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Licence to pollute: Stakeholders' suggestions for environmental improvements on drilling waste in the Barents Sea

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ABSTRACT

The Earth system is threatened by the continuous growth and expanding scope of human activity. At the same time, offshore petroleum operations in the Arctic are increasing the burdens on vulnerable marine ecological systems. In research on offshore industries, the environmental focus is on contributions to climate change and "worst-case scenarios" of oil spills. An undesirable implication of such spills is that other common polluting operations escape critical review, also due to a predominant marginalistic approach to considering environmental problems. In the wake of economic activities and industries expanding into increasingly more exposed and vulnerable areas, the article centres on the discharge of drilling waste from petroleum operations in the Barents Sea. The purpose of the qualitative research is to present suggestions for environmental improvements to the Norwegian regime for discharging drilling waste. A theory of definite stakeholders is applied to bring together the most crucial views on the increased pollution. The principal result is a suggestion to enhance ecological integrity by changing the decision-making system regarding permission to pollute. The authors conclude that the applied systemic methodology yields new knowledge and salient policy recommendations for a part of the Barents Sea petroleum regime that has been less studied to date.

Keywords: *Barents Sea, definite stakeholders, ecological integrity, drilling waste, petroleum*

1. INTRODUCTION

The cumulative effect of multiple human-induced stressors on ecological communities has started to influence the global research agenda (Crain et al. 2008; Gunderson et al. 2016; UNEP 2008). Recent transdisciplinary research has provided estimates that humanity has already transgressed several planetary boundaries, intruded by the continuous growth and expanding geographical scope of human activities (Rockström et al. 2009; Steffen et al. 2015).[1] An example of an industrial expansion – the case study in this paper – is how offshore petroleum operations in the Norwegian part of the Barents Sea (Nilsen 2016) are adding pressure to marine ecosystems already affected by human activity (Benn et al. 2010; Cole et al. 2011; Hoegh-Guldberg 2015; Reker et al. 2015; Thompson et al. 2005). Policies in which the various forms of stressors and pollution have been seen as part of one system are not yet on the global agenda (Crain et al. 2008; UNEP 2008).[2] This means that researchers have a significant responsibility to tackle this challenge in a proactive manner: to bring to the forefront suggestions for how to lessen the ecological burden of economic activities and industries.

Practitioners of systemic research consider a system in a holistic manner (Crain et al. 2008; Rockström et al. 2009; Steffen et al. 2015; UNEP 2008), and systemic research therefore differs from the long predominant reductionist and marginalistic methods for considering environmental problems within economics, the natural sciences, and law (Capra and Mattei 2015; Ingebrigtsen and Jakobsen 2006; Meadows 2008). The ruling reductionist economic postulate is that man-made changes to nature resulting from an activity should not be questioned as long as the economic benefits of the activity outweigh costs (Ison et al. 2002; Neumayer 2003; Perman et al. 2003). There is hence a need to perform systemic and holistic scientific analysis within spheres still dominated by marginalistic methods, and to influence the policy sphere, as has also been pointed out and debated by a wide range of scholars (Ählström et al. 2009; Nilsen and Ellingsen 2015; Spash 2013; Welford 1998).

This paper is based on our case study of offshore oil extraction in the Barents Sea, where controversies relating to economic and environmental concerns have existed for decades. Guided by systemic thinking, we use a stakeholder approach to draw attention to a multitude of perspectives on possible environmental improvements. Our point of departure is the need to lessen the total burden of pollution on the seas and to discover how established activities and processes can contribute here, also when there are positive results from cost-benefit analysis of current practices (Statens strålevern et al. 2008).

The Barents Sea is located north of Russia and Scandinavia, and forms part of the Arctic Ocean, which is home to unique sea bird colonies, large cold-water reefs, and large populations of aquatic animals. The Barents Sea is one of Europe's cleanest and most intact marine environments but is subject to rapid industrial development, specifically within petroleum exploration and fishing (Harsem et al. 2011; Hønneland 2010; WWF undated). As arctic sea ice is receding due to climate change, the southern part of the Barents Sea is becoming increasingly open to shipping, oil and gas exploration, and tourism. The Norwegian petroleum industry keeps expanding geographically, also in the Barents Sea (Norwegian Ministry of Petroleum and Energy 2017). More than 5700 wells have been drilled on the Norwegian Continental Shelf, compared with around 150 in the Barents Sea (Norwegian Petroleum Directorate undated).

In 2016, the Norwegian oil and gas industry produced 15 million tons of CO2. In 1990–2016, emissions of greenhouse gases from the Norwegian petroleum industry increased by 80% (Statistics Norway 2018). If the objective of limiting the global temperature rise to below 2°C is achieved, only one-third of the known fossil resources could be extracted (International Energy Agency 2013). The Paris Agreement on limiting global warming to 1.5°C implies the extraction of even fewer resources (European Commission 2014). However, the restructuring of the global energy production has been hampered by huge sunk investments, petroleum-driven economies, and the increasing demand for new energy at a global scale, and consequently fossil fuels are convenient in a short-term perspective (Nilsen 2017). The necessary focus on the emissions of greenhouse gases has probably crowded out public debate on other petroleum operations and practices that pollute and influence ecosystems every day (Blanchard et al. 2014; Frynas 2012). One of these practices is the discharge of drilling waste on the sea floor, and is the topic of our case study.

Drilling waste can be water, drilling mud, or drill cuttings, either separately or in combination. Ecological concerns have been raised about the discharge of drilling waste, which has been practised both with and without a public licence to pollute (Blanchard et al. 2014; Bechmann et al. 2006). Bakke et al. (2012) report that even water-based drilling fluid and cuttings can have biological effects when suspended in water masses. Due to the overall pressures on the ecology of the seas, and guided by the importance of not treating problems as separate phenomena but rather relating them to the totality of a given situation (Alvesson and Sköldberg 2008; Capra and Luisi 2014; Meadows 2008), we use a stakeholder approach to put forward salient suggestions for environmental improvements to the practice of drilling waste in the Barents Sea. More

specifically, we apply a theory of definite stakeholders and bring together their views on the current problem of increased pollution and vulnerability. A definite stakeholder possesses the attributes of legitimacy, power, and urgency (Mitchell et al. 1997). Our research question is: *How can the existing regime of environmental regulations relating to offshore oil drilling be improved?* A stakeholder approach helps us to contribute new knowledge of how policy management in the Barents Sea can secure a better balance between systemic environmental thinking and the traditional reductionist approach.

We start with an outline and discussion of our theoretical platform for systems thinking and stakeholder theory. Next, we describe the study method, followed by identification of definite stakeholders in the discharge regime of oil drilling. Thereafter, we present the data and results of the analysis of both the document review and interviews held with definite stakeholders. We discuss the most salient suggestion for environmental improvement and then present our conclusions.

2. THEORETICAL FOUNDATION

2.1 The methodology of systems thinking

The point of departure in systems thinking or in a systemic methodology is that the component parts of a system will act differently when isolated from the system's environment or other parts of the system. In contrast to a reductionist and positivist methodology, in systems thinking a system is perceived in a holistic manner (Meadows 2008). A recent and well-known example of systems thinking is the framework of planetary boundaries (Rockström et al. 2009; Steffen et al. 2015) referred to in the preceding section, but the main characteristics of systems thinking emerged in several disciplines in Europe as early as the 1920s. It was pioneered by biologists, enriched by Gestalt psychology, the new sciences of ecology and ecological economics, and, perhaps most importantly, quantum physics (Capra and Luisi 2014; Ingebrigtsen and Jakobsen 2006; Meadows 2008). More recently, many researchers have concluded that the paradigm of a reductionist and mechanical methodology is the main reason for the unsustainable path that we, as a global community, are now on (Capra and Mattei 2015; Nilsen 2010; Sjåfjell and Taylor 2015; Steffen et al. 2015). Still, many scholars stress that the two different forms of methodology are complementary, and there is a need to shift from the hegemony of reductionism to allow for other approaches, such as holism (Meadows 2008; Nilsen 2010). One striking feature of the difference between reductionism and holism is the change of emphasis from quantities to qualities and relations. This does not mean giving up

scientific rigour but is rather a realization of what science can do. What a theory does not include and therefore cannot be used to explicate is just as important as what it can explain (Alvesson and Sköldberg 2005; Capra and Luisi 2014; Funtowicz and Ravetz 1993; Nilsen 2010). The terms "holistic thinking" and "systemic thinking" are often used interchangeably. In this paper, "holistic thinking" is in line with how the interviewed stakeholders expressed themselves, and is therefore used when referring to them.

In this paper, our use of systemic methodology provides a framework and argument for our normative research question. The methodology also serves as a guide for our stakeholder approach, specifically with regard to the reflexive method of mapping definite stakeholders, which is presented in the following sections.

2.2 Definite stakeholders

In the social sciences, the stakeholder approach is widely recognized as a method to increase the legitimacy and probability of acceptance (Jenkins 1999; Mikalsen and Jentoft 2001; Nastran 2014). According to Robert Edward Freeman's classic broad definition, a stakeholder is "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Weber 1947, 854). In this paper, we apply the specific definition of definite stakeholders that leads to significant qualitative suggestions, in this case with regard to improving the regime for discharging drilling waste.

Here, we use the concept delineated by Mitchell et al. (1997): one has to possess the three attributes of *legitimacy, power,* and *urgency* to be a definite stakeholder. Mitchell et al. (1997, 878) state: "Stakeholder salience will be high where all three of the stakeholder attributes – legitimacy, power and urgency – are perceived by managers to be present." Stakeholders lacking one or more of these three attributes have variously been described as dormant, dominant, dangerous, definitive, dependent, discretionary, or demanding (Mitchell et al. 1997).

Suchman (1995) defines the attribute of legitimacy as a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within a socially constructed system of norms, values, beliefs, or definitions. Moreover, legitimacy is a perception or assumption in that it represents a reaction by observers to an organization as they perceive it. Thus, legitimacy is created subjectively but possessed objectively. The classic definition of *power* is a relationship among actors in which one social actor, A, can get another social actor, B, to do something B would

not have otherwise done (Mitchell et al. 1997; Weber 1947). In the study on which this paper is based, we sought and invited the participation of stakeholders who wanted to exercise power by communicating their knowledge. Hence, we looked for knowledge-based power and specifically knowledge about modifications to a discharge regime for drilling waste.[3] Moreover, by presenting their views in this research paper, we have granted *power* to the stakeholders who communicated such knowledge.

According to Mitchell et al. (1997), *urgency* – the third attribute of a definite stakeholder – exists when a relationship or claim has a time-sensitive nature as well as being important or critical to the stakeholder. Knowledge gains authority through legitimacy, and attention through urgency.

With respect to a recent typology developed by Mielke et al. (2016), the involvement of stakeholders in our research can be characterized as democratic. It is a collaborative approach to research, in which the role of the researcher is to bring together different stakeholders and to facilitate and moderate a dialogue. The typical outcome of such a stakeholder approach is policy recommendations, as opposed to, for example, technical feasibility studies. Our typology thus differs from typologies inspired by rational choice, neutral science, and objectivism. In the following section, we describe our method for identifying the definite stakeholders in the discharge regime for drilling waste.

3. METHOD AND DATA

In order to explore our research question (Section 1), we conducted a qualitative case study guided by our theoretical foundation. Our aim was not to provide statistical representativeness or to develop generalization, but rather to explore the research question based on abductive reasoning (Edwards et al. 2014). The case study approach is a preferred strategy when questions are posed of "how" and "why", the researcher has little or no control over events, and the focus is on a contemporary phenomenon with a real-time context (Yin 1994). The approach allows in-depth, multifaceted explorations of complex issues in their real-life settings, and is well suited in cases in which the boundaries between the context and the studied phenomenon are not clear (Yin 1994). As argued by Thomas (2011), a distinction between the subject of the study – the case itself – and the object being the theory used to view the subject, is relevant for case studies. We followed this distinction by defining the subject as the waste management regime, while stakeholder theory and systems thinking were defined as the object.

To investigate the topic of stakeholders' perception of waste management regimes in peripheral regions we combined document studies, and qualitative interviews from December 2013 to February 2015. The data material for this paper thus contains two different, but complementary components of qualitative data. The largest share of the data are the results of the analysis of documents from a public consultation held by the Norwegian Ministry of Climate and Environment in 2010 on a revision of the management plan for the Barents Sea, including the discharge regime for drilling waste (Ministry of the Environment 2006). A total of 78 institutions participated in the public consultation process, and we investigated and explored all of their respective 78 documents for comments or opinions on the discharge regime at that time, and for their suggestions for improvement to that regime.

Our process of identifying definite stakeholders was done in a reflexive manner (Alvesson and Sköldberg 2005) with several different sources. We started with brainstorming and discussions about possible definite stakeholders, together with other members of the research project "Barents Sea drill cuttings research initiative" (BARCUT) (EWMA 2015).[4] We involved other BARCUT researchers in the initial process to secure the validity of the identification process and the data analysis. The core of these discussions is described in Section 4, where the focus is on absence or presence of the three attributes required of definite stakeholders.

Next, we checked whether the results of our discussions on definite stakeholders were in accordance with the findings from the document review, and confirmed that our identified definite stakeholders were among the 78 institutions that participated in the public consultation. Further, we investigated whether the identified stakeholders' contributions to the hearing gave input to the three attributes of knowledge, urgency, and legitimacy. The results of this analysis of 78 statements are described in Section 5.1. As part of our reflexive identification process, we used these findings as a quality control of the discussion explicated in Section 4, on absence or presence of the three attributes. These parts of the identification process laid the foundation for proceeding with interviews with representatives of the following groups of stakeholders: oil companies, supply industry, bureaucracy, fishing industry, environmental NGOs, and research organizations.

Moreover, we conducted interviews with one representative from each of the first five above-mentioned groups of definite stakeholders. For the sixth group – research

organizations – we approached three different research institutes for interviews but they all declined to participate. They explained that they did not want to exercise power by communicating their knowledge in a sphere which they perceived as impregnated by politics. Furthermore, two of the research institutes were not comfortable about communicating hypothetical changes to the current discharge regime, and preferred to wait for a potential specific request from their owners or a call from a financier. In total, we conducted five in-depth interviews.

In the interviews, we performed the last step in our reflexive process of identification and confirmation of definite stakeholders: we explained the concept of definite stakeholder and asked our interviewees (1) whether they had any objections to the ones already included, and (2) whether they wanted to include any others, hence opening up for snowball sampling (Miles and Huberman 1994). None of the interviewees had any objections to the already included definite stakeholders, nor did they suggest any additional groups of definite stakeholders, and therefore our reflexive process of identification was completed. The results of the identification process and a summary of the results of the discussion are presented in Section 4. Identifications of stakeholders commonly and often necessarily combine different methods, and often the particular combination of brainstorming, semi-structured interviews, and snowball sampling (Reed et al. 2009).

Three of the interviews were conducted face-to-face and two by telephone, all following the same semi-structured interview guide. Overall, the interviewees were asked to suggest specific modifications to reduce the environmental burden of petroleum activities in regular operations at sea. There were also specific questions relating to drilling waste on the sea floor as opposed to on land, environmental surveillance, cooperation between companies, and the use or development of new technology. To ensure the most accurate analysis of the data material, the interviews were audiotaped and transcribed. The results of the interviews are described in Section 5.2.

3.1 Limitations of method and data

The systemic methodology we used recognizes the inherent subjectivity in all research and the importance of researchers being explicit about the possible implications of their research (Alvesson and Sköldberg 2005; Funtowicz and Ravetz 1993). *First,* the initial identification of definite stakeholders was made by BARCUT researchers (EWMA 2015), including us. Although this identification was followed by several more steps in a reflexive process, it was crucial in terms of its influence on the

subsequent steps. This is a well-known weakness in several methods for identifying definite stakeholders (Reed et al. 2009).

Second, the 78 institutions that participated in the public consultation on the management plan for the Lofoten Islands and the Barents Sea demonstrated wide-ranging interest in the plan. However, there may have been groups whose voices were not channelled into the hearing, and groups that our reflexive identification process of definite stakeholders did not recognize. The regime of a public hearing may reinforce already established knowledge structures, including perceptions of what kind of knowledge is expected. By relying to such an extent on a public hearing in order to identify stakeholders willing to express knowledge, we have reinforced the current knowledge structure through our paper. Additionally, granting the stakeholders power through this knowledge by including them as definite stakeholders in the study reported in this research paper further strengthens the knowledge structure.

Third, we attempted to increase the number of representatives and interviewees within all the groups of definite stakeholders. For some groups this was not possible due to very few actors in the field, while for other groups, particularly bureaucracy, we did not get any response to our repeated requests for interview. Increased numbers and more diverse representatives could have led to modified versions of the salient suggestions presented in this paper.

4. LEGITIMACY, KNOWLEDGE, AND URGENCY IN THE DRILLING WASTE REGIME

In this section we discuss the attributes of each of the six identified groups of definite stakeholders. In the identification process, the research team discussed each stakeholder group in terms of the presence or absence of the attributes of legitimacy, knowledge-based power, and urgency (Mitchell et al. 1997). The value added of the following discussion is its transparency with regard to the qualitative assessment of the presence of the three attributes.

The most readily apparent group of stakeholders were oil companies, which indisputably have knowledge through first-hand experience and expertise in the drilling waste regime. Moreover, any changes to the discharge regime will have an immediate effect on their business practices and are therefore highly urgent matters. What, then, is the legitimacy of oil companies' suggestions to modify the discharge regime of drilling waste for the benefit of the environment in the Barents Sea? Their most apparent stake

is the production of petroleum at the lowest possible price within the responsible frame in accordance with the Norwegian Petroleum Act (Ministry of Petroleum and Energy 1996), and therefore their best financial option is to leave the drilling waste on the sea floor. However, some oil companies have conducted environmental research relating to the sea floor, although with a reductionist methodology (Klima- og miljødepartment 2010). Moreover, they contribute to environmental research on this theme through independent research organizations in which systemic thinking, too, is applied (EWMA 2015). We conclude that petroleum firms' legitimacy is not absent from environmental questions related to the drilling waste regime. They are definite stakeholders.

The supply industry is a very broad category of firms. We concentrated on those directly involved in handling drilling waste from petroleum explorations, operating both offshore and onshore. There has been continuous development of the various techniques to handle drilling waste considered by the authorities and petroleum firms. Such techniques include increased injections of drilling waste offshore and the collection of discharges in large long-life bags stored on the sea floor (Onsite Treatment Technologies undated; Statens strålevern et al. 2008). The supply industry possesses expertise and knowledge in the field of improvements to the regime for discharging drilling waste, and has a high sense of urgency regarding such waste, because handling it is the foundation of its business. Their business idea is either to handle or to process waste into new production, typically recycling it into concrete. Leaving and dumping the drilling waste on the sea floor gives the least ripple effect for the supply industry. This industry therefore operates in compliance with the waste disposal hierarchy, which per se gives them legitimacy in environmental matters. The waste disposal hierarchy proposes, once the waste is produced, to reuse or recycle the waste into new products. Leaving the waste at landfills is the last option in the hierarchy. The current practice of dumping most drilling waste on the sea floor, albeit with permission from the Norwegian authorities, is not even part of the hierarchy (Avfall Norge 2014; Klima- og miljødepartment 2013; Norwegian Ministry of Foreign Affairs 2016).[5] We thus label the supply industry a definite stakeholder, as all three attributes are present.

With regard to bureaucracy as a group of stakeholders, the owner of the discharge regime for drilling waste in Norway is the Norwegian authorities, represented by the Ministry of Climate and Environment (Ministry of Climate and Environment 2011; Ministry of the Environment 2006). Other relevant actors and representatives of the bureaucracy are the Ministry of Petroleum and Energy, which grants the licences to drill, and the Norwegian Environment Agency, which negotiates and grants permission

to discharge drilling waste. The institutional legitimacy is embedded within a system of legislative acts and the existing management regime (Mikalsen and Jentoft 2001). The current regime for discharging drilling waste in the Norwegian part of the Barents Sea has existed since 2011, and since then, the bureaucracy, as a definite stakeholder group, has not suggested any environmental improvements to the regime. Still, the urgency of the bureaucracy's views is not necessarily visible, because the views are channelled – and sometimes moderated – through the political system. This was confirmed by the representative of the bureaucracy in the interview, which they used as an opportunity to propose a substantial change to the discharge regime. From this, we infer that the bureaucracy is a definite stakeholder, because all three attributes are present.

Non-governmental organizations (NGOs) are important stakeholders in a widening spectrum of themes and many have established themselves as credible institutions and are recognized as such, not least in social and environmental debates (Whawell 1998). In Norway, the environmental NGOs occupy central positions in the political debate (UNEP 2008). Mikalsen and Jentoft (2001, 287) state: "Both industry and government have started to pay attention – and increasingly so – to the pressures for changes in management regimes from environmental NGOs." Norwegian environmental NGOs have been explicitly invited to participate in public hearing processes on petroleum-related matters, and from time to time their claims have led to changes in pollution permits granted by the public authorities (Klima- og miljødepartment 2010). We therefore conclude that environmental NGOs have knowledge and legitimacy concerning the discharge regime of drilling waste. The typical use of a loud public approach, justified from an ecological perspective, is an expression of urgency. Norwegian environmental NGOs are thus definite stakeholders with respect to the discharge regime of drilling waste.

Since the 1970s, petroleum activities on the Norwegian continental shelf have expanded continuously. Although the income from the sector has contributed to increased welfare in Norway, including the funding of costly public functions, the expanding petroleum activities have led to a continued conflict of interests between fishing and petroleum activities. Today, there is no sign of the relative amount of discharges of drilling waste to sea lessening; rather, there have been attempts to deposit less material on land and to increase dumping on the sea floor (Norges Fiskarlag 2014). The Norwegian fishing industry has demonstrated knowledge and urgency concerning the discharges of drilling waste. Moreover, the industry has pronounced legitimacy in marine-related issues (Gezelius 2008; Mikalsen and Jentoft 2001).

Research institutes that focus on the environmental consequences of the discharge regime for drilling waste are stakeholders with highly specific knowledge and have legitimacy through the system of blind-review publications. While their urgency may not always be visible, the urgency is also dependent on how time-sensitive their research findings are. None of the representatives from this group of definite stakeholders were willing to participate in interviews. We infer that research institutes are a definite stakeholder, as all three attributes are present, although not always visible in the public debate.

We used the same method for defining stakeholders as did Mikalsen and Jentoft (2001).[6] They also discuss other possible definite stakeholders, namely indigenous people and sports fishers. However, these are not definite stakeholders in the discharge regime for drilling waste but in the regime of fisheries management. Our case study concerns the environmental situation on the sea floor in deep seas and therefore our mapping of stakeholders does not include as many stakeholders as in cases closer to the shore, or on land (Nastran 2014).

5. RESULTS AND ANALYSIS OF DOCUMENTS AND INTERVIEWS

5.1 Ending of the zero discharge regime

The Norwegian areas of the Barents Sea were opened up for petroleum exploration in 1980, and for many years the regime for discharging drilling waste was the same for all operators on the Norwegian continental shelf. In 2006, there was a change, as a stricter practice called the zero discharge regime was imposed on the Norwegian areas of the Barents Sea. All types of drilling waste now had to be either re-injected below the sea floor or taken ashore. This regime – or policy – was imposed after political negotiations and was reasoned from a precautionary principle and overall environmental concerns (Knol and Arbo 2014; Ministry of the Environment 2006). Such overall environmental concerns are in line with a more holistic and systemic thinking rather than with the traditional reductionist approach.

In 2010, the Ministry of Climate and Environment invited various institutions to contribute to a public consultation to revise the 2006 plan (Klima- og miljødepartment 2010). In such consultations or public hearings, the Ministry is obliged to consider all incoming responses as part of the knowledge base for the consequent factual policy (Government.no undated).

The 78 institutions that participated in the public consultation represented petroleum firms, research institutes, environmental organizations, municipalities, tourism firms, fishing-related firms, political parties, interest organizations for diverse industries, and labour organizations. We investigated the content of the 78 documented responses to the public consultation for the revision of the integrated management plan (Klima- og miljødepartment 2010) in search for answers to our research question.

The results of the document analysis revealed that only three institutions, all representing the petroleum industry, had comments on the discharge regime. None of the remaining 75 institutions had commented upon or supported the zero discharge regime. The comments from the three institutions were essentially the same: there was no need for the zero discharge regime in the Barents Sea, because pollution from discharges of drilling waste and produced water would not have significant environmental consequences. The institutions were the Federation of Norwegian Industries (Norsk industri), the Norwegian Oil and Gas Association (Norsk olje og gas), and Statoil, the partly state-owned and the dominating oil company in Norway, with over 70% of the licensees. All three institutions have coinciding interests under the definite stakeholder group of oil companies, and are therefore included in our further analysis in this paper.

The subsequent revised integrated management plan abolished the zero discharge regime after only five years of running. In 2011, the rules for the discharge regime in the Barents Sea were softened and aligned with those applicable elsewhere on the Norwegian continental shelf (Knol and Arbo 2014). This was also a shift away from a holistic view of the system, to become aligned with a more traditional and marginalistic regime with cost-effective considerations. According to an interviewed representative of the bureaucracy, the end of the zero discharge regime hinged not only on the feedback from the three representatives of the petroleum industry, but was also subject to political negotiations.

However, a lesson learned is that a consultation can and should be used to support the parts that the stakeholders believe are important to keep, otherwise there is a risk of losing them. By communicating knowledge, one exercises power (Avelino and Rotmans 2011), and in this case power was exercised through arguing that single sources of pollution from drilling waste and produced water would not create significant environmental consequences. This was also expressed as a lesson learned by the other stakeholders we interviewed, who did not use the opportunity to exercise power through communicating their knowledge and concern for the marine environment on the basis of a more holistic view. The results of the public hearing have led us to frame this interface as a "battlefield" where rational actors seek to maximize their

utility by their individual preferences. This neoliberal rational stakeholder approach is in contrast to the democratic stakeholder approach reported in this article with reference to the typology developed by Mielke et al. (2016).

5.2 Perceptions of environmental improvements

The results of the interviews with representatives from the five groups of definite stakeholders are summarized in Table 1.

PROPOSED MODIFICATION	INITIAL STAKEHOLDER SUPPORT	ENVIRONMENTAL BENEFIT
Petroleum firms cooperate to use the same ship to transport drilling waste ashore	Environmental NGOs, fishing industry	Reduced emissions to atmosphere, fewer ships
Permission to pollute as a pre-defined part of licence to drill	Bureaucracy, oil companies, environmental NGOs, supply industry, fishing industry	Sea floor integrity, predictability
Using gas as fuel on ships used for transporting drilling waste ashore	Bureaucracy, oil companies, environmental NGOs, fishing industry	Reduced emissions to atmosphere, more waste sent ashore for reuse
More drilling waste should be taken ashore	Supply industry, environmental NGOs	More waste sent ashore for reuse, sea floor integrity
Oil companies must take greater responsibility for waste deposits on land	Bureaucracy, environmental NGOs	Safeguards environmental standards for deposits on land

Table 1. Stakeholders' suggestions and support for modifying the drilling waste regime

The heading of the middle column in Table 1 includes the word "initial" to highlight that the support is suggested before further analysis of the suggestions has been made. The stakeholders were not unconditional supporters. Each suggestion must be followed by a range of analyses and subsequent specifications regarding issues such as financial conditions, time span, and transparency, to mention a few.

In Table 1, the third column lists the environmental benefits that the stakeholders pointed to as explanations for why they proposed or supported a modification. It should be noted that the term "sea floor integrity" is our translation of the stakeholders' environmental reasons for supporting a modification, also in line with the role of scientists in this democratic type of stakeholder involvement: "Scientists have to translate the beliefs and languages of the different 'systems' […]" (Mielke et al. 2016, 75).

In the course of drilling almost 5700 wells on the Norwegian continental shelf (Norwegian Petroleum Directorate, undated), substantial amounts of cuttings and contaminating substances have been discharged daily (Blanchard et al. 2014). "The integrity of the sea floor" is an emerging and increasingly used concept to focus on human-induced changes to the seabed from a systemic view (Beurier 2014; Boyen et al. 2012):

> Safeguarding the integrity of the sea floor entails protecting the structure of the sea bottom and the function of the benthic ecosystems from human activities, including physical damage to the structure and species in the benthic habitats. Human activities which affect the sea floor include bottom and beam trawling, nutrient discharges both from land-based and marine activities, sand and gravel extraction, chemical discharges, drill cuttings, barium discharges from oil and gas extraction, the establishment of pipelines, dredging and the dispersion of harbor sludge and sediments. (Nielsen and Ravensbeck 2014, 48)

The suggestion for modifying the waste drilling regime that attracted most support was "Permission to pollute as a predefined part of licence to drill" (Table 1), and therefore this suggestion has the highest salience. In the next section, we explore the background and the motivations for this specific modification, as well as objections to it.

6. DISCUSSION OF THE SELECTED MODIFICATION

As shown in Table 1, all interviewed stakeholders expressed initial support for the suggestion "Permission to pollute as a predefined part of the licence to drill", but there were different motivations for their support. In this section, we continue our role as scholars in the democratic type of stakeholder involvement (Mielke et al. 2016) by discussing their explanations, motivations, and doubts about supporting this modification. This also gives an indication of the strengths and weaknesses to be further analysed beyond this initial study. The representative of the bureaucracy reasoned as follows (our translation):

> Under the current regime, the Norwegian Ministry of Petroleum and Energy announces [a call for application of a] licence to drill wells, and the compa nies granted such a licence must apply to the Norwegian Environment Agency for permission to pollute. As the companies are required by law to utilize the licences, the Norwegian Environment Agency finds itself in a position where it must negotiate with every single firm holding a licence about the size and type of permission. Taking drilling waste ashore is a much more expensive operation for the firm than discharges at sea. This is an essential element in a firm's bargaining position. Other firm-specific challenges, such as technical capabilities and their own financial situation, will also affect the bargaining power of the firm. Ultimately, one of the factors to be negotiated is the sea floor integrity. The suggested modification is to assign the pollution permit conditions for each block before the announcement of licences for explorative drilling. This means that the public authorities must carry out, or at least facilitate, a sea floor investigation before the licence is announced. Today, this is the responsibility of the petroleum firm holding the licence. The sea floor investigations in this modified regime can be in line with the already established project, Mareano.

Mareano is a broad, state-governed and state-financed research programme for mapping depths and topography, sediment composition, contaminants, biotopes, and habitats in Norwegian waters (Mareano undated). We do not know whether the suggested modification to the drilling waste regime would entail the transfer of more drilling waste ashore, which would reduce marine pollution. Four interviewees stressed that discharges of drilling waste, even water-based ones, had a negative effect on swamps, corals, and shells, and created stress for nearby fish. However, all five interviewees agreed that simply by removing the bargaining process between the provider of the pollution

permit and the single petroleum firms, the modification would better safeguard the ecological conditions.[7]

Another distinct motivation among the interviewees was predictability, in several respects. All stakeholders welcomed a better preliminary understanding of how much waste should be discharged on the sea floor and how much should be transported ashore. An important feature of this predictability was that the permission to pollute would have to be non-negotiable. An additional incentive for the oil companies was the ending of the current public hearing process on their plans for handling drilling waste. The hearing process is time-consuming and often leads to oil companies changing their plans due to protests from NGOs or the fishing industry.

Both the representative of the oil companies and the representative of the environmental NGOs had doubts concerning the selected modification, as they believed it to increase costs. The total costs of sea floor investigations would probably be higher if they were carried out by the public authorities, who would investigate larger geographical areas than the more confined areas usually investigated by the oil companies. However, this was challenged by the representative of the bureaucracy, who said that Mareano could be rescheduled to also investigate areas relevant for the petroleum industry; such an analysis has since been done by Fjose et al. (2016). Regardless, if the tax regime continues whereby the Norwegian state refunds 78% of all exploration costs (Aarsnes and Lindgren 2012), the public authorities will pay most of the increased costs of sea floor investigations. Five interviewees raised the point that even if the increased costs were to be added to the licence fee, thus making oil companies pay for investigations of areas where they might not intend to drill or dump waste, the tax refund would leave them with only 22% of their total costs.[8]

CONCLUSIONS

The total magnitude of stressors on the marine environment is alarming (Benn et al. 2010; Cole et al. 2011; Hoegh-Guldberg 2015; Reker et al. 2015; Rockström et al. 2009; Steffen et al. 2015; Thompson et al. 2005). Each polluter must therefore critically scrutinize their practice towards a more sustainable marine environment. In 2015, 231 wells were drilled on the Norwegian continental shelf, a record number for one year (Norwegian Petroleum Directorate undated). However, in the offshore petroleum industry, the environmental focus is on contributions to climate change and the "worst-case scenarios" of major accidents. This focus is undoubtedly crucial and highly

justifiable, but an undesirable implication is that the environmental consequences of these everyday offshore petroleum operations largely escape critical review. The policy sphere is still guided by marginalistic approaches, both when considering environmental harm and when calculating it in terms of short-term costs and benefits for humans. Our research question is guided by a systemic methodology, asking how the existing regime in offshore oil projects can be improved, and addressed by a stakeholder approach.

We have brought to the fore the suggestion that all interviewed representatives of the definite stakeholders supported; it is thus the most salient suggestion for environmental improvements. The proposed modification is to rearrange the process and conditions for granting permission to pollute by discharging drilling waste on the sea floor. Today, the public authority that grants the permissions has to negotiate the content of the pollution permit with each firm holding a licence to drill. In this situation, a firm's bargaining position is naturally affected by firm-specific challenges, such as their financial and technical situation. Ultimately, one of the factors to be negotiated is the sea floor integrity. Instead, the conditions for the pollution permit should already be settled when the licences for drilling are announced. This means that the public authorities would have to carry out or at least facilitate a sea floor investigation before the licence to drill is announced. Currently, this is the responsibility of each petroleum firm already holding a licence. This suggested modification would alter the process whereby pollution permits are granted, and would imply new processes for both the authorities and the stakeholders. There are environmental arguments for initially implementing this modification in petroleum activities in the Norwegian parts of the Barents Sea (Bakke et al. 2012; Harsem et al. 2011), and then eventually applying it to other seas with petroleum activities.

A weakness of our reflexive method is that it gave the members of the BARCUT research group, including us, the power to make the first and important identification of definite stakeholders. However, we checked this initial identification against the findings from the document analysis as well as the opinions expressed by the interviewees. Moreover, we did not go into further details about the suggested modification or its consequences, by for instance conducting a feasibility study. Instead, we used a democratic stakeholder approach, in which the fundamental strength is the high legitimacy of claims in the science–policy interface (Mielke et al. 2016). The definite stakeholders' claim was first and foremost the need to enhance sea floor integrity, which is an argument for pursuing this novel suggestion through further research, also by use of complementary scientific approaches.

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FOOTNOTES

[1] The planetary boundaries that have been transgressed to date are climate change, biosphere integrity, biogeochemical flows of phosphorus and nitrogen, and land-system integrity. A further five boundaries – threatened but not yet transgressed – are ocean acidification, global freshwater use, atmospheric aerosol loading, stratospheric ozone depletion, and chemical pollution (Rockström et al. 2009; Steffen et al. 2015). These earth-system boundaries are interdependent, as transgressing one boundary may cause others to be transgressed.

[2] The concept of planetary boundaries was incorporated into a draft agreement from the United Nations Conference on Sustainable Development in 2012, but was cut partly because the concept was too new and partly due to concerns from poorer countries that its adoption could lead to a sidelining of efforts towards poverty reduction and economic development (Nilsen 2017).

[3] The relation between power and knowledge has been debated to a great extent in social theory, and it is not within the scope of this paper to add substance to this huge and important research area, beyond considerations at the end of the section on limitations relating to the knowledge base we have used and its consequences for power (Section 3.1).

[4] This article was written as part of a project titled "Barents Sea drill cuttings research initiative" (BARCUT), both funded by Eni Norge. The project period is 2013–2018 and the partners are UiT – The Arctic University of Norway, Akvaplan Niva, and Norut. Eni Norge has not been involved in the collection of data, analysis, or interpretation of the data. Eni Norge has been informed about the status of the research project, but was not involved in the writing of this article or the decision to submit the article for publication.

[5] The EU introduced the waste hierarchy in 1975, and the concept was further strengthened by 2010 (2008/98/EC). In 2015, the European Commission launched "Closing the loop – An EU action plan for the circular economy". The theory of circulation economics is an example of systemic thinking (Ingebrigtsen and Jakobsen 2006). In Norwegian policy it is also becoming more common to see waste as a resource, as part of a circular economic thinking.

[6] One difference between our paper and that by Mikalsen and Jentoft is that they discuss nuances between absence and presence as high or low degree of urgency and legitimacy, whereas we use the dichotomy of absence or presence.

[7] The representative of the oil companies claimed that the responsibility for setting the right level of drilling waste dumped on the seabed should rest with the bureaucracy. They explained that their initial support for this modification served as a tool for this purpose.

[8] The scope of this paper does not allow for a discussion of this specific feature of the Norwegian regime for oil drilling further, nor does this aspect have any implications for the conclusions in this paper.

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