate change might have for themselves and their families (44%) compared to earlier measurements. That said, among those who claim to have experienced consequences of climate change the concern is much higher (62%), and they are also more conscious about their own actions to deal with the problem. For instance, more than half of the population would like to buy an electric vehicle or plug-in hybrid vehicle the next time they buy a car. This has probably a lot to do with Norway's ambitious electric car policy (Ryghaug & Toftaker, 2014). Nonetheless, the government gets very little credit for its climate policy and only about a third (31%) consider Norway to be playing a lead role in international climate issues.

The Practice Perspective: Professional Users of Climate Science and Climate Change Adaptation

Climate change communication does not only target the general public or policy makers. A large variety of more specialized audiences, actors in various practice fields, are responsible for acting on climate knowledge are also natural audiences or users of climate science. Over

the last few years these groups have been subject to some academic scrutiny. Climate change adaptation received little research or policy attention in Norway and was treated only peripherally in Norway's national Governmental White Paper on Climate Policy (St Melding 54), which was published in 2001 (G. O'Brien, O'Keefe, Rose, & Wisner, 2006). However, climate adaptation work and consequently climate change services have increasingly become a part of the climate change research and communication agenda. This has also been a growing concern for the authorities. In 2010 the first governmental report on climate adaptation was published, and in 2012 a Governmental White Paper on "How to live with the dangers—about flooding and landslides" stated that there was a need for better mapping of flood and landslide/avalanche prevention.

A book by Robert Næss and Jøran Solli (2013) about climate knowledge and adaptation work in Norway has a somewhat different perspective. It describes the way different actors working on maintenance, planning, and development of infrastructure understand and experience climate change and its effects. By analyzing how information (science and knowledge) about climate change is interpreted and how this knowledge is used in practice, the book provides basic knowledge and understanding for what should be done to achieve effective climate change adaptation. The authors state that more knowledge is needed about how to adapt efficiently to the consequences of a changed climate in many sectors of the society. However, according to these authors, there is even more need for political actions such as developing guidelines and standards for local adaptation, as well as allocating economic resources to adaptation work in the municipalities (Næss & Solli, 2013; Ryghaug & Solli, 2012). Thus, what is seen as missing is professional, experience-based, and often localized knowledge about the effects of climate change on local communities and locations, rather than more general climate science.

This point is made in an article by Marianne Ryghaug and Jøran Solli (2012) in which they investigate how managers in the transport sector perceive and utilize climate science and, subsequently, how they appropriate the climate change problem. The analysis focuses on which devices are seen as useful for translating between knowledge, policy, and practice. For transportation-sector managers on the regional and district level, the climate problem is largely perceived through the occurrence of extreme weather rather than through what is perceived as abstract climate science. However, this knowledge basis is not considered sufficient to support "knowing how to act" and has resulted in unresponsiveness, while waiting for the authorities to make standards and regulations that would translate climate change knowledge into methods of practice. The authors argue that the development of standards and regulations might be underestimated in relation to user demands in climate adaptation work that involves reconciling scientific information.

A related case study of indigenous experts involved in practical operations dealing with the risk of avalanches in a particularly vulnerable area in northern Norway finds that indigenous knowledge held by local area experts and Western science overlaps. The authors describe how assemblages of climate change adaptation are produced as collaborative guesswork related to coupling and negotiation of different types of knowledge in a decision context. By following different assemblages of climate knowledge they point to an alternative way of understanding a process of policy shaping in relation to climate adaptation: a sideways policy shaping process where what gets included or excluded and what is considered internal or external to a decision making context becomes evident (Solli & Ryghaug, 2014).

All in all, these studies point to the importance of focusing on different audiences and fields of application when studying climate science and its communication challenges. The later studies make the argument that practitioners are calling for more relevant climate science that can be transformed to practical and applicable climate adaptation measures. This, of course, poses new questions regarding climate science communication. While this is a relatively fresh field of study in the Norwegian context, it does point toward a key challenge for climate change communicators in the years ahead. How can we make sure that the increasingly certain, but relatively abstract, knowledge about climatic processes on a global or aggregated scale becomes useful for actors who work with climatic processes on local scales? This is both a scientific challenge and a communication challenge, and there is much need for work in this area over the coming years.

Conclusion

Norwegian climate science communication research clearly illustrates that context matters for the communication and reception of climate change science. In Norway, the pervasiveness of the oil-industrial complex seems of particular importance. This has been reflected in the press in at least two ways: first, through a focus on Norwegian efforts to lead in climate technology and policy development internationally, and second through moral considerations about Norway's role in this carbon-intensive industry. This kind of dualism is found not only in the press, but also in policy documents and among the public. The Norwegian public seems to accept the basic insights of climate science, but based on their observation of relative inaction in terms of policy development, they are hesitant when it comes to the urgency of the matter.

The field of climate science communication has changed and expanded significantly from its meager beginnings when the main focus of research was on how natural scientists involved in climate science communicated their research in the press, mainly to educate the public. Since about 2005 there has been a diversification in the climate scientific field, with an increasing number of disciplines and scholars entering the arena. Thus, climate science has become more open, in the sense that it has found its way into new and diverse outlets of research, targeting an increasing number of relevant audiences and users of climate science. These processes have also become subject to academic scrutiny. The result is that we now have a much more complex image of the relationship between "core" climate science producers and "society."

Currently, there is very little suggesting that the problem in Norway is a lack of knowledge in the general public. Instead, there are a multitude of specific publics, actors who might play different roles in transition processes such as climate adaptation or mitigation. A key challenge in the years ahead seems to be creating knowledge devices targeting these specific groups in useful ways. The production of general, abstract climate knowledge has been useful in establishing a general understanding of the relationship between emissions and climate change but much less so with respect to what should be done in different sectors and localities of society to prepare for and mitigate climate change.

The increasing scholarly diversity in the field is in this respect promising, because it points toward an increased interest in different aspects of the "problems" and potential "solutions" of climate change.

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Notes:

(1.) In working with this review, we have strived to be inclusive and to make visible as many strands and perspectives of relevant climate change communication research going on in Norway as possible. We started out by informally sketching out the field and how it has developed during the last several years, proceeding to conduct systematic literature searches to build the narrative further. We searched international and Norwegian databases, using a broad range of search terms (such as “climate* change* communication*”) that we believed could yield fruitful outcomes. Once previously unfamiliar contributions had been identified, we actively used the reference lists of such papers to dig further for more relevant research, searched the websites of relevant research institutes and universities, and sent emails to key persons to identify contributions that we might have missed. In sum, we believe that this paper provides insights into most of the key strands of Norwegian climate communications research, although we cannot guarantee that no contributions have been missed.

(2.) The graph was compiled using the Norwegian media database Retriever.no, searching for the terms “climate change” or “global warming” in all printed Norwegian newspapers. The database is the most comprehensive newspaper archive in Norway. It includes close to all national, regional, and local newspapers, as well as 900 online news outlets (not included in our search). Thus, the image produced is arguably very representative of what can be seen in the Norwegian media landscape. The result is admittedly somewhat crude, but the pattern is clear and corresponds to results from other countries (e.g., Boykoff, 2011; Schmidt, Ivanova, & Schäfer, 2013).

