Slightly Covered All the Time

The Science of Sandbanks on the Dogger Bank

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THE SCIENCE OF SANDBANKS ON THE DOGGER BANK

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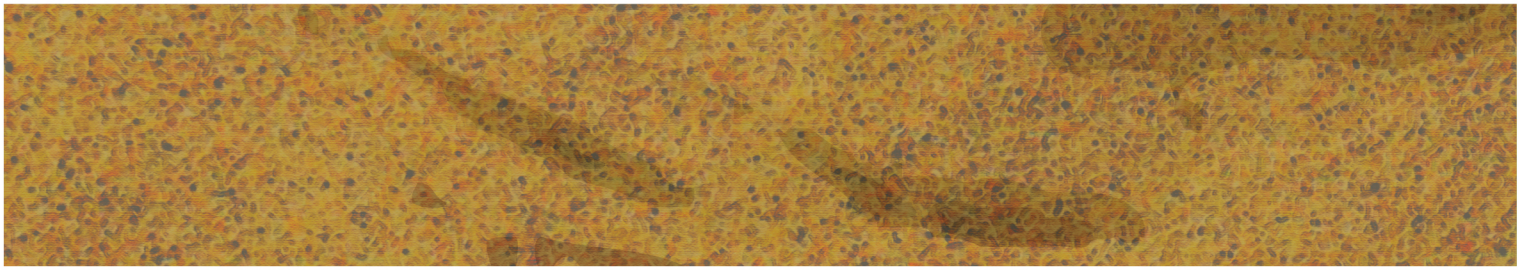

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The Science of Sandbanks on the Dogger Bank

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Ditte Degnbol, July 2012

Summary

In recent decades science has come to play an important role in policy making particularly in relation to environmental policy and risk management. As a consequence, issues related to the configuration and management of the boundary between science and politics have become more visible and urgent. Are scientific advisors free of political interests? Have they tried to accommodate their funders? Do they have a sense of the eventual implications of their results? And should they? Do they listen to the stakeholders? And should they? A basic assumption in this thesis is that the process as well as the outcome of developing scientific advice for policy is affected by the wider policy setting: The legal frameworks, policy objectives, government agendas, potential implications and stakes. Taking an outset in detailed studies of concrete advisory processes I set out in this thesis to explore in which ways this is so. Moreover, I study the ways in which the boundary between science and politics is mobilised, transgressed, dissolved and in other ways processed as part of the work for producing credible justification for policy. And I explore the effects of such boundary management.

More concretely, I follow and compare the work of German and UK statutory scientific advisors to define the boundaries of habitat type 1110 in the EU Habitats Directive: 'sandbanks which are slightly covered by seawater all the time'. According to the Habitats Directive the initial designation of sites is to be based exclusively on science, without consideration of social and economic issues. But the prospects of protected areas on the Dogger Bank raise concerns. Among other things the world's biggest wind farm has been projected here, and it is an important site for a major fisheries industry. I follow the scientific decision making step by step and account for the events, logics, ambiguities and uncertainties, negotiations and practicalities which in different have affected the processes and resulting boundaries. I conclude that the two processes and outcomes differ because the scientific advisors have been working for different governments and because the stakes and audiences are different.

Moreover, I show that while the advisors' work involves technical as well as practical and ethical considerations, the processes also involve strategies and rhetoric to manage the boundaries between science and politics. One effect is that the scientific advisors are not made accountable for the political elements of their work, and that the political issues are not made accessible for public scrutiny and debate. The mandate given to science in the Habitats Directive is that of providing site boundaries exclusively based on science. I suggest an alternative mandate for scientific advice where the technical as well as ethical character of their work is welcomed, expected, accounted for in reports, formalised and, most importantly, debated.

Abbreviations

BfN	Bundesamt für Naturschutz. The German scientific statutory advisory agency tasked with providing advice for the implementation of the Habitats Directive in the German EEZ.
Birds Directive	An EU directive signed in 1999 for the protection of birds. The main tool in the directive is protected areas.
BMU	The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit).
Crown Estate	The property portfolio owned by the UK Crown – in principle they own the rights to the resources in EEZ to which the UK have exclusive rights. It is Crown Estate who give licenses for offshore wind farm development, including the one to Forewind Ltd. on the Dogger Bank.
Defra	The UK government Department for Environment, Food and Rural Affairs.
DECC	The UK government Department for Energy and Climate Change.
DTI	The UK government Department for Trade and Industry.
EEA	European Environment Agency. Agency under the European Union tasked with providing the EU and member states with information on the environment for political decision-making.
EEZ	Exclusive Economic Zone. According to the UN Convention on the Law of the Sea a state has special rights to exploitation of resources in their EEZ. A state's EEZ stretches from the boundary of the territorial zone 12 nautical miles off the coast to 200 nautical miles off the coast.
Forewind Ltd.	A consortium of four international energy companies, namely SSEplc (formerly Scottish and Southern Energy plc), RWE (formerly Rheinisch-Westfälisches Elektrizitätswerk AG), Statoil and Statkraft. In January 2010, in the Crown Estate's third license round for UK offshore wind farms, the consortium won the rights for development in the Dogger Bank zone.
Greenpeace Judgment	Wording frequently used about a decision at the UK High Court which extended UK's obligations to the Habitats Directive from the national territory, which for UN member states stretches out to 12 nm (nautical miles) off the coast, to the 200 nm Exclusive Economic Zone (EEZ). Later this extension came to apply for all member states.
Habitats Committee	Committee under the European Commission tasked with steering the implementation of the Habitats Directive at the level of the Commission.

Habitats Directive	An EU directive signed by member states in 1999 for the protection of diversity. The main tool in the directive is marine protected areas. Annex I and II in the directive holds a list of habitat types and species of community importance which each member state is obligated to protect.
ICES	International Council for the Exploration of the Sea. Intergovernmental scientific advisory organisation providing advice to the ICES Convention's member states and the EU. The member states include all states bordering the Baltic Sea and North Atlantic.
JNCC	Joint Nature Conservation Committee. The UK scientific statutory advisory agency tasked with providing advice for the implementation of the Habitats Directive in the German EEZ.
Marine Biodiversity Policy Steering Group	A group consisting of representatives from UK government departments considered to have stakes in marine conservation issues, namely Defra, DECC and DTI. The purpose is to get ongoing government level comments on scientific advice.
MEWG	Marine Expert Working Group. Group under the European Commission's Habitats Committee tasked with developing more instructive guidelines for the implementation of the Habitats Directive in the offshore marine environment.
Natura 2000	A European network of protected areas under the Habitats and Birds Directives for the conservation of biological diversity. Together the protected areas are to form a coherent network which taken together covers the different ecological requirements for the life and reproduction of the threatened habitat types and species in the two directives.
SAC	Special Area of Conservation. A site designated for the conservation of habitat types and species in Annex I and II in the Habitats Directive.
pSAC	proposed Special Area of Conservation. A site designation which is advised to government.
cSAC	candidate Special Area of Conservation. A site designation which is approved by government and submitted for approval at the level of the European Commission before it finally becomes a SAC.

1 Introduction

During recent decades, the role of scientific experts has received much attention among scholars of science studies, philosophy of science and political science. The debates have been triggered by, among other things, a growing field of applied sciences, that is, sciences that feed directly into production, regulation and political decision making. According to some scholars (e.g. Gibbons et al. 1994, Jasanoff 1994) science has become more influential in our societies over the latest decades. In relation to scientific advice, Jasanoff argues, "The proposition that science-based decisions should be reviewed by independent experts strikes us today as hardly more controversial than the proposition that there is no completely risk-free technology" (Jasanoff 1994, p. 1). Scientists advise politicians and managers on issues such has the risks of GMO and nuclear waste disposal, the prospects of stem cell research, climate change induced flooding scenarios, the state of fish stocks and biodiversity, the psychological health of gay parents' children and the preventive effects of imprisonment. Even in public disputes, where critics question the data or methods behind the scientific advice, Thomas Gieryn notes that the authority of science as the basis for decision-making persists:

> So secure is the epistemic authority of science these days, that even those who would dispute another's scientific understanding of nature must ordinarily rely on science to muster a persuasive challenge. We may be unsure about which truthsayers are really scientific or whether they enforced proper scientific procedures, but still we routinely appeal to science – whatever and whoever it is – as a first-pass source of credible understandings of nature […]. (Gieryn 1999, p. 3)

The influence of scientific advisors is so substantial, Sheila Jasanoff argues, that they have become a fifth branch of government (Jasanoff 1994).

The role of scientific advisors is twofold. Science produced in order to feed into political decision-making, which I shall refer to using Jasanoff's term *regulatory science* (Jasanoff 1995), is tasked with providing policymakers with the information they need in order to make decisions. But in doing so and just as importantly, science is also tasked with justifying the political decisions that refer to it. In this way the role of regulatory science differs in important ways from what Jasanoff calls *research science*, that is, science produced outside contexts of direct implementation. With these developments scientists have stepped out of their laboratories. Politicians, industries, interest groups and international treaties take part in formulating their research questions. They are asked to provide outcomes that can transform more or less easily into political action, and the timeframes they are given are defined by political and societal needs.

Their work is scrutinised not merely by scientific peers as the work outside contexts of application is; first of all it is reviewed by decision-makers, stakeholders, media and the wider public. And their work has more or less direct effects on political decisions. Against this background, a basic assertion in this thesis is that these scientific advisors do not proceed as their colleagues outside contexts of direct application. Their practices – and outcomes – are affected by the role their expertise plays in decision-making.

This notion – that being more closely linked to decision-making or to society in a wider sense changes the scientific practices – is shared across a wide field of science studies scholars. In the book *The New Production of Knowledge: Dynamics of Science and Research in Contemporary Societies* Gibbons et al. argue that the growing field of applied sciences, i.e. sciences feeding directly into production, regulation or political decision-making, has changed the conditions under which science is produced and hence also the sciences (Gibbons et al. 1994). Traditional scientific practices, which they call Mode 1 science, are driven by autonomous scientific institutions and scientists and by internal disciplinary taxonomies. Contemporary scientific practices in the context of application, however, are shaped by a number of drivers that to a greater degree orient them towards society. Among the most important changes Nowotny et al. (Nowotny, Scott & Gibbons 2003) mention three trends: 1) Research priorities are increasingly steered through funding programmes and governmental research programmes, 2) research is increasingly commercialised and 3) science is increasingly assessed, evaluated and managed, for example through the establishment of research councils. Taken together, these developments create new conditions for the production of knowledge, resulting in more application- and problem-oriented, context-driven and interdisciplinary science. Nowotny et al. term this new form of knowledge, which supplements rather than replaces Mode 1 science, Mode 2 science.

While the concept of Mode 2 science has been widely discussed, the main conception of a shift in the conditions for research production towards more applied contexts which, at least for some scientific fields, are transforming the scientific practices, is broadly shared (Jasanoff 1987, Collins, Evans 2002, Böhme et al. 1983, Funtowicz, Ravetz 1990, Jamison 2001, Irwin et al. 1997, Beck 1992). The main disagreements do not concern whether the concept of Mode 2 science is to some degree descriptive of the current developments related to the role of science. Rather, the main debate centres around 1) whether this is problematic and hence what to do about it, and 2) whether Mode 1 science on the other hand is detached from society and more universal and disinterested.

The main dispute organising these debates concern the boundary between science and politics. Its existence and configuration, function and practicability. The debate about the relation between science and politics can be traced back to the scientific revolution in the 16th and 17th centuries (Shapin, Schaffer

1989) or even to Greek Antiquity (Nielsen 2008). However, with the increasingly central role science has come to play in our contemporary societies the debate has intensified, and scientific advice is one of the areas where the complex relation between science and politics is a particularly visible, urgent and often controversial issue. Not only among academics, but also among practitioners and other actors involved in or affected by scientific advice. The ways in which the relation between science and politics is managed are, among other things, a core issue when scientific advisors, critics, policymakers, the media and the wider public debate the extent to which the scientific underpinning properly justifies particular political decisions. Scientific advice may have rather direct political effects and often in areas with major interests involved. Are the scientific advisors free of political interests? Have they tried to accommodate their funders, who often happen to be one of the involved parties? Is their advice relevant and useful for the political issue in question? Do they have a sense of the eventual implications of their results? And should they? Do they listen to the stakeholders who may have a lot to contribute with from their everyday experience? And should they, given that stakeholders also might have interests in the research outcomes motivating them to say what they do?

In this thesis I set out to address two overall research questions. The first is based on the assumption that scientific advice is shaped by the particular situation of application – by the particular institutional setup organising the relation between scientific advisors, decision makers, interest groups and the wider public. I explore how. I do so by comparing parallel processes of working out advice – two processes framed by two different national agendas, two sets of stakeholders, two different institutional setups, two different sets of potential implications and two geographically different areas of implementation. The first overall research question, then, is: *What does the task of informing and justifying political decision making for different kinds of audiences do to the scientific process and outcome?*

While science on the one hand is affected by the particular context of application, several cases studies have demonstrated how the management of the boundaries between science and politics can be a particularly pressing issue, both in the practice of and responses to scientific advice. Hence the second overall research question is: *In which ways is the boundary between science and politics mobilised, transgressed, dissolved and in other ways processed as part of this work for producing credible justification for policy?*

My starting point is that any simple representation of science/policy boundaries and of how they should be managed stems from rather abstract notions about what science and politics is and is not. Hence, a motivating point of departure for this thesis is that these issues must be approached, among other things, on the basis of a more detailed understanding of the particular practical implications and dilemmas that

arises when science gets to play particular roles. Hence, rather than describing general trends across the regulative sciences I have set out to address these issues by studying the concrete scientific practice. I do so by comparing two particular processes of producing scientific advice:

Cases: Defining the sandbank habitat type on Dogger Bank

More concretely, I have studied the processes of working out advice to implement the EU Habitats Directive for the conservation of biodiversity. The main tool in the Directive is a Europe-wide network of protected areas representative of a number of habitat types and species, which are listed in Annexes to the directive. All EU member states are to designate sites for the protection of the habitat types and species occurring in their territories and offshore waters by 2012. One of the habitat types to be protected is habitat type 1110: 'sandbanks slightly covered by seawater all the time'. The particular site in question is the Dogger Bank – a major bank below sea level rising off the sea bottom in the middle of the North Sea. The bank stretches through the Exclusive Economic Zones (EEZs) of four member states, namely Denmark, Germany, the Netherlands and the UK. EEZs are the zone from the boundary of territorial waters 12 nautical miles off the coast to 200 nautical miles off the coast to which member states enjoy exclusive rights to resource exploitation. Each member state has had to consider whether the Dogger Bank in their EEZ is a sandbank, and if so: Where exactly does it start to be so in the terms of the directive? I follow and compare the processes of defining the boundaries of Special Areas of Conservation (SACs – used about sites protected under the Habitats Directive) for the protection of the sandbank habitat on the Dogger Bank. In order to obtain the needed level of detail I focus on the German and UK processes.

According to the Habitats Directive the process of designating sites is to follow a two-step procedure: 1) The selection of areas to be protected including the definition of their boundaries, and 2) the development of management plans. In relation to the first stage, member states are obliged to

> […] ensure that the site designation process is exclusively based on scientific criteria. As regards areas to be protected under the Birds Directive [an EU directive for the protection of birds, ed.], the Court of Justice has emphasised that the selection of sites and the delimitation of boundaries should be carried out on the basis of exclusively ornithological criteria. As regards the Habitats Directive, case law confirms that site selection by Member States should be exclusively based on the ecological criteria of Annex III of the directive. (European Commission 2007, p. 21)

The background to the claim is that focus should be on conservation objectives and not on socio-economic concerns. The guideline continues: "Therefore, future management challenges should not be a determining element in this process." (European Commission 2007, p. 21) The boundaries between science and politics

are spelled out in the directive: Scientific advisors should draw on ecological criteria and not consider lost incomes and national strategies for renewable energy. And if they cease to do so, or if the politicians cease to follow the scientific advisors' advice, the member states risk a case at the European Court. A series of court cases has further reinforced this position and is referred to by, among others, environmental NGOs.

If the choice between exclusively scientific methods was a straightforward choice and their application was unproblematic, the process would presumably have been undertaken in short time and the result would have been simple to account for. Also, one would expect that the approaches in the four member states would be rather similar, and that the resulting objects – the delineated 'sandbanks slightly covered by seawater all the time' – would be similar when it comes to the principles for their demarcation. This is, however, not the case. The scientific exercises in the different member states turned out to become very different. Where the German process took two years all in all including public consultation and governmental approval before the site was submitted to the European Commission, the UK process took more than ten years and was not submitted until August 2011. The two groups of scientific advisors based their advice on very different methodological approaches and data types. And where the German process involved one version of the site, which was approved by government, the UK process involved several versions, the first of which were rejected by government.

The national differences show how the scientific advisors' struggle to produce exclusively scientific advice for the justification of protected areas on the Dogger Bank is conditioned by factors which differ between the member states. The potential SACs have different political implications. The interest groups are different. The governmental agendas are different. There are different expectations to the scientific advisors. Hence, one of the main methodological tools in this thesis is to compare the processes. The comparison among other things forms the basis for studying which factors condition the scientific processes and outcomes and in which ways.

Sub questions

While digging into the Dogger Bank cases, each of the two main research questions are accompanied with a set of sub-questions.

Looking at the first research question about how scientific advisory processes and outcomes are affected by having to feed into decision making I have focused on two main sub-questions. The first has to do with the Terms of Reference – the way the scientific advisors' tasks are defined from the outset. When providing advice for political decision-making scientific advisors are asked to address particular research questions, work within particular methodological frameworks and provide particular kinds of outputs that can be

transformed into particular kinds of policies. How does this direct and constrain the scientific advisors' work, how does it affect the outcome, and which kind of tensions and frustrations does it provoke among the scientific advisors? In the particular cases treated here I have looked at the Terms of Reference defined at the level of the EU Habitats Directive. The first sub-question, then, is: *How does the task of informing and justifying political decision-making define and limit the kind of research questions, methodologies and outputs the scientific advisors can work with? And in what ways do the scientific advisors work within this framework?*

The second has to do with the particular settings in which the scientific advisors are supposed to respond to these Terms of Reference. While implementing the same directive and defining the boundaries of the same habitat type, why do they work so differently? What affects the scientific decision-making – the scientific advisors' decisions about which methodological approaches to follow, which data to use or collect, how to analyse it, how to interpret the results and what to advise? That is, what makes scientific advisors in UK and Germany respectively make different scientific decisions? Hence, the second research question is about the factors that affect the research processes at the more national level. These factors are addressed with the comparative question: *Which differences between the two cases have contributed to making the research processes and outcomes turn out so differently in Germany and in the UK?*

The second main research question about how the boundaries between science and politics are managed in the processes is likewise accompanied by two sub-questions. The first has to do with the role of science for policy. With different notions about the boundaries between science and politics follows also different mandates for scientific advice. For example, if science is seen as ideally detached from political institutions and goals, scientific advisors may be expected to provide an objective basis for decision making, but make sure to stay on their side of the boundary and leave policy issues to policy makers. And if scientific advice is seen as ideally developed in careful consideration of the particular policy issues, scientific advisors may be expected to engage as consultants in the political issues. Hence, when addressing the research question about how boundaries between science and politics are managed, a sub-question is: *Which mandate is given to scientific advice in this process?*

Finally, different mandates have different effects, for example for the scientific process and outcome and for democratic decision making. Hence, a second sub-question in relation to science/policy boundary management is: *What are the effects of such mandate?*

Theoretical framework

While addressing these research questions I work with some analytic themes. But before presenting them a brief introduction to the theoretical framework is needed. In the following I start by introducing the existing approaches to regulatory science within the scholarly field of Science and Technology Studies (STS) and explain where in this landscape I place myself. Secondly, I introduce more thoroughly the different approaches to one of the core issues in these debates, namely the existence, function and management of boundaries between science and politics. Finally, I introduce some of the main methodological concepts that inspire the analysis.

Regulatory science

The core role of regulatory science in contemporary societies is treated in a growing field of literature. The close connection between science and political decisions in this area raises a number of issues. One issue is the various political agendas which might potentially create pressure on science to arrive at particular conclusions. Another issue is the democratic implications of a growing crowd of scientific experts influencing political decisions about everything from public health and the nations' economies to the future of the planet. A third issue is the risk of regulatory science becoming either too distant from the research science carried out outside applied contexts or too detached from the practical reality addressed by the political decision-making. The literature addressing these issues tends to differentiate between research science on the one hand and regulatory science on the other. The exercise to classify and distinguish them is difficult, however – particularly because of the variation in the sciences within each of the categories.

The attempts can roughly be divided into two groupings. The first grouping counts those who argue that research science and science bound closer up with decision-making are fundamentally different in nature, and that the difference lies in the extent to which the boundaries between science and politics are maintained. Funtowicz and Ravetz, for example, differentiate between situations where scientists can follow normal routines unproblematically, and situations in which science has to be practiced in acknowledgement of the wider political situation (Funtowicz, Ravetz 1993). Rather than drawing the line between regulatory and other sciences, they operate with two parameters. The first is the level of scientific uncertainties, the second about the amount of stakes in the decisions depending on the science. If both parameters are low, we operate with *normal science* and scientists can carry on as usual. When either or both parameters are high, we operate with *post-normal science* where scientists' work needs to be more closely bound up with the wider societal needs.

Another member of this first group is Weinberg who differentiates between *science* and *trans-science* (Weinberg 1986). As examples of trans-science Weinberg mentions assessments of the probability of

extremely improbable events like catastrophic reactor accidents. Such assessment could consist of the construction of plausible accident trees where each branch represents a potential failure of a particular component, each accompanied by statistics for their failure. However, there is no way to assess whether all potential failures have been included. And the resulting number is so small that it would require say building 1000 reactors and running them for 10.000 years. Hence, because of the need to make predictions, the norms of proof are less demanding when dealing with trans-science issues. And the scientist is in no better position to provide definite answers than a lawyer, politician or other lay person. Rather, the scientists' role is to define where science ends and trans-science starts. (Weinberg 1986, p. 68)

Both the distinction between normal and post-normal science and between science and trans-science can be seen as a means of safeguarding 'science proper' from the compromising effects of being enmeshed with politics. However, some critics have argued that such a distinction suggests that research science not feeding directly into politics is unproblematic, ahistorical, objective and value-free (Yearley 2000). Along the same line Irwin et al. argue that rather than safeguarding science proper they come to disregard regulatory science altogether as "a poor imitation of conventional science", hence inviting criticism of regulatory science on the grounds that it is policy in scientific disguise ((Irwin et al. 1997, p. 19)).

The second grouping is defined by Irwin et al. as those who differentiate between research science and regulatory science on the background of their context (Irwin et al. 1997). According to scholars within this group there is nothing essentially different between science outside and within contexts of direct implementation – both are affected by the contexts in which they are produced. It is not the fundamental qualities, e.g. of being value-free or not, but the contexts which make them differ. An often cited member of this group is Jasanoff. While stressing the socially constructed character of any science, she argues that the factors influencing the construction of research science and regulatory science are different. For example, the goal of regulatory science is to produce truths relevant to policy, while the goal of research science is to produce truths of originality and significance. And where the accountability of research science is mainly assessed by scientific peers, the accountability of regulatory science is assessed by, among others, the congress, courts and media. Likewise, where the timetable of research science for arriving at conclusions is open-ended, the timetable of regulatory science is defined by policy needs (Jasanoff 1995, pp. 280-285).

The theoretical approach in this thesis belongs to the second grouping. A large body of case studies within the social studies of science has efficiently demonstrated the contingent and embodied character of any science. The claim that science produced outside the contexts of direct implementation should be universal and value free is, I find problematic. University driven science is also driven by struggles to get funding, by

prestige, disciplinary paradigms, political issues and historical contingency. Rather, the difference lies in the particular conditions under which regulatory science is produced.

The science/policy boundary

Given that it is a core issue running through the analysis, a brief introduction is needed here to the ways in which I approach the science/policy boundary:

According to Shapin and Schaffer, the separation between science and politics has been perceived as one of the defining principles of science ever since the Scientific Revolution in Europe in the 16th and 17th century (Shapin, Schaffer 1989). Robert K. Merton, who was the first sociologist to actually study scientific practice, is frequently referred to as the one who voiced this strict divide between science and policy. First descriptively, as an observation of how scientists work. Then, based on his observations, as a set of prescriptive norms scientists should ideally follow to ensure first of all that science is universal and free from economic and ideological interests (Merton 1973). In this way he defined science as the place outside politics from where to speak disinterestedly – and hence as the source of privileged universal knowledge. The cognitive authority of science came to be defined as a function of, and hence conditioned by, its demarcation from politics.

The Mertonian norms have been strongly influential and shaped the public as well as the scientific practitioners' own perceptions both about how science ideally should be and about how science really works. And a number of scholars (Jasanoff 1987, Gieryn 1983, Latour 1993) have described how much of science's success in society lies, using Sheila Jasanoff's wording, "in persuading decision-makers and the public that the Mertonian norms present an accurate picture of the way science 'really works'." (Jasanoff 1987, p. 196)

An illustrative example of this work can be found in Stephen Hilgartner's description of the American National Academy's work to stage three advisory reports on diet and health (Hilgartner 2000). According to the formal procedures of the Academy all draft reports, communications and disagreements that formed part of the drafting of the report were to be held in confidence. This was, according to a brochure Hilgartner quoted from the National Academy about their advisory process, first of all to ensure that the resulting reports were perceived as disinterested and, hence, as credible:(Felt, Wynne 2007)

> Early briefings … damage the final report by subjecting the committee to the accusation that it permitted the sponsor to preview and approve the conclusions and recommendations – a serious charge that undermines the independence and integrity of both the committee and the institution. In

> such cases, the hard work of the committee can be discredited, diminishing the report's value to the sponsor and to the nation. (The National Academy of Sciences 1996, quoted in Hilgartner 2000, p. 56)

Hilgartner also showed that in situations where the National Academy did not succeed in building public trust in a report's credibility it was, among other things, because critics had pointed to connections between committee members and interested parties or to some committee members overruling others with opposing views, hence raising questions about the disinterestedness of the report.

Whereas Merton's norms are still influential in our expectations to science in scientific advice, they have been challenged from various positions within feminist theory, cultural studies, anthropology, political science, philosophy of science and science sociology. As my own work in this thesis feeds into this literature, a brief introduction to some of the core positions is needed before I motivate my own starting point.

The various positions regarding the relation between science and politics can roughly be organised along the same line as the science wars, that is, between the two poles of essentialism and constructivism (Nielsen 2008). At the essentialist pole we find those who like Merton argue that science and politics are essentially different domains, and that their separation is an ideal to strive for and to a large extent practicable (Merton 1973). At the constructivist pole we find those who argue that science and politics cannot be defined by resorting to any essentialist criteria; their definition will always be socially and historically embedded (Shapin, Schaffer 1989, Gieryn 1983, Latour 1993, Jasanoff 2004, Wynne 1992a). While the essentialists believe that the boundary between science and politics preexists any practice and can be identified, the defenders of the constructivist position argue that the boundary is rather an outcome of practices to define and manage such boundary. From a constructivist perspective the boundary is productive rather than descriptive: It produces what it delineates. While from an essentialist perspective the boundary between science and politics preexists any practice, the constructivist approach implies that the boundary *is* this very work to delineate them.

While the essentialist approach describes the boundary as something that is and can be identified, it provides no tools to study how it is produced, maintained and transgressed. Moreover, it predefines the very categories which are up for negotiation in my cases. The essentialist approach, then, is little productive for my analysis. Among the approaches closer to the constructivist pole multiple tools are provided to study the work to define, separate, negotiate and intermingle science and politics in the production and communication of scientific advice. Hence, it is among these scholars I find inspiration for my analysis.

The course of chapters

In chapter 2 I introduce some of the main issues in scholarly debates about science/policy boundaries in scientific advice. I introduce the methodological framework for my exploration of science/policy boundaries in the designation processes on the Dogger Bank, the research design and some considerations related to my fieldwork. In chapter 3 I introduce the overall framework of the Habitats Directive and open the discussion about how the Directive conditions the scientific advisors' work. Chapter 4 is focused on the designation processes – here I follow the scientific advisors' decision making step by step and discuss the ways in which the validity criteria motivating their decisions are bound up with the particular settings in their respective member states. In chapter 5 I account for the kind of validity criteria the scientific underpinning of the UK is evaluated against by two different stakeholder groups. In the concluding discussion in chapter 6 I draw on the three previous chapters to consider the ways in which the processes of producing scientific advice are affected by having to feed directly into decision making. I discuss the effects of the particular mandate the Habitats Directives' gives to science, namely that of providing an 'exclusively scientific' basis for site designation. Finally, I consider an alternative mandate for scientific advice for policy.

2 Science, its boundaries and how to study them

Before exploring the role of scientific advice for the designation of protected areas on the Dogger Bank, I introduce some of the positions in the scholarly debate about the role of scientific advisors in policy making. Rather than giving a complete overview of existing literature, the main focus is to introduce the resources which I draw on in my analysis.

The boundary and distribution of power between science and the state is at the core of the debate about the role of scientific advice for policy. Other likewise central issues concern the boundaries between science on the one hand and politics, interests, culture and local knowledges on the other. These issues have also shown to be central for the role of science in the processes designating protected areas on the Dogger Bank – hence, the next section of this chapter is dedicated to building up an analytical framework for understanding the dynamics of such boundaries. First I draw on a range of science studies scholars to introduce my own scientific theoretical starting point – the basic conception of science boundaries which forms the basis for the analysis. I then explain what this has meant for the research design. In the final section I go through the more practical organisation of my fieldwork and share some ethical considerations about my role in the field. Finally I account for my use of categories in the analysis.

Scientific advice

Despite an increasing acknowledgement among scientific practitioners, policy makers and the wider public of the social attributes of science, a number of STS studies have shown how the maintenance of strict boundaries between science and politics still tends to be an important concern in contexts of scientific advice (Nielsen 2008, Hilgartner 2000, Holm, Nielsen 2004, Guston 1999). Hence, before I introduce the different scholarly positions on scientific advice, a brief introduction to the traditional ideal of strict boundary management – where does it come from and why is it advocated?

Mertonian norms

Science has for several centuries played the role in modern societies as as the cognitive authority concerning the natural world. And according to a range of science studies scholars, science has during the 20th century played a still larger role in politics as the basis for decision-making (Jasanoff 1994, Nowotny, Scott & Gibbons 2001, Maasen, Weingart 2005). Its authority has been based primarily on the belief that science is fundamentally different from other forms of knowledge. This distinction between science and other cognitive activities has, among others by Shapin and Schaffer and Latour, been traced back to the scientific revolution of the 16th and 17th centuries. The scientific revolution was a break with Aristotle and

the Church as the main sources for understanding the natural world. Scepticism, reason and experiment should form the basis for our knowledge of nature and free us from superstition and authorities. Man should believe and nurture his own reason and senses. These ideas later formed part of the basis for the Enlightenment in the 18th century, where science and reason were promoted as means of breaking with the Church and the state. In this way, the distinction between science and the state was a means of emancipation and came to be an integrated part of the basis for modern democracies.

One of the often cited exponents of the norms of a strict division between science and society is the sociologist Robert K. Merton (e.g. Shapin 1995). In the essay *The Ethos of Science* he listed a set of four norms for scientific practice (Merton 1996). The norms were descriptive, based on his sociological studies of scientists. The first norm, *universalism*, was a claim to focus on the content of claims rather than on the persons making the claims – without consideration of religion, economic status or academic ranking. The second, *communism*, was an insistence that science should not be capitalised through intellectual property rights – findings should be communicated openly and fully. The third norm, *disinterestedness*, was a claim that scientists should not strive in their work to support particular ideologies. One of the ways to keep ideological agendas out of science was peer review. Finally, Merton found scientists to be bound by norms of *organised scepticism* – a claim that all phenomena should be open to objective scrutiny, and that all claims made by scientists should continually be open to be questioned and tested. Though they were meant as descriptive accounts of the norms to which scientists held themselves and each other accountable, he argued that they were descriptive of all scientific practice. Hence, while at first they were based on observations of particular scientific communities, Merton's norms ended up being a essentialist definition of scientific practice (Nielsen 2008, p. 61).

The Mertonian norms became and still are a core reference point in debates about scientific norms and tend today to be presented in a modified version as the CUDOS norms (Communalism, Universalism, Disinterestedness, Originality and Skepticism), with *originality* added as a fifth norm. Originality is a claim for scientific contributions to provide something new, be it in relation to findings, methodology, theory or data. A number of STS scholars (Gieryn 1983; Latour 1993; Jasanoff 1987) have further confirmed how the Mertonian norms are descriptive, if not of scientific practice, then of the norms against which science is evaluated. According to Jasanoff much of science's success in society lies "in persuading decision-makers and the public that the Mertonian norms present an accurate picture of the way science 'really works'." (Jasanoff 1987, p. 196)

New roles of science, new perspectives

Developments in the role of science in society during the 20th and early 21st centuries, however, have encouraged new perspectives on science. Along with the industrial revolution issues related to health, environment and security increasingly became objects for regulation – a development that gave science and scientific advisors a still more important role in the policy process (Jasanoff 1987). During the cold war science also came to play a core role in relation to military technology (Weingart 1999). Science was generally perceived as a success for its contributions to human welfare and progress. However, this image was seriously challenged during the 1960s and 70s when the backdrops of technological advancement began to show in cancer rates, biodiversity loss, birth defects and, particularly dramatically, nuclear accidents. According to Weingart "Three Mile Island and Chernobyl, became symbols not only of the vulnerability of nuclear power technology but more of the loss of scientific authority based on reliable knowledge and unanimous expertise, as well as of the loss of credibility of politicians who relied on it" (Weingart 1999, p. 151). These developments inspired the development of a new branch within sociology, engaged in issues of risk (e.g. Beck 1992).

Moreover, science was now asked to provide solutions to these problems. Quests for biodiversity conservation, cancer prevention and secure nuclear technology brought science to focus on risk, prevention and forecasts – areas characterised by indeterminacy and large levels of complexity. Again using Jasanoff's phrasing, "this shift of scientific attention to the unknown, and possibly unknowable, effects of technology highlighted the intuitive, subjective and uncertain underpinnings of much of the advice that scientists provide to government" (Jasanoff 1987, p. 201).

Science, then, played an increasingly important role in providing solutions to a series of new, complex and often urgent problems, both in the form of advice and technology. As a consequence of the central place in society and in policy making, science also became an object of increased public interest and intellectual scrutiny. First of all, the scientists' credibility as disinterested providers of objective knowledge for decision making was questioned. Scientists became visibly enmeshed in politics. Sabine Maasen and Peter Weingart describe how scientists with the debates over nuclear energy and environmental protection in the 1960's came to be perceived as parties in the dispute:

> They were instrumentalized as experts whose technical know-how was to support political positions on both sides in vicious controversies over technical issues. The public appearance of experts defending contradicting positions made it apparent to the public for the first time that scientific

> knowledge is not unequivocal, that its implementation entails risks, and that there can, in fact, be a complete lack of knowledge. Experts, it was discovered, are far from representing neutral knowledge but rather interpret the state of research in various, even completely contradictory ways, taking sides with their favoured political positions and/or lobbying for their own interests. (Maasen, Weingart 2005, p. 2)

Secondly, science's uncertain and sometimes indeterminate character was highlighted. Most importantly by the dramatic demonstrations of technological failure by accidents like nuclear meltdowns and the toxic cloud from a chemical factory in Bhopal. But also because science with the preventive turn was brought to the edge of its capabilities (Weinberg 1972, p. 2). And because providing advice for policymaking necessitated scientists to pronounce more carefully their reservations and uncertainties (Jasanoff 1987). Finally, science was increasingly seen as part of the problem and not just as the solution and the driver behind human progress (Beck 1992, Latour 1993).

These developments have, along with others, challenged the Mertonian norms, both with regard to their descriptive and their prescriptive value, and given rise to new perspectives on science's boundaries. The debates have both taken place in the practical setting among citizens and interest groups, policy makers and scientific practitioners, and among scholars across a broad range of disciplinary fields in the academic environment including feminist theory, philosophy of science, human ecology, ethnography, sociology of science and Science and Technology Studies.

I introduce in the following some of the scholarly approaches to the role and boundaries of science, particularly in relation to scientific advice. First I introduce the concepts of post-normal science introduced by Funtowicz and Ravetz, and trans-science introduced by Alvin M. Weinberg (Funtowicz, Ravetz 1990, Weinberg 1972). Both perspectives differentiate between advice in situations where science can proceed as always and advice for policy issues where science cannot stand alone, either because of their content, the stakes involved or the amount of uncertainties. Both perspectives further conclude that in the latter situation, scientific advisors need to work in close dialogue with stakeholders and policy makers.

I continue by arguing that both perspectives still operate with traditional perspectives on the boundaries between science and politics – the boundary has just been displaced, this time to distinguish between science proper and science which is not. I argue that in order to study how boundaries are defined in practice, I need to draw on approaches that do not define any boundaries on beforehand, but treat the boundaries as fundamentally constructed.

I then introduce a series of more constructivist approaches to science/policy boundaries – approaches which are closely related and together form the conceptual background for my approach.

Safe-guarding science proper

With the term 'post-normal science' Funtowicz and Ravetz allude to Thomas Kuhn's term 'normal science'. Normal science refers to the puzzle-solving and steadily accumulating routine work of scientists which takes place within one paradigm in between the conceptual revolutions of science. In these periods, Funtowicz and Ravetz argue, "uncertainties are managed automatically, values are unspoken, and foundational problems unheard of" (Funtowicz, Ravetz 1993, p. 740). However, while science today is increasingly produced in contexts of application and plays a core role for political decision making, science in these situations also plays new roles. Funtowicz and Ravetz define these new roles taking an outset in two parameters, namely decision stakes and systems uncertainties. Decision stakes concern the value commitments, costs and benefits involved in the issue via the different users with stakes in it, including managers and decision makers. Systems uncertainties concern the uncertainties relating not to a particular fact, but to the understanding and management of a complex reality.

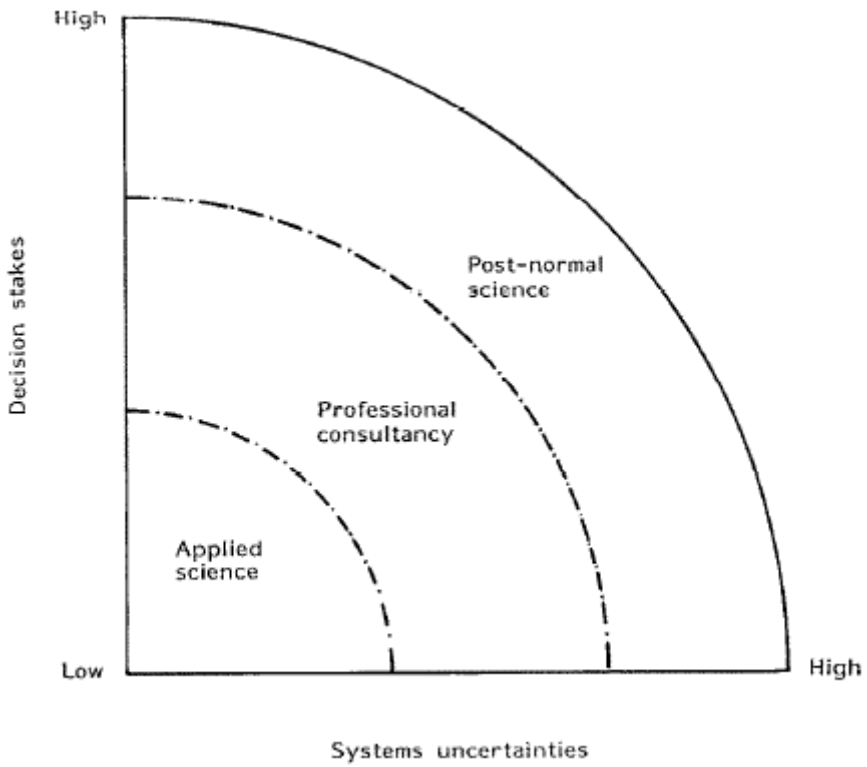

Figure 1 Problem-solving strategies. Taken from Funtowicz and Ravetz. (Funtowicz, Ravetz 1993, p. 745).

In a diagram where these two parameters constitute each their axis (see Figure 1), Funtowicz and Ravetz distinguish between three kinds of situations. Normal science developed outside any applied contexts

constitutes the point at the intersection of the two axes. As the science neither directly nor indirectly feeds into decision making, and as the systems uncertainties are low, scientists go about as usual, drawing on standard routine practices. Funtowicz and Ravetz refer to this as 'pure' or 'core' science. Moving out the axes the first situation is that of applied science. Here science is produced for application, but does not feed into issues with major stakes. It could for example be research for a company and feed into product development. Systems uncertainties can be managed at the technical level, and they can be managed with standard routines. The role of scientists here is that of manufacturers developing products for consumers. For core and applied science alike, quality assessment can be carried out by drawing on traditional procedures of peer review. Further out the axes we move into the realm of professional consultancy, which for example could concern issues relating to risk or the environment. Here the issues cannot be dealt with drawing on standard routine practices. Uncertainties are more complex and must be dealt with at a more methodological level. The decision stakes are complex, too. The costs of error may be large, and decisions about where to place the burden of proof relies on values about whose harm should be prevented first of all. The work of the professional consultant involves an important element of personal judgment which touches upon technical as well as political issues (Funtowicz, Ravetz 1993, p. 748).

Finally moving to the outer end of the two axes we find the realm of post-normal science. As with professional consultancy, Funtowicz and Ravetz refer to policy issues related to risk and the environment. However, decision stakes are extreme and conflicting among stakeholders. Likewise, the systems which science address are particularly complex to comprehend and uncertainties are high, bordering to ignorance, and tend to be of an epistemological or ethic character (Funtowicz, Ravetz 1993, p 744). Funtowicz and Ravetz quote J. C. Balibar who argues that

> […] the kind of random variability we see in the big problems of the day tend to be small relative to other uncertainties. This is true, for example, for data on poverty or unemployment; international trade; agricultural production; and basic measures of human health and survival. Closer to home, random variability – the stuff of p-values and confidence limits, is simply swamped by other kinds of uncertainties in assessing the health risks of chemicals exposures, or tracking the movement of an environmental contaminant, or predicting the effects of human activities on global temperature or the ozone layer. (Balibar 1988, p. 19)

In such situations, Funtowicz and Ravetz argue, where stakes and uncertainties alike are extreme, scientists cannot follow the same standard puzzle-solving exercises as they can within core or applied science. And they can no longer make decisions in ignorance of the policy issues, stakes, values and potential implications of their outcomes. For the problem-solving activity involved in post-normal science, "the

traditional domination of ‘hard facts’ over ‘soft values’ has been inverted” (Funtowicz, Ravetz 1993, p. 750). Apart from being reverted, facts and values are no longer separable. Funtowicz and Ravetz use the extinction of species as an example: Science alone cannot provide a rationale for weighing the rights of people benefitting from particular activities against the rights of the species which it affects.

Funtowicz’ and Ravetz’ approach is a well-known example among a range of approaches which attempt, among other things, to take account of the blurring of science’s boundaries in applied contexts while still reserving a place for ‘science proper’, that is, pure, objective Mode-1 science guided by methods and internal epistemological criteria and not by interests and societal utility. Their model, one could say, introduces a new boundary – this time not between science and politics, but between pure science and post-normal science, where the science/policy boundaries are more diffuse. Another example is Alvin M. Weinberg who distinguishes between science and trans-science (Weinberg 1972). He gives examples of three ways in which issues can be unanswerable by science and hence transcend science:

> In the first case (low-level insult), science is inadequate simply because to get answers would be impractically expensive. In the second case (social sciences), science is inadequate because the subject-matter is too variable to allow rationalisation according to the strict scientific canons established within the natural sciences. And in the third case (choice in science), science is inadequate simply because the issues themselves involve moral and aesthetic judgements: they deal not with what is true but rather with what is valuable. (Weinberg 1972, p. 213)

Science issues should be dealt with by “the republic of science”, the inhabitants of which are scientists alone. Trans-science issues should be dealt with by “the republic of trans-science” in a more openly political structure: “The "republic of trans-science" (if one can identify something so diffuse as a republic) has elements of the political republic on the one hand, and the republic of science on the other. Its character must therefore reflect to a great extent the political structure of the society in which it operates.” (Weinberg 1972, p. 218)

Weinberg admits that the boundaries between science and trans-science are blurred, and that the republic of trans-science is diffuse and can be hard to identify. However, he still argues that with regards to science issues, they should be dealt with by scientists alone, and that such issues can operate under traditional, internally defined epistemological criteria.

One main criticism of concepts such as post-normal science and trans-science is that they merely introduce new boundaries between issues which can be addressed by pure science and issues which need to be addressed in acknowledgement of the political elements involved (Yearley 2000, Wynne 1992a). Hence,

they maintain the traditional notion of science as essentially and ideally pure, but under certain circumstances compromised by resource limitations or extreme uncertainty. Both do they base their distinction between the two situations on the scientific content: Whether or not science is really capable of addressing the issues with reasonable certainty, whether the issue really involves ethical and political elements or not.

As I argue towards the end of the analysis, the designation processes on the Dogger Bank confirms the problems in such distinctions based on content. Defining to which side in either model the designation processes on the Dogger Bank belongs is not at all straight-forward. The involved actors disagree about the extent to which scientists alone can address the issue in a technical manner, and whether the issues are considered technical or ethical and more or less uncertain or indeterminate depends not alone on the object of study or the scientific content, but also on government agendas, legal issues, interests and contingent chains of events.

Furthermore, the approaches do set out to define the boundaries between science and politics, or between science and politicised science on beforehand. Hence, they will not serve as a methodological framework for studying processes of boundary construction in practice. Hence, in the following I turn to some of the most well-known alternative accounts of science's boundaries from which I have found inspiration.

Boundary work

In 1983 Thomas F. Gieryn introduced the concept of *boundary-work* (Gieryn 1983). In his article *Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists*, Gieryn approaches the demarcation between science and other activities as a practical construction. Scientists have an interest in constructing such a boundary in order to underpin their authority and gain access to resources, prevent 'pseudo-scientists' from enjoying the same privileges, and maintain autonomy by protecting their research from political interference. In his analysis Gieryn takes an outset in three examples of situations where scientists have, for different reasons, defended their profession. Where the defence of science varies across the examples, what is shared is "a common rhetorical style: attributions of selected characteristics to the institution of science for purposes of constructing a social boundary that distinguishes "non-scientific" intellectual or professional activities." (Gieryn 1983, p. 791) Hence, Gieryn also argues that while the definition of science is a demarcation from other activities, the definition varies depending on what science is demarcated from. For example whether science is defined as 'not-religion' or 'not-mechanics'.

Where Merton argued that the norms he observed counted for any scientific practice, then, Gieryn's

approach implies that science has no internally rooted essence, but varies with the particular setting. Rather than being defined by its inherent characteristics, science (and what it is not) is defined by continual *boundary work*: the scientists' "attribution of selected characteristics to the institution of science (i.e. to its practitioners, methods, stock of knowledge, values and work organization) for purposes of constructing a social boundary that distinguishes some intellectual activities as "non-science". (Gieryn 1983, p. 782) For this use, Gieryn argues, scientists operate with a number of cultural repertoires about the character and value of science – repertoires they draw on when constructing boundaries:

> Especially when scientists confront the public or its politicians, they endow science with characteristics selected for an ability to advance professional interests. Scientists have a number of "cultural repertoires" available for constructing ideological self-descriptions, among them Merton's norms, but also claims to the utility of science for advancing technology, winning wars, or deciding policy in an impartial way. (Gieryn 1983, p. 783)

In the particular case of the Dogger Bank, a core issue throughout the processes of working out advice for the site designation was the boundaries between science and politics, and the involved actors operate with multiple different interpretations of how to comply with the claim in the Habitats Directive that sites should be selected on the basis of science alone. Hence, as the debate over the contents of categories like science, socio-economic interests and politics are among the objects of my study, I cannot use pre-defined notions of either category. Drawing on Gieryn's approach I can study the very work at the boundaries involved in defining the contents of both.

One issue, however, in relation to Gieryn's approach is that boundary work according to him is made by scientists in their own interests. However, in the Habitats Directive as well as in the two designation processes on the Dogger Bank boundary work is in the interest of multiple actors who all work to construct the boundaries in particular ways to support their case. Hence, I am not studying boundary work as an activity undertaken by scientists alone, but rather as a continual negotiation between different actors involved. For this purpose, I turn to Jasanoff:

Co-production of science and politics

In the same way as Nowotny et al. (Nowotny, Scott & Gibbons 2001), Funtowicz and Ravetz (Funtowicz, Ravetz 1993, FuntowIcz, Ravetz 1994) and Weinberg (Weinberg 1972), Jasanoff argues that the kind of questions scientists contemporarily are asked by politicians to address are often contested and indeterminate, and that such issues cannot be addressed from within their disciplinary frameworks. Rather, scientists are required to act as experts, and they do not provide knowledge, but *judgments* in

acknowledgement of the policy issues and implications: “Judgment in the face of uncertainty, and the capacity to exercise that judgment in the public interest, are the chief qualifications sought today from experts asked to inform policymaking.” (Jasanoff 2005, p. 211) This also changes the kind of qualities against which the science are evaluated and the kind of procedures involved: “In these circumstances, the central question is no longer which scientific assessments are right, or even more technically defensible, but whose recommendations the public should accept as credible and authoritative.” (Jasanoff 2005, p. 211) Unlike Funtowicz and Ravetz and Weinberg, however, Jasanoff does not draw on any predefined categories of science proper – rather, she takes up Gieryn’s concept of boundary work.

Where Gieryn argued that boundary work is a rhetorical style scientists take on to defend their territory, Jasanoff has demonstrated through a number of case studies how science-policy boundaries in the regulatory sciences are up for continual negotiation between for example scientific advisors, government and the public (Jasanoff 1994, Jasanoff 1995, Jasanoff 1987, Jasanoff 2004). Defining the boundaries between science and politics is a shared interest across various actors. Moreover, as the boundary between science and politics is fluid, she argues, defining it cannot be an *a priori* exercise:

> Judgments that seem purely scientific on the surface, such as choices of research design, are influenced by policy concerns ranging from the costs of data gathering to concerns about who should bear the burden of proof when data are uncertain. Equally, however, key policy choices, including the interpretation of statutory terms such as “adverse health effects,” may demand inputs from the medical and scientific research communities concerning the present state of knowledge in their fields. It is not surprising then that attempts to make a priori determinations of where science ends and policy begins in regulatory science – whether on the basis of “universal” characteristics of the scientific method or on the basis of decisions to separate risk assessment from risk management – have encountered repeated obstacles. (Jasanoff 1995, p. 289)

An interesting tension in Jasanoff’s findings is that on the one hand she shows how boundary work is what gives the scientific advice legitimacy – repeating her quote from the introduction, “Much of the authority of science in the twentieth century rests as well on its success in persuading decision-makers and the public that the Mertonian norms present an accurate picture of the way science 'really works'.” (Jasanoff 1987, p. 196). On the other hand, she demonstrates through a series of case studies how the politically most successful examples of scientific advice for policy, that is, those which tend to generate least conflict, are those where there is room for the political agencies and scientific advisors to negotiate the boundaries and the meaning of them. (Jasanoff 1994)

In her book *States of Knowledge. The co-production of science and social order* Jasanoff introduces the concept co-production. Her main argument is that science and politics are fundamentally intertwined. They are outcomes of the same processes and define each other:

> Briefly stated, co-production is shorthand for the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it. Knowledge and its material embodiments are at once products of social work and constitutive of forms of social life; society cannot function without knowledge any more than knowledge can exist without appropriate social supports. Scientific knowledge, in particular, is not a transcendent mirror of reality. It both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions – in short, in all the building blocks of what we term the *social*. The same can be said even more forcefully of technology. (Jasanoff 2004, p. 2-3)

The concept of co-production has been adopted by a range of scholars. One example relevant to marine management is Holm and Nielsen's case study showing how the EU methodological and institutional setup for providing scientific advice on how much biomass can sustainably be harvested from particular fish stocks has co-developed along with the institutional setup to define the Total Annual Catch – the maximum catch quotas at the level of the EU for particular species – and divide it between member states (Holm, Nielsen 2004). The joint system of advice and management, which Holm and Nielsen call the TAC Machine, has developed in response to each other in a way that makes it impossible to change the scientific practice without having to reorganize completely the whole management setup – and vice versa. This makes it hard to adjust the system as a response to the latest decades' experience that while it may be an organizational success, the TAC Machine has been a disaster with regard to its main objective: To ensure sustainable fisheries in the EU.

The concept of co-production provides a useful background against which I can compare how the processes of providing advice on the boundaries of protected areas on the Dogger Bank are formed by the different national setups in the two member states, that is, different governments, agendas, interests and institutional setups.

Where the concepts of post-normal science and trans-science in their attempts to safe-guard science proper can be seen as an input in the science wars debate between realism at the one pole and radical constructivism at the other, Jasanoff escapes either pole by arguing that science and the social is co-produced: Neither domain determines the other; they are created in concert and underwrite each other's existence.

The Modern Constitution

Jasanoff's concept of co-production is much in line with Latour's concepts of *mediation* and *purification*, which I return to below. The concept of the *Modern Constitution*, which is unfolded in Latour's well-known essay *We Have Never Been Modern* (Latour 1993), forms an important background for the way I analyse the processes of designating protected areas on the Dogger Bank. According to Latour, modernity is the simultaneous invention of society and nature, or of humanity and non-humanity, or of politics as science, as two completely distinct ontological domains. Society is on the side of humans, is represented by politics and is our own invention. Nature is on the side of non-humanity, is represented by science and is not made by us. As moderns we engage in practices of separating the domains of society and politics and of nature and science. Latour calls such practices the work of *purification*. As an example he draws on Shapin and Schaeffer's account of the 16th century chemist Robert Boyle's attempts to 'clean' his observations from social elements and hence ensure that the phenomenon he produced in his experiments were unveilings of undistorted Nature. For example, choosing the right witnesses for his experiments who would not have economic or other social incentives to report observations different from how they had really experienced them.

Purification, however, only accounts for what happens 'above'. And while occupied with the work of purification we have been deprived from an epistemological framework which would enable us to notice the simultaneous production of *hybrids* operating across the domains. This production is what Latour calls the work of *mediation* (see Figure 2). As examples of hybrids Latour mentions computers, global warming and gene technology. They consist of interrelated webs of technology, politics, bodies, media and culture etc., all of which cannot be grasped if we apply our purifying practices and place them on either side of the constitutional division, for example with technology, bodies and climate on the side of nature and politics, media and culture on the side of society. The term *monsters* emphasizes that as with Frankenstein's monster, our purifying practices does not allow us to properly understand the character, scope and implications of the hybrids we produce, neither to control them accordingly. Hence, Latour compares the modern invention with the constitutional separation between the judiciary and executive branches of a government: The separation is effective, convincing and productive, however it does not account for all the countless intersections between the branches. Hence Latour has named the parallel processes of purification above and mediation or translation below the Modern Constitution (Latour 1993, p. 13-15).

Deprived of an epistemological framework enabling us to consider our simultaneous production of hybrids we give little consideration of the implications our innovations may have on the other side of the strict divide. In this way the work of purification – the separation between science and nature on the one side

and politics and humans on the other – makes us believe we are invincible. It enables us, unworried, to multiply the hybrids – or monsters – of the modern world.

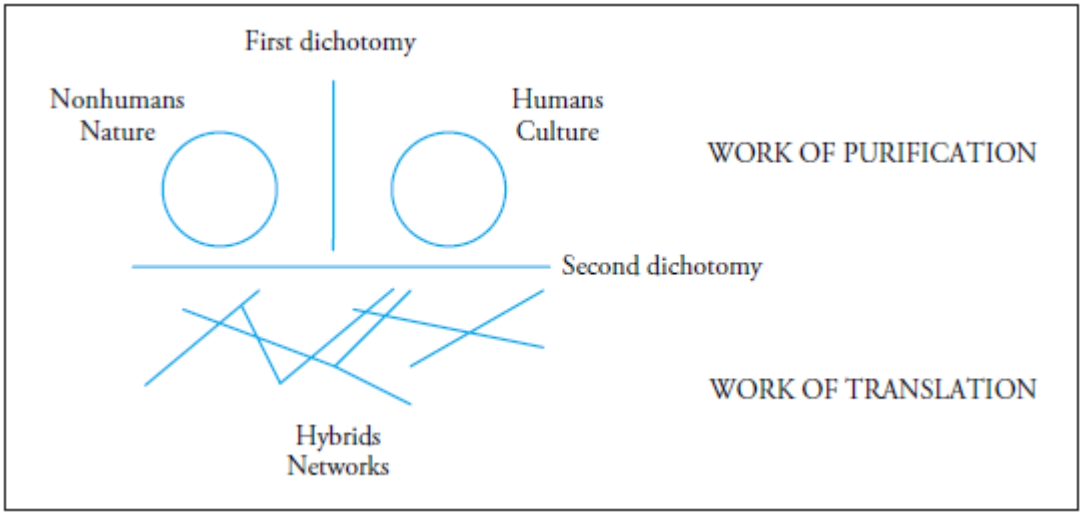

Figure 2 The Modern Constitution. After Latour (Latour 1993, p. 11.)

Latour's distinction between 'above' and 'below' is not a distinction between illusion and reality. We are perfectly aware of the work of mediation, and our daily newspaper is packed with accounts of hybrids, for example the consequences of mobile phones for teenagers' social life or the ethical issues involved in cloning. What we do not consider as moderns, however, is the relation between what happens above and what happens below: How the work of purification deprives us of an epistemological framework to understand that inventions and monsters are products of the same process.

Merton's norms is an obvious illustration of the work of purification, and so is the claim in the Habitats Directive that sites should be designated on the basis of science alone, meaning without socio-economic considerations. Likewise, the work of purification fits well the concept of boundary work. That is, the practices of defining whether actors, methodological approaches and statements belong on the one or the other side of the science/policy boundary.

These different perspectives on the fundamentally constructed character of the boundaries between, and character of, science and politics, form the analytical background for my study of the site designation processes on the Dogger Bank. In the following section I account for the more practical implications of this for the research design and for my way of analysing the data:

How to study science and its boundaries

My study of the Dogger Bank site designation is a detailed enquiry into the whole process, from the research question is defined to the advice is given and subject to public scrutiny in the consultation process.

What can such details do for my exploration of the role of science for policy making and for the processes of drawing boundaries between science and politics?

Science in action and black boxes

The far dominating source of inspiration for the research design is the conceptual framework for laboratory studies provided in a series of works by Latour (Latour, Woolgar 1979, Latour 1987, Latour 1999b), most condensed in the book *Science in Action* (Latour 1987). His main starting point is that in order to understand the authority of science and scientific facts, looking at its products alone will not bring us far. We need to study science in the making – the processes which in the end lead to the establishment of facts. Once a fact is established, Latour says, it is accepted in and by itself, and we forget about all the elements which took part in its production. Its contingent and tangible history is *black boxed*. Latour has taken the term *black box* from cyberneticians. They use it when they draw regulatory systems: When a segment in the causal chain is too complex they draw a box in its place about which they only need to know input and output. The complicated details about what happens between input and output are not needed in order for them to draw their system. Likewise, Latour argues, when an output of a research process is accepted and the history behind its production not considered relevant any longer and hence becomes a black box, the output becomes a fact. But it has a history nonetheless, and it is the history behind its production that helps us to understand its contingent character: "Uncertainty, people at work, decisions, competition, controversies are what one gets when making a flashback from certain, cold, unproblematic black boxes to their recent past." (Latour 1987, p. 4) Hence, Latour argues, we need to open the black boxes and study science *in the making*.

Latour's conceptual framework for the study of science builds on Actor-Network Theory (ANT), an analytical framework developed by Latour, John Law and Michel Callon among others. ANT is a semiotic-material approach – the world is argued to be a heterogeneous web of relations between humans and non-humans alike. The world is not social and not natural, but both – no precedence is given to the explanatory powers of either domain. The term network refers to the way non-humans are connected in a web of relations: A network has no top and no bottom, no pre-defined centre or domain determining the organisation of rest, and it does not differentiate between a macro- and a micro level (Latour 2006, Latour 1999a).

The relations between actors in a network are built through translation processes. Translation is the movements and transformations taking place when building a network. When elements in the network are aligned in particular ways, one element becomes spokesperson for the others, which are silenced. This is what happens when facts are stabilised and the history of their making is black boxed. Through processes of translation the statement in the end stands out, and the network – the sediment samples, the

disagreements when interpreting the results, the contingent events etc. which led to the stabilisation of the network – becomes invisible. Translations, then, are "all negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or to act on behalf of another actor or force." (Callon, Latour 1981, p. 279) One important point is that elements do not travel unaltered in networks, but are transformed. And ANT provides an approach for studying which kinds of transformation processes take place.

Scientific advice differs from academic science by, among other things, its products: Scientific advice does not provide facts, but information for decision makers to base their decisions on, or sometimes even policy recommendations. Scientific advice seldom achieves the same stable authority as facts, and where facts are characterised by being widely accepted, advice can both be accepted or highly controversial. Still, the history behind its production can be more or less visible. And as Hilgartner has shown in his study of the staging of advisory reports on diet and health (Hilgartner 2000), the authority of the advice and of the advisory institution can depend on keeping the messy, tangible processes involved in its making out of sight from the public or other potential critics (Hilgartner 2000). Moreover, while scientific advice may not be stabilised by obtaining the status as a fact, it can be stabilised in some sense by being transformed into decisions.

Hence, even though the boundaries of the Dogger Bank SAC have not been produced in laboratories and have not obtained the status as facts, I have set out to open the black box of the advised boundaries and protected features of the German and UK SACs on the Dogger Bank. The purpose has not merely been once again to show *that* facts are socially constructed. Rather, it has been to see in which ways the particular national frameworks of the UK and Germany respectively affect the processes and outcomes – and, on this background, to comment on the role of science for policy.

Another difference between the processes on the Dogger Bank and research processes involved in fact-making is that the translation chains are reversed. A range of laboratory studies have accounted for translation chains starting with for example pigs' brains or mice in the laboratory or soil in the Amazon and ending in more general, factual statements (Latour, Woolgar 1979, Knorr-Cetina 1999, Roepstorff 2003). In the case of the Dogger Bank designation process, where the task is to implement a directive, the references move the other way – for example from the general definition of the sandbank habitat type in the guidelines of the Habitats Directive to particular representations of the sandbank habitat type on the Dogger Bank. Scientists are tasked with establishing translation chains from the general to the specific. Hence, opening the black box and describing the details of the translations and transformations that take place in the process is not only a study of the constructed character of science, but also of the ways in

which e.g. international agreements about biodiversity conservation is translated, and transformed, to protected areas on the Dogger Bank which are assumed to act as a spokesperson for, among other things, biodiversity conservation and the sandbank habitat type. In other words: Translation processed provides an entrance point to studying the role science plays for policy.

Description as method

Opening black boxes is a descriptive exercise. But even though ANT abstains from *explaining* phenomena by not granting privileged explanatory power to macro- or micro levels, society or nature or particular forces, description does in a way explain how statements achieve the status as facts. As Latour formulates it,

> Explanation does not follow from description; it is description taken that much further. We do not look for a stabilized and simplified description before we begin to propose an explanation. On the contrary, we use what they do to an innovation or a statement to define the actors, and it is from them and them alone that we extract any 'cause' we might need. (Latour 1991, p. 121)

I have not intended to make a classic ANT study – however, it has inspired my analysis in important ways. First of all, I do not talk about driving forces involved in science, in politics, in institutions etc. I have followed the succession of events, the details of the negotiations and the chains of translations which took place in the processes. Through detailed descriptions, I show how decisions are made and boundaries established. And where I do dare to make claims about, for example, relations between scientific and political decision making, they are founded on my descriptions.

The design of the cases

In this section I account more practically for my choice of cases and focus, and for the ways I have organized the analysis.

Comparing two processes on the Dogger Bank

I have set out to study the scientific decision making step by step which led to the advised Dogger Bank SAC boundaries and added features that were finally submitted to the European Commission. In order to see how particular settings affected scientific decision making I have chosen to compare two processes of implementing the same directive and of designating sites for the protection of the same feature, but taking place within different national frameworks. What makes Dogger Bank particularly useful for the purpose is that the designation processes take place on different parts of the same bank – something which further highlights the ways in which differences in approaches are related, in part, to the national framework. Furthermore, the close relatedness of the two cases meant that I was not the only one comparing. Actors in

the two member states also made comparisons themselves. Some actors compared because they found it important to end up with coordinated boundaries and a coordinated management regime on the Dogger Bank. And some actors compared as part of their evaluation of the processes: They ascribed the differences to politics (where resemblance would have been due to standard scientific procedures).

One main difference between the two cases is the amount and kind of stakes on the respective sites. While the German part of the Dogger Bank is important only for a small group of stakeholders, the prospects of a protected area on the UK part of the Dogger Bank raise major concerns, most importantly because the world's biggest offshore wind farm has been projected here. Given this difference between the two cases, comparison on the one hand facilitates analyses of the ways more or less stakes have affected the scientific decision making. On the other hand, it has made it hard to assess which importance other factors have had for the differences between the two member states. For example, the UK government is much more engaged in the statutory advisors' methodological decision making than the German government – however, it is hard to know if the German government had been more engaged and the UK government less if the stakes on the two sites had been reversed.

The focus on SAC boundaries

As mentioned, Germany and the UK were in different stages of their designation process when I started my fieldwork. While the UK were still involved in the initial designation of the site, Germany had submitted their candidate SACs to the European Commission some years before and were now engaged in the development of management plans. The first events I participated in were related to the EMPAS project (Environmentally Sound Fisheries Management in Marine Protected Areas) – a research project tasked to provide scientific advice for the management of the ten German SACs in offshore waters. However, as the role of science was defined so differently for the two phases in the site designation – that is, as the first phase should be based exclusively on science and the second could involve socio-economic considerations – I found that it would be problematic for the comparison. Moreover, I wanted to compare two processes where the task from the outset was the same. Finally, I found the claim in the Habitats Directive about the need to base the choice of sites exclusively on science interesting, as it was a legal obligation to follow Mertonian norms. What would it do to the process if you could be taken to court for not being exclusively technical? Hence, I chose to focus on the first phase of the designation – the initial selection of sites and qualifying features. The choice had the implication mentioned earlier that I had to compare an ongoing process with one that ended some years ago.

The designation processes were wide-ranging, and there were multiple issues I could dig into. I needed to narrow my focus even more. I observed 1) that a main issue for the scientists was to provide scientific

methodological interpretations of the sandbank habitat type definition, and 2) the main issue in the search for the right methods was how to define the boundaries of the site. In order to keep a narrow focus in a widely dispersed field, both geographically, institutionally and thematically, I chose to focus on this one, seemingly small issue: The processes of defining the boundaries of the sites.

This focus was extremely helpful in guiding my fieldwork. Throughout the interviews I had a clear idea about what I needed to focus on, and – surprisingly – most of my informants had engaged opinions about what a sandbank is and how their boundaries should be defined. An engagement which may tell something about differing epistemological approaches, but first of all something about how different interests affect epistemological approaches to sandbanks: I doubt I would be able to find that kind of engagement in an organisation defending patients' rights or among scientific advisors working to define the limit values of chemicals in drinking water. Hence, my focus on how the boundaries of the sandbank habitat type were defined by different actors showed to be very well suited for studying what an applied context does to science: What it does to the science of sandbanks that it has very direct effects in the form of policy decisions and economic and environmental implications.

However, during the interviews and at a UK Dogger Bank SAC consultation meeting with environmental NGO representatives it appeared to me that in the UK case, the process of defining the boundaries of the Dogger Bank SAC could not be accounted for without also digging into the process of defining whether harbour porpoise is a feature which requires particular protection on the Dogger Bank SAC. The harbour porpoise issue had indirect, but important impacts on the discussion of the boundaries of the site. Furthermore, it turned out that where fisheries industry representatives in the UK case were mainly interested in the boundaries of the site, environmental NGOs were first of all concerned with the harbour porpoise issue. In order to capture these differences, I needed to include the discussion about the conservation status of harbour porpoise. The main focus, however, is the process of defining the boundaries of the sandbank habitat type. The harbour porpoise debate is included where relevant, either to the boundaries, to the working relationship between the statutory advisors and government, or to the stakeholder evaluation of the site. This also means that the German process in relation to harbour porpoise is hardly mentioned as it was no major issue here. Where it is mentioned, it is first of all because critics of the UK process used Germany as comparison.

The sandbank definition

Habitat type 1110 – 'sandbanks slightly covered by seawater' – is the habitat type in the Habitats Directive which the statutory advisors were tasked with identifying representations for in their respective Exclusive Economic Zones. As I dug into the cases, the habitat type definition showed to be extremely important for

the scientific advisors' work. The sandbank habitat type definition is a legal object which scientific advisors are tasked with translating into boundaries on the Dogger Bank. But it is also assumed to refer to a reality – to be a general category covering an array of particular sites in the EU waters which is claimed to play a certain role for biological diversity. Moreover, the background of the sandbank habitat type definition came up in several of the informal talks I had with informants in the beginning of the fieldwork – either as a funny story or as a means of questioning the meaningfulness of protecting offshore sandbanks. It appeared to me that that, too, was a black box I ought to open. As the sandbank definition in a way is the research question scientific advisors are tasked with addressing (*where does the Dogger Bank start to be a sandbank?*), its contingent history says something about the inherently historical, political, institutional, legal and in other ways social framework conditioning the work of scientific advisors. Hence, my study of Dogger Bank SAC boundaries in the making starts one step further back, with the formulation of the research question: The history of the definition of habitat type 1110 – sandbanks slightly covered by seawater all the time.

The course of the analysis

To summarise the focus of the thesis as introduced in the introduction, the research questions guiding the analysis are as follows:

1. *What does the task of informing and justifying political decision making for different kinds of audiences do to the scientific process and outcome?*
    a. *How does the task of informing and justifying political decision-making define and limit the kind of research questions, methodologies and outputs the scientific advisors can work with? And in what ways do the scientists work within this framework?*
    b. *Which differences between the two cases have contributed to making the research processes and outcomes turn out so differently in Germany and in the UK?*
2. *In which ways is the boundary between science and politics mobilised, transgressed, dissolved and in other ways processed as part of this work for producing credible justification for policy?*
    a. *Which mandate is given to scientific advice in this process?*
    b. *What are the effects of such mandate?*

The analysis is divided into four chapters. Chapter 3-5 treat different stages of the designation process, and chapter 6, the concluding discussion, draws on the previous chapters to discuss the role of scientific advice for policy. In the following I go through the different chapters, accounting for their role in the thesis.

In chapter 3 I focus on one particular element in the Terms of Reference defined at the level of the Habitats Directive. The implementation of the Habitats Directive in offshore waters is a major task which has occupied a relatively large amount of staff in the statutory advisory agencies in both member states for

several years. In this thesis I focus on a little corner of this task, namely the designation of sites on the Dogger Bank for the conservation of habitat type 1110, 'sandbanks slightly covered by seawater all the time'. The habitat type is defined in a set of EU guidelines for the implementation of the Habitats Directive. In order to designate sites for the protection of habitat type 1110, the scientific advisors need to identify concrete representations of the habitat type on the Dogger Bank. That is, they have to provide a scientific translation of the legally defined definition, and their output is supposed to come in the form of boundaries defining the edge of the habitat. In chapter 3 I trace the history behind the definition of habitat type 1110. Drawing on legal documents, meeting documents, communications and interviews with some of the participants in the negotiations of the definition I describe how the definition is an outcome of historical contingencies, negotiations and national mandates, an important birds' habitat near the German coast, a court case and inputs from lawyers, biologists and environmental NGOs. The main purpose of this chapter is to set the scene for the scientific practice I am about to describe, hereunder to demonstrate the inherent tension in having to find representatives in the marine environment of a habitat type which to a large degree has its origins elsewhere.

In chapter 4 I follow the processes of designating sites for the protection of habitat type 1110 in Germany and the UK. And because it has shown to be relevant to the sandbank designation process in the UK case, I also follow part of the UK process of assessing whether the site is sufficiently important for harbour porpoise to give them special conservation status on the Dogger Bank. I approach the designation process as a process of translation: Drawing on different scientific methods and lines of reasoning, the scientific advisors translate the formulations in the definition to boundaries on the Dogger Bank. Establishing references between the site they define on the Dogger Bank and the sandbank definition in the directive enables them to scientifically justify the site they advise. With regard to the harbour porpoise the scientific advisors' work consists in establishing references between the selection criteria in the Habitats Directive and the harbour porpoises on the Dogger Bank. Drawing on research reports, process documents, minutes of meetings, observations of meetings and interviews of the involved actors I describe the scientific decision-making step by step – that is, the decisions about which methodologies to use, what data to draw on and collate, how to interpret it and how to define the boundaries and the conservation status of harbour porpoise. While doing so, I let the actors themselves describe why they made the choices they did.

In the second part of the chapter I consider which criteria for scientific validity guides the scientific decision making. The criteria are among other things guided by the regulatory framework, the national agendas, the potential implications of the sites and the need to justify regulation. Based on a comparison of the two cases I open the discussion about which effect various factors have on the scientific process and outcome.

In chapter 5 I focus on the consultation process. One of the important differences between research science and regulatory science is that where research science tends to be evaluated by scientific peers, regulatory science is evaluated by a wider audience of decision makers, other stakeholders, the wider public and the media. And where research science tends to be evaluated first of all according to internal disciplinary criteria for validity, scientific advice is also evaluated on the background of the policy objectives, implications and interests. My starting point is that the validity criteria according to which the process and outputs are evaluated affects the scientific decision making. In chapter 5 I account for the consultation responses from two stakeholder groups, namely environmental NGOs and fisheries industry organisations, in the UK consultation of the Dogger Bank site. The purpose is to demonstrate the ways in which the science is evaluated on the background of the particular implications and interests.

In chapter 6 I draw on the previous three chapters. The first part of the chapter is concerned with the first main research question about what the task of informing and justifying political decision making for different kinds of audiences do to the scientific process and outcome. First I account for the ways in which the different national frameworks have meant that what counted as scientific justification of the Dogger Bank boundaries did not suffice as scientific justification in the UK – and vice versa. Then, on the background of a discussion of Funtowicz' and Ravetz' post-normal science model, I argue that the same counts for scientific uncertainty.

The second part of the chapter is focused the second research question about the ways in which the boundary between science and politics is mobilised, transgressed, dissolved and in other ways processed as a part of the work to produce credible justification for policy. First I account for and compare the ways in which the boundaries between science and policy are managed in the two designation processes and in the stakeholder consultation. I then argue that there is a mismatch between the boundary drawing language and the advisory practice where technical and ethical issues intertwine. I discuss some of the effects of such a mismatch – first of all that scientific advisors are only held accountable for the technical element in their work, leaving the ethical issues outside democratic control and debate. Finally, taking an outset in the cases, I consider briefly which kind of arena could embrace the technical as well as the ethical issues involved in scientific decision making and allow for public debate.

Data, fieldwork and some methodological reflections

Empirical data

My focus on the processes of defining the SAC boundaries in the two member states has been very helpful in terms of guiding the fieldwork. Even though the field was dispersed, both geographically and in time,

trying to get the course of events right, including the reasoning behind the decisions, has been a rather simple track to follow. And where other elements showed to be important, such as the background for the sandbank habitat type definition of the UK government's strategy for renewable energy, I stumbled upon them in my work to get hold of the process, for example when I wondered about the reasons for a sudden change in strategies or a long period of silence, or when informants brought it up.

My analysis draws on a range of different sources of data. Starting with observations, they came to play a minor role, as the field, if one can speak of such, has been widely dispersed in time and space. With respect to the time, the first event in the process which I include in the analysis, namely the entrance of the sandbank habitat type in Annex I of the Habitats Directive, took place before the directive was signed in 1992. I leave the process where the UK cSAC (candidate SAC approved by government and submitted to the European Commission for final approval) is submitted to the European Commission in October 2011. With respect to the geography, the process includes court cases at the European Court of Justice, meetings between member states and the European Commission and between member states and stakeholders on different sites in the EU, survey activities on the Dogger Bank and meetings and work at the offices of the statutory advisory agencies. For this reason, the activities involved in the production of boundaries have not been directly accessible to observe.

I have, however, participated in a number of different meetings where stakeholder groups were presented to and commented on the proposed advice by statutory advisors. Participation at meetings in the very beginning of my work has been important both for identifying the cases and issues I should focus on and for getting in contact with some of the informants. Likewise, informal talks with involved actors, some of them facilitated by my participation at meetings, have helped me direct my focus throughout the process. Finally, one particular meeting in the UK consultation process has provided important data for the analysis.

Documents, on the other hand, have played a core role. They comprise legal documents and court cases relevant to the interpretation of the Habitats Directive; process documents in the form of reports, maps, articles, minutes of meetings and written correspondence (mails and letters); and formal documents in the form of the final advice and consultation responses.

Finally, I have been interviewing a range of the actors involved in the processes. With respect to the UK, I have interviewed seven contemporary and former scientific advisors involved in the designation process, four environmental NGO representatives and three fisheries industry representatives (one of them representing Danish fishers as these are the main fisheries stakeholders on the UK part of the Dogger Bank). Moreover, I talked with an offshore wind farm representative with activities elsewhere in the North

Sea – unfortunately it has not been possible to get contact with the wind farm developers with activities on the Dogger Bank. With respect to Germany, I have interviewed four scientific advisors, one fisheries industry representative and two environmental NGO representatives.

The interviews were qualitative and semi-structured. They served a number of purposes. The first, which concerned all interviews, was to get information on the course of events and the decisions made – to fill out the gaps which my document readings did not cover. With regard to this element in the interview, I did not need to ask all informants the same questions. This kind of questions took up considerably more time in the interviews with scientific advisors than in the interviews with stakeholders. I also asked all informants about their perspective on what a sandbank is and why, if at all, it should be protected. Finally, all informants were asked about their view on the obligation according to the Habitats Directive to designate sites exclusively on the basis of science. With regard to the interviews with scientific advisors, another purpose was to get the scientific advisors' explanations on why they made the decisions they made and what the complications were during the process. During this part of the interview I used maps showing the different versions of boundaries. With regard to the interviews with stakeholders, asked them among other things about their perspectives on the scientific underpinning of the site and their perspective on the process. Also during these interviews I used maps when we talked about the justification for the boundaries.

All informants were highly engaged. And to my surprise, all stakeholders talked at length about the role of science and the boundaries between science and politics – in ways which suggested that they had been occupied with the issue for length. Something which confirmed to me that science/policy boundaries can indeed be of major public concern. However, the engagement was of very different kinds. The environmental NGOs tended to be concerned with the need to enforce the boundaries, and some of them may have seen my project as an attempt to point to this need. The fisheries industry representatives tended to point to the need to involve fishermen in the research process, both because they had experience-based knowledge of the area and for democratic reasons. And they generally found the need to base the designation exclusively on science absurd. They found that my project could point to such issues. One of the German scientific advisors happily displayed their strict management of the science/policy boundaries. And two of the UK scientific advisors found my ambition to show how they could not be strictly managed interesting and facilitated my work to follow the entanglements. In this way, I had no problems trying to figure out where to look for the object of my study and how to articulate it. The subject was 'hot', and everybody I talked to seemed to have stakes in it, each in their way.

Meeting the cases before and after the fact

One important challenge, both for the fieldwork and for the comparison, has been that where I met the German boundaries after the fact, I met the UK process in the making: The boundaries had been accepted by government, been out for public consultation and submitted to the European Commission in 2004 – the process was closed and the boundaries and added features had transformed from advice to decision. The German boundaries and added features had been stabilised, leaving the history of their making behind. The final product was an EU standard form with factual statements like the name and size of the site and descriptions of its distinct ecology and added features. The process documents were hard to find – what I could get hold of was a book which was published at the end, presenting the scientific reasoning behind the designation in a retrospective manner, leaving out all the uncertainties and disagreements that were involved. References were made to a number of published articles which I got hold of, too – all of them likewise presenting the findings and not the tangible process behind. When I interviewed the people involved, the process with all its complications was far behind them. What they could tell me was mainly what they finally ended up doing and the resulting boundaries. The process had been 'easy', they told me – they just followed scientific logic.

The UK process, on the other hand, was still in the making at the point where I entered the process – inconclusive, ambiguous and highly controversial. There were many unresolved questions, and the approaches taken by the scientific advisors were still negotiated and disputed from several sides, and I had a hard time getting hold of all the details in the process. For a long period I was even told not to ask questions about the Dogger Bank because it was highly controversial, and documents were held back from the statutory advisory agency's website. The version of boundaries I was presented to at first was one in a row and was later revised before the final boundaries were then accepted by government, sent to public consultation and, in October 2011, submitted to the European Commission.

The German process, then, may have been simple and straight-forward compared to the UK process, but this impression has no doubt been extrapolated by me entering the process *after the fact*, when the process behind it had long been a black box. The UK process, on the other hand, was wide open for me to study with all the mess, disagreements and complications – I met the boundaries, so to speak, *in the making*. The comparison in this analysis no doubt reflects this difference concerning the point in time from where I observed the process.

Access to the field

My access to the field has been further complicated by a number of factors. With respect to the German case, I have had access to very few process documents. No minutes of meetings, a few reports from status

seminars and workshops about the designation in general, only final reports and no reports from the process before that, and no written correspondence. The main reason probably is, as already mentioned, that the process ended four years before I began my fieldwork. Preliminary reports and minutes of meetings etc. either may not exist any longer, or they may be time consuming to dig out from the archives. Another reason may be that the German statutory advisory agency does not weigh transparency as the UK agency, at least not in the sense of a norm of making as much as possible accessible on their website. Furthermore, all the German offshore SACs were designated in the same process, why most documents account for the general methodologies and not for the details of the particular process on the Dogger Bank. Finally, some of the informants which I have asked for data have been very helpful, but have had difficulties in understanding my interest in the details of the designation process. While informants in the UK suggested documents themselves which I did not know of and hence did not ask for, but which were very helpful, getting hold of German documents required very specific requests, I have a feeling that I may not have managed to mediate properly which kinds of documents I was after. Apart from having difficulties with getting hold of documents, I also had problems with reading the documents I actually got hold of as many of them were in German. Given my sparse German language skills it has been difficult to treat the material with the same attention to detail as the UK documents.

With respect to the UK case, I have had very easy access to documents. The Joint Nature Conservation Council (JNCC), the statutory advisory agency tasked with providing advice for the implementation of the Habitats Directive in offshore marine waters, puts major emphasis on transparency and uploads minutes of meetings, reports and a range of other documents on their website. Moreover, they have provided me with a range of process documents, for example three peer review reports which formed the basis for a revision of the SAC boundaries and a range of earlier versions of SAC boundaries. The informants I spoke with also suggested documents themselves which they found might be relevant for my work. Finally, two particular informants have been particularly helpful and interested in my project and have been facilitating my fieldwork in a number of ways.

While this was the general style at the statutory agency, however, for a period of time – so long that I for a while considered changing my case very late in the process – I could not get hold of any information whatsoever from the statutory advisory agency about the Dogger Bank. All documents related to the Dogger Bank were inactive links on the website, marked ‘In confidence’. I was told that it would be wise to wait with interviews as the statutory advisors were not allowed to talk about the Dogger Bank. The radio silence, as one of the fisheries industry representatives I interviewed called it, was frustrating, but also informative – retrospectively the experience provided me with some important insights. However, it meant

that I spent a lot of time reading the documents I did have access to and that I could not start interviewing before very late in my PhD process.

With respect to the stakeholders, the environmental NGOs I contacted except one welcomed me and were extremely helpful, both in setting time aside for interviews and in providing me with information. Likewise, fisheries industry organisations have been very helpful, and as mentioned both groups have been quite interested in my project and the issues I have been looking at. Regretfully I have not managed to get in contact with one of the most important stakeholders on the Dogger Bank, namely Forewind Ltd., the wind farm developer holding the wind farm license on the Dogger Bank. Likewise, I was not granted permission to participate at a consultation meeting between JNCC and Forewind Ltd. I believe that an important reason is that Forewind Ltd., who were organising parallel consultation processes in relation to the wind farm and needed to be in a good stand with all the different users on the Dogger Bank, did not want to be too outspoken about their stand on the Dogger Bank SAC. Likewise, they may have wanted to keep a low profile as they have been aware that it would be controversial if their interests had any impact on the Dogger Bank SAC.

Messing with the science boundaries

According to the Habitats Directive, member states are obliged to base their site designation entirely on science. The claim has been verified by several cases at the European Court. Hence, the very issues I was looking at, all related to the hybrid character of the processes behind scientific advice, were controversial. In the last instance, member states can be taken to the European Court of Justice for not complying with the claim. Contributing to a court case manifesting the need to comply with Mertonian norms is the last thing I want – hence, I have conferred with those of my informants which might have such concerns and let them read my chapters. Even though they appreciated – and asked for – the possibility, they have, however, not had concerns about what I have written – their main comments have been about errors in my English writing.

The use of categories

A few words on my use of categories before I finally turn to the analysis. I use a range of categories, which from an ANT perspective are just as constructed as the SAC boundaries on the Dogger Bank. My use of them does not imply that I grant them any essential qualities or content. Rather, I use them because they are used by informants and in documents. My starting point is that where categories are referred to as an entity – 'Germany', 'the European Commission', 'the fisheries industry', 'scientific advisors' and 'sandbanks' – they they indeed an entity. I do not intend to naturalise the categories – rather, I argue that the actors' use of them is performative: It confirms, reproduces and enforces them. Hence, to the extent that they are

used and make sense in the particular settings, they are indeed actors. Their distinct qualities and power, however, does not pre-exist the network, and I use the categories with reference to the content they are given by other actors in the particular situation.

For example, I write that “Denmark supported the 20 metres depth limit […]” in my account of a process where member state representatives act on behalf of their government. Other places, where I am not describing negotiations between member states, but for example the particular work of the scientific advisors when producing advice to government, I find it more relevant for example to talk about how “the UK scientific advisors continually make references to […]” etc.

Likewise with the categories of science and politics: My starting point is that they do not pre-exist the practices and boundary drawing processes at work. They are a product of such processes – hence their definition also depends on the particular processes involved in their making. And as with the actors mentioned above, the categories of science and politics are performative: The very use of them is part of the boundary-drawing practices that produce them. Hence, I do not use the categories with particular predefined qualities in mind. I merely use them with reference to the meaning ascribed to them by various actors, legal documents etc. in the two cases and with reference to the boundary drawing processes by which they are defined. The processes defining and differentiating between them are the very object of my study.

Important to note, I do not hereby defend a radical relativist position. For example I do not hereby argue that any claim about Dogger Bank could be as descriptive about it as another. But I have set out to study the role of science for policy and the boundary drawing dynamics that take place in advisory processes; not to define the ways in which the Dogger Bank is best represented. Hence, I will not dig deep into the science-wars debate about the ‘real’ boundaries of science and about the relation between scientific representations and ‘reality’.

Now, let us turn to Dogger Bank. Or no, let us start at the beginning – what I choose to call the beginning anyway: The process in which sandbank habitat type 1110 came into existence as an object that required protection.

3 Sandbanks slightly covered by seawater

> We've done the job to the best of our ability; I don't think there is anything more… Unless you're going to spend a fortune on going and doing lots more surveys there isn't very much more that you can do and even then your gain would be not very much I suspect. If you are asking if I think the law is a bit silly then yes I would, in other works I think that if I were to adjust anything in the process it would be the legal requirement rather than anything we've done. And I think I've explained, I mean porpoises is silly on there, and sandbanks… is fairly silly…
>
> UK scientific advisor

The scientific advisor above, whom I frequently talked with during my fieldwork, expressed his frustrations several times over the task he and his colleagues were undertaking. And as in the above quote, the frustrations tended to be directed towards the legal framework of the Habitats Directive and the way it was restricting their work in the designation process on the Dogger Bank. According to him, the very premise – to protect sandbanks in the offshore marine area – is 'fairly silly' seen from the perspective of biological diversity conservation. Likewise he finds it silly to use protected areas as the main tool when protecting highly mobile species like harbour porpoise. However, he and his colleagues were not asked for advice on how to best protect biological diversity in the North Sea. They were asked to locate representations of the sandbank habitat type in the North Sea, and they were asked to locate places of particular importance for harbour porpoise. Sandbanks were a given, and so was protected areas as the main conservation tool.

In this chapter I address my first research question about the ways in which the scientific advisors' work has been conditioned at the level of the Habitats Directive and the European Commission. I start by introducing the Habitats Directive, focusing particularly on what I have found to be the most important elements conditioning the scientific advisors' work at this level – elements which have given rise to some friction in the process. Their concrete influence on the scientific advisors' work is treated in the next chapter.

Then follows the main focus of this chapter where I explore the research question which the scientific advisors have been tasked with addressing: *Where in the member state's Exclusive Economic Zone do you find representations of the sandbank habitat type?* I do so by studying the history of the sandbank definition – from the point where it enters Annex I in the Habitats Directive until its final definition was published in the European Commission's guidelines for the implementation of Natura 2000 in the offshore marine area. The history of the definition serves the same purpose as a laboratory study of the history of a fact: It shows the contingent and hybrid character of the sandbank habitat type. The main point I set out to

show in this section is that a research question about the location of the sandbank habitat type is not at all innocent. It is based on a number of assumptions which the scientific advisors have to accept, and which they may or may consider make sense.

But first a brief introduction to the legal framework, to give a first overview of the legal framework being implemented on the Dogger Bank and of some of the key elements which, as I will show later, are restricting the scientific advisors' work at this level:

The Habitats Directive

At the United Nations Conference on Environment and Development in June 1992, better known as the Earth Summit in Rio de Janeiro, the UN Convention on Biological Diversity was opened for signature. Over the next year 169 countries signed, and today the number has grown to 192. The convention marked a number of shifts from earlier conservation policies. First, whereas earlier conservation policies tended to focus on particular species and habitats, the convention described biological diversity including all ecosystems, species and genetic resources as a common concern for human kind. Secondly, biodiversity was described as an integral part of development – hence, the parties committed themselves to adopting the principles of sustainable use. That is, while it was recognised that species, genes and ecosystems must be used for the benefit of humans, it was also stressed that natural resources are not infinite why their use is to happen in ways that do not lead to long-term reduction of biodiversity. Thirdly, the convention introduced the precautionary principle into the legal arena. That is, here an action or policy might form a significant threat to biodiversity, lack of scientific certainty or data should not postpone management measures to avoid the threat. Rather, the burden of proof falls on those advocating the activities or policies. Article 8(a) CBD is about site based conservation and instructs the contractors to 'Establish a system of protected areas where special measures need to be taken to conserve biological diversity.' (United Nations 1993)

Two months before the Earth Summit, in May 1992, the European Union member states adopted the Habitat's Directive meant to protect threatened species and habitats in Europe (European Commission 1992) Even though the work on the Habitats Directive had been under development since the mid-80's, it was staged among other things as a means of implementing Article 8(a) in the Convention on Biological Diversity in the EU. The directive complements the Birds Directive from 1979, and together they form the basis for *Natura 2000*, an EU wide network of protected areas for the protection of biodiversity. The idea behind forming a *network* of protected areas is that biodiversity cannot be conserved by protecting individual species and habitats; an integrated network is required which taken together ensures the different ecological requirements that are needed to protect the threatened habitat types and species. For

migratory species, for example, their breeding, moulting and wintering areas as well as their migratory routes are to be taken into account. The Habitats Directive lists a long range of habitats that qualify for protection under the directive - and which should all be sufficiently represented in the EU wide network of protected areas.

Three elements are important for understanding the ways in which the Habitats Directive frames the work of the scientific advisors and the kind of tensions it gives rise to: 1) The Directive was originally developed with land and coastal areas in mind, but was understood later to cover offshore areas as well. The directive, particularly the habitats and species listed in the annexes, bears witness that it was not developed for offshore areas, and the implementation in the offshore area is not without friction. 2) Where a main conservation tool in the directive is protected areas and reflects the dominating views on nature conservation at the time, the effects of protected areas, particularly in offshore waters, is increasingly up for discussion in current scientific debate. 3) According to the Habitats Directive, the designation of sites is supposed to be based exclusively on scientific criteria, meaning that the potential socio-economic implications should not be taken into consideration. This has shown not at all to be straight-forward. In the following, I merely introduce the three elements in order for them to form a background for the analysis – their effects will become clearer as the analysis progresses and be summarised in the final chapter.

The extension to the offshore area

The first element to mention that has given ground for tensions in the scientific advisors' work is a mismatch between what the directive was originally designed to apply to and where it is actually implemented. In 1999 a court ruling in the UK called the Greenpeace Judgment extended the UK's obligations to the Habitat's Directive from the national territory, which for UN member states stretches out to 12 nm (nautical miles) off the coast, to the 200 nm Exclusive Economic Zone (EEZ) – an area to which the countries have exclusive rights to exploit resources. The logic in the court ruling was that whereas the member states have exclusive rights to exploit resources they also have obligations to protect the marine life. As the subsequent process of implementing the Habitats Directive in the offshore area was delayed, the UK was taken to court by the European Commission for not fulfilling its duties in offshore waters. In this way the conclusions of the Greenpeace Judgment, which only referred to UK waters, came to apply to all member states. The European Commission stated that "… within their exclusive economic zones the Member States have an obligation to comply with Community law in the fields where they exercise sovereign powers and that the directive therefore applies beyond territorial waters". (Commission of the European Communities v. United Kingdom of Great Britain and Northern Ireland 2005).

All coastal EU member states were therefore also to designate areas offshore for protection of the habitat types and species in the Habitat's Directive.

The offshore application of a directive originally formulated to apply on land and in coastal zones has not been without friction. First of all, only three habitat types listed in the directive were found to be relevant to offshore waters, namely:

- Reefs
- Sandbanks slightly covered by seawater all the time
- Submarine structures made by leaking gasses

The transfer of the Habitats Directive from land and coastal zones to marine areas was not considered unproblematic. It has given rise to a number of discussions. One discussion has been about the obligation to protect in offshore waters a list of species and habitat types which were originally added with land and coastal zones in mind. That is, whether important habitat types and species are lacking on the list and whether the ones which are there are as relevant to protect in offshore areas as they are along the coast. Another discussion has been about the emphasis on site based protection in the marine area, where the biological life tends to be more migratory and according to some makes it particularly necessary to supplement site based protection with other approaches. Thus the translation of the directive to offshore areas involved some friction, which scientific advisors, managers, stakeholders and decision-makers have been dealing with during the offshore implementation.

Protected areas as the main tool

The second element causing tension in the scientific advisors' work is the stress by many on protected areas as the main tool for biodiversity conservation in the Directive. The Convention on Biological Diversity and the Habitats and Birds Directives alike are products of a trend characterising environmental policy: A shift in focus towards more holistic approaches where the wellbeing of ecosystems as a whole are considered as core for the wellbeing of its entities. This has implied a shift in regulation from the management of individual species towards the management of ecosystems. At the 5th Conference of Parties in 2000[1] on the implementation of the Convention of Biodiversity this was termed the Ecosystem Approach. The term ecosystem-based management is little instructive as to what it means and how it should be implemented. Various forms of area-based management tools including Marine Protected Areas are most frequently used as part of its implementation. With area-based management the managed unit is a geographical space rather than individual species or sectors. It is a means of managing all elements of an

[1] COP 5 Decision V/6: http://www.cbd.int/decision/cop/?id=7148.

ecosystem, including the human activities, within a geographically defined space.

Marine protected areas, also referred to as MPAs, are particularly strongly advocated among NGOs. However, where they tended to be seen as a stand-alone conservation measure at the time the Habitats Directive was drafted, their limitations and the need for other tools is increasingly brought up for discussion. For example much marine life is migratory, according to some making particular places less important than they are on land. Another issue is that protected areas risk just to displace activities like fishing to other areas, creating higher pressure in those places. Today, marine protected areas tend to be seen as one tool among others, just as their usefulness is seen as much more limited. For example one of the Habitats Directives' latest successors, The Marine Strategy Framework Directive which was signed in 2008, is much broader in its approach.

Some of the tensions in the designation process, then, are effects of having to implement a directive resting on basic assumptions not unequivocally supported by all the involved scientific advisors.

The role of science

Finally, the role defined for science in the directive has given rise to tensions in the scientific advisors' work. According to the Habitats Directive the process of designating Natura 2000 sites is to follow a two-step procedure: 1) The selection of areas to be protected and the definition of boundaries, and 2) the development of management plans. With regard to the first stage, the European Commission stresses that 'Their [the Member States', ed.] choice of sites is an exclusively scientific exercise undertaken using standard selection criteria specified in Annex III of the directive.' (European Commission 27 December 2002, p. 8) The member states are obliged to:

> … ensure that the site designation process is exclusively based on scientific criteria. As regards areas to be protected under the Birds Directive, the Court of Justice has emphasised that the selection of sites and the delimitation of boundaries should be carried out on the basis of exclusively ornithological criteria. As regards the Habitats Directive, case law confirms that site selection by Member States should be exclusively based on the ecological criteria of Annex III of the directive. (European Commission 2007, p. 21)

The background for the claim is that focus should be on conservation objectives and not on socio-economic concerns – a focus that according to most of the environmental NGO representatives and scientific advisors I interviewed has often shown difficult to maintain in other cases of environmental regulation. The guidelines further specify the claim with reference to economic activities: 'Future management challenges (related to any future activity such as fisheries, energy generation or distribution…) should not be a

determining element in this process.' (European Commission 2007, p. 27) This claim has further been settled by a series of court cases.

The tensions triggered by the claim for an exclusively scientifically based designation are not treated here, but this is a recurrent issue throughout the analysis.

The designation criteria

When designating sites, the scientific advisors are to follow a number of site selection criteria which are specified in Annex III in the directive. Two criteria relevant to habitat protection are mentioned here:

Representativity of the natural habitat type on the site: First of all, the scientific advisors need to assess to which degree the site is typical for the natural habitat type in question. Considering a site's 'typicality' here means the degree to which the site correlates with the habitat type definition and accompanying list of characteristic species. On this background those sites should be chosen which make up the "best examples in extent and quality of the main type and its main variants" (European Commission 2007, p. 41). The main variants are up to the member states to define – if there are important variations at all within their area.

Area of habitat types: The member states are to measure the overall area in their waters covered by the habitat type in question. They should then select sites that cover a suitable proportion of the overall area. What makes up a suitable proportion depends on a number of different factors, but covering less than 20 per cent of the overall area of the habitat type in the member state's waters will generally be seen as inadequate. If the suggested sites cover between 20 per cent and 60 per cent, the European Commission's approval will depend on expert judgments of the protection of the particular habitat or species in question. Finally, when the areas cover more than 60 per cent of the overall area of the habitat type in the member states' waters, it will generally be perceived as sufficient.

Summary

The scientific advisors, then, are to provide advice for the offshore implementation of a directive that was originally designed to apply on land and in coastal zones, and which has not been amended following the extension. They are required to provide place based advice for biodiversity protection. And they are required as scientific advisors to provide the full and only basis for site designation without considering potential socio-economic implications. Furthermore, the Habitats Directive introduces a rather detailed framework for the site selection.

The History of the Definition

The elements described above all influences the scientific advisors' work. However particularly dominant in their work is the research question as it has been formulated within the framework of the Habitats

Directive. The scientific advisors are tasked with identifying representations of habitat type 1110 – 'sandbanks slightly covered by seawater all the time'. They are tasked with identifying where on the Dogger Bank it starts to be a sandbank habitat as it is defined in the guidelines for the Directive. As mentioned before their research question could be formulated as 'where does the Dogger Bank start to be a sandbank habitat representing habitat type 1110?'

The habitat type is a classification, a *genus*, which is argued to refer to a group of concrete habitats with shared characteristics. How was the classification made, and how was its reference to a grouping of specific sites in the marine environment established in the first place? In order to explore the character of the framework which the sandbank definition constitutes for the scientific advisors' work, the first black box I set out to open is that of the definition of habitat type 1110. I do so by tracing its history. In the following I first account for the succession of events and versions of definitions from the point where it entered Annex I in the Habitats Directive till a more elaborate definition was published in the European Commission's guidelines. I then introduce the discussions in the debate about the definition which took place during this period.

The succession of events

The history of the definition of habitat type 1110 is long and controversial. This account starts at the point where the sandbank entered the Habitats Directive. It happened during the drafting of the directive, where it was intended to apply on land and in coastal areas. I have not been able to find any documents from this process. However, one of my informants took part in it and happened to be present at the meeting where sandbanks came up and were added in Annex I, that is, the list of habitat types to be protected under the directive. It was, the informant recalled, a German representative who suggested it with reference to its importance as a habitat for diving sea ducks:

Meeting participant	I'm virtually certain, I mean I've never found those notes again, that was the sort of thing that got thrown away unfortunately, but my belief was that the Germans put them [sandbanks, ed.] on because it was an area that sea ducks could feed in. So shallow sandbanks and that's you know near to the shore, that's a reasonable reason for it. Except that you've got the birds directive that could cover them anyway, but it didn't get pointed out at the time and was not analysed properly at the time.
Interviewer	And was that with reference to any particular site or was it just general?

Meeting participant Well no, I think that if you, most of the German coast has got sea ducks on and they are feeding on sandy sediments.

This is about the only information I have been able to find about the original intention with protecting the shallow sandbank habitat type. This particular informant recalls the meeting which took place sometime before 1992, but still didn't dare to be more than 'virtually certain' because of the lack of documents. This is important, because with the loss of this information the sandbank habitat type has been freed, one could say, from its original objective and has been even more open for new interpretations.

Aside from this, I have not found any information about the drafting of the first definition of the sandbank habitat type. But according to informants from Germany as well as from the UK the initial definition bears witness that it was written in a hurry without time for proper consideration. For example, sandbanks are described as 'resting places for seals', which does not make sense as they are also defined as being 'slightly covered by seawater all the time' (European Commission 1996)

Let us now jump in time, to 2003. But before I start, first a brief introduction to the organisation of definitions for the habitat types listed in the Habitats Directive. The definitions are listed in the Interpretation Manual of European Union Habitats – a document that has been revised on a number of occasions, for example to include new classification systems and to include new relevant species following the inclusion of new member states in the European Union (latest version is European Commission July 2007). The definitions in the manual include a Natura 2000 code, a code referring to the Palearctic habitats classification, a main definition, a list of animal and plant species characteristic for the habitat type, an overview of sub-types and regional variations, corresponding categories with other classification systems etc., a list of associated habitat types and finally the bibliographic references (see Figure 3).

In 1999 the Habitats Directive was extended to the Exclusive Economic Zone, and in 2003 the member states were in the process of designating sites in the marine area. However, the process was not progressing as fast as expected. One reason was a lack of more instructive guidelines for the implementation in the marine environment. Another was that there was some confusion in the member states about how to interpret the definition in the designation process. Annex I in the Habitats Directive only lists the title, namely 'sandbanks which are slightly covered by seawater all the time'. An interpretation manual from 1996, which is not a legal document but a scientific reference document, provided more elaborate interpretations of the habitat types. The main formulation in the definition formulated in the Interpretation Manual was:

Sublittoral sandbanks, permanently submerged. Water depth is seldom more than 20 m below Chart Datum. Non-vegetated sandbanks or sandbanks with vegetation belonging to the Zosteretum marinae and Cymodoceion nodosae. (European Commission 1996, p. 8)

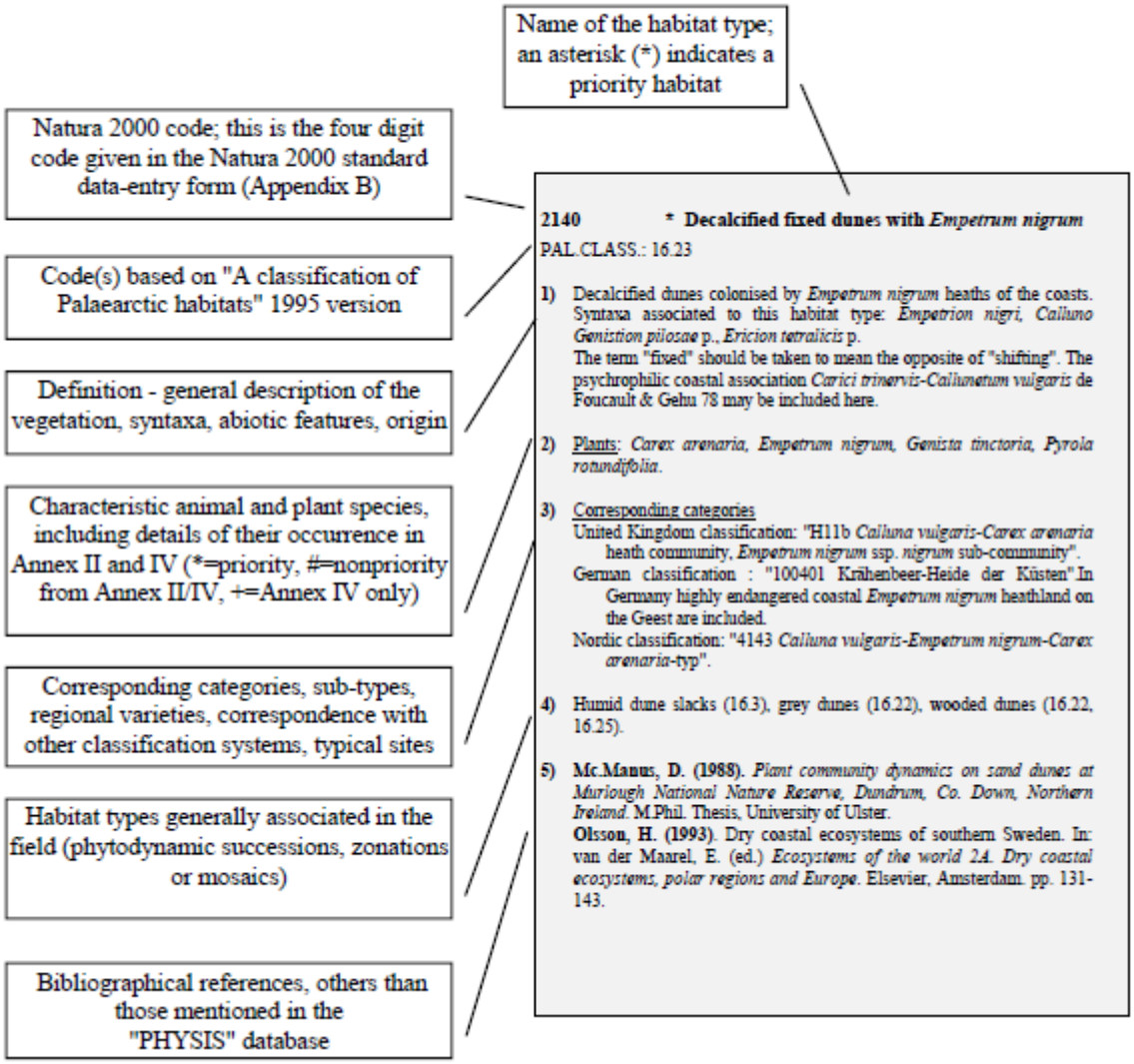

Figure 3 Grouping system for habitats in the Interpretation Manual of European Union Habitats EUR27 (European Commission July 2007, p. 7)

The operating definition in the Interpretation Manual was, however, neither sufficient, nor accepted among all member states. Most importantly, the formulation 'slightly covered' in the habitat type title left much room for interpretation about water depth, and different member states operated with different criteria in their designation process. As mentioned, whereas the UK scientific advisors were drawing on the Interpretation Manual and operating with a lower depth limit of 20 metres, German scientific advisors, who were already rather far in the designation process, were operating with a national version (see Box 1) of the sandbank habitat type holding no references to lower depth limits.

Box 1: The operating German national definition in 2003

Sandbanks are sandy ridges that clearly rise above their surroundings.

They must be permanently submerged and be mainly surrounded by deeper water.

Their substrate is primarily a sand to gravel mix with a minimum thickness of 30 to 40 cm to provide habitats for typical sandy bottom communities, but patches of larger grain sizes, including boulders and cobbles may also be present on a sandbank as well as lower portions of mud.

They are often free of vegetation, or only sparsely covered by macrophyte vegetation.

Sandbanks can be found in association with mudflats and sandflats (1140) as well as with reefs (1170).

Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than the underlying hard substrata.

(Boedeker, Krause & von Nordheim 2006, p. 51)

Box 2. Definition proposed at the second meeting of the MEWG in November 2003

Sandbanks are elevated, elongated, rounded or irregular topographic features, consisting mainly of sandy sediments that are permanently submerged. They are predominantly surrounded by deeper water. Above the sandbank, at its highest point, water depth is generally less than 20 m below chart datum, but the top of the bank may be deeper than this. The lower limit of a sandbank is determined by e.g. the loss of primary production at the sediment surface, decreased wave or current exposure or disappearance of typical sandbank biocoenoses.

Sandy sediments are mainly composed of grain sizes in the range of 0.06 – 2 mm, but patches of larger grain sizes may also be present on a sandbank.

Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than the underlying hard substrata. (European Commission 2006, p. 12)

Box 3. Definition proposed at the third meeting of the MEWG in May 2004

Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water, consisting mainly of unconsolidated sandy sediments. Above the sandbank, at its highest point, water depth is generally less than 20 m below chart datum.

The sandy sediments of sandbanks are mainly composed of grain sizes in the range of 0.06 – 2 mm, but patches of larger grain sizes, including boulders and cobbles, may also be present on a sandbank as well as lower portions of mud. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than the underlying hard substrata. (European Commission 2005, p. 12)

The differing implementation strategies created frustrations among some member states. Furthermore, the confusion delayed the process and created some concern among member states about what was expected from the European Commission and hence how their site designations would be evaluated.

As a response, the Nature Directors of the member states requested the European Commission to initiate a process to develop more instructive guidelines for the implementation of the Habitats Directive in the marine environment. Under the European Commission's Habitats Committee tasked with steering the implementation of the Habitats Directive, the Marine Expert Working Group (MEWG) was established to undertake this task. The group was composed of experts from member states, regional maritime organisations, NGOs and industry stakeholders. The group was tasked with developing guidelines for the marine part of Natura 2000.

This was the beginning of a long, conflict-ridden process, and it took another two years before the group reached an agreement, assisted by a panel of independent scientific experts. At the first meeting of the MEWG in March 2003 the Commission asked Germany to chair an inter-sessional subgroup tasked with working out more instructive definitions for the three marine habitat types relevant in the marine area, namely reefs, sandbanks slightly covered by seawater all the time and submarine structures made by leaking gases – hereunder to review their applicability offshore and if necessary adapt them. Besides Germany, Denmark, Greece, Ireland, the European Topic Centre for Nature Conservation and WWF International were represented in the group.

At the second meeting of the MEWG in November 2003 the subgroup's proposed amendments of the definitions for 'reefs' and 'submarine structures made by leaking gasses' were accepted, but no agreement was reached on 'sandbanks slightly covered by seawater all the time'. The disagreement, both at this meeting and in the subsequent process, concerned the general definition; point 1 in the definition. The disagreements mainly centred on the lower limits of the sandbank which in the proposed definition (see Box 2) was formulated as:

> Above the sandbank, at its highest point, water depth is generally less than 20 m below chart datum, but the top of the bank may be deeper than this. The lower limit of a sandbank is determined by e.g. the loss of primary production at the sediment surface, decreased wave or current exposure or disappearance of typical sandbank biocoenoses. (European Commission 2006, p. 12)

Some, particularly German representatives, argued that in the offshore environment the relative depths of a sandbank would naturally be deeper, why it would make sense to operate with other depth limits in offshore waters. Others argued that excluding any lower depth limit would be to move beyond the existing

habitat type, 'sandbanks *slightly covered* by seawater all the time' (my italics), and transform the existing habitat type into a new habitat type – something that lied outside the remedies of the working group.

The group also discussed how the lower depth limit should be defined technically. The MEWG was in support of an ecologically defined depth limit, but found parameters like 'primary production' and 'wave or current exposure' too difficult to measure.

At the third meeting of the MEWG in May 2004 the subgroup proposed a new definition (see Box 3). This time there were no indications of a lower depth limit for the extent of the sandbank, but merely a formulation about the depth of the top of the bank: "Above the sandbank, at its highest point, water depth is generally less than 20 m below chart datum." Most members of the MEWG supported this definition, but some still objected to extending the habitat type into deeper waters. The MEWG now asked the European Commission to find a solution, and the Commission invited Germany and the UK to assist the Commission in developing a new version of the definition. The new version was presented at the fourth meeting of the MEWG in January 2005 (see Box 4). The lower depth limit was now extended:

> "Slightly covered by sea water all the time" means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend beneath 20 m below chart datum and it is appropriate to include in designations such areas where they are part of the ecological feature and have the required similar ecological values. (European Commission 2006, p. 14)

Furthermore, a new line was added where Dogger Bank was mentioned as an example: "Such features may have trans-frontier dimension (e.g.: the Dogger Bank in the North Sea)." (European Commission 2006, p. 14) This definition received general acceptance on the condition that some adjustments were made. First of all, the Dogger Bank should be deleted as an example of a trans-frontier sandbank. Furthermore, the ecological definition of the lower depth limit in the clarification should be removed, again because they were considered hard to measure.

Another version of the definition was presented on the fifth meeting in May 2005 (see Box 5). Again the group could not agree and MEWG asked the European Commission for help. The German chair made a document accounting for the process and finished the account with some frustration:

> Although before the fifth Meeting of the MEWG it appeared that all Member States would agree on this version, it turned out that not all Member States did. Denmark raised fundamental concerns which were partly supported by the UK. (European Commission 2006, p. 18)

Box 4. Definition proposed at the fourth meeting of the MEWG in January 2005

Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata.

Clarification:

"Slightly covered by sea water all the time" means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend beneath 20 m below chart datum and it is appropriate to include in designations such areas where they are part of the ecological feature and have the required similar ecological values. Such features may have trans-frontier dimension (e.g.: the Dogger Bank in the North Sea). (European Commission 2006, p. 14)

Box 5. Definition proposed at the fifth meeting of the MEWG in May 2005

Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata.

Clarification:

"Slightly covered by sea water all the time" means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend beneath 20 m below chart datum and it is appropriate to include in designations such areas where they are part of the feature. Such features may have trans-frontier dimension. (European Commission 2006, p. 14-15)

The European Commission asked the European Environment Agency (EEA) for independent scientific advice. EEA is an agency under the European Union tasked with providing the European Union and member states with information on the environment for political decision-making. The commission requested the EEA to provide advice with the support of the international consortium European Topic Centre on Biodiversity and one of its partners, ICRAM, now known as ISPRA (the Italian abbreviation for Institute for Environmental Protection and Research).

It took another year before the independent expert panel was gathered. This happened at a two-day meeting in Brussels in June 2006. The meeting was split in two. The first day was dedicated to political representations and the second meeting to scientific assessments. On the first day the members of the MEWG, including any interested stakeholders and member states, were invited to give their inputs to the

expert panel. The second day access was restricted to the expert panel and the European Commission. The scientific advisors came from EEA, the European Topic Centre on Biodiversity and ICRAM. They were to make a scientific evaluation of the inputs from the day before and finally suggest a definition (European Commission 2005).

Less than a week later the experts submitted a report to the Habitats Committee where they advised a definition. In the report they also advised that the guidance document for implementation should remind that as offshore sandbanks tend to be larger in scale than sandbanks in coastal waters, member states would likely have to operate with different scales in the marine environment during designation. Furthermore, it should be stressed that further expert judgment at the national level would be needed during the application in the member states. Finally, the guidance document should make clear that the examples mentioned in the original definition under the section 'Characteristic animal and plant species' should neither be taken as an exhaustive nor a restricting list. (European Environment Agency 27 June 2006)

The expert panel's advice was accepted by the Commission, and the resulting definition was published in 2007 in the *Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Birds and Habitats Directives* (European Commission 2007) and a few months later in the EUR 27 version of the *Interpretation Manual of European Union Habitats* (European Commission July 2007):

> **1110 Sandbanks which are slightly covered by sea water all the time**
> PAL.CLASS.: 11.125, 11.22, 11.31, 11.333
>
> 1) Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata.
>
> "Slightly covered by sea water all the time" means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend beneath 20 m below chart datum. It can, therefore, be appropriate to include in designations such areas where they are part of the feature and host its biological assemblages. (European Commission 2007, p. 29)

The definition is followed by a clarifying text. The text among other things repeats the recommendations from the panel of experts and refers to the Dogger Bank: “The Doggerbank in the North Sea is a typical case of a sandbank feature that extends across the marine zones of several Member States.” (European Commission 2007, p. 29-30)

The guidelines are not legally binding. They express the views of the European Commission and therefore provide member states with a better idea about what they can expect the Commission to approve and not to approve. The next step was now in the hands of the member states: To identify representations of this habitat type in the offshore marine area.

The debate

What is about sandbanks that inspires such controversy? How can member states be so engaged in the details about what constitutes a sandbank? The debate was kept in technical terms, that is, the arguments were legal and scientific and all about how sandbanks should be defined in the Habitats Directive. Hence, this is also the layer in which I let you meet the member states: In a debate about what constitutes a sandbank.

The disagreement centred on a number of issues: The lower depth limit of the sandbank habitat type, whether the Dogger Bank should be mentioned in the guidelines as a ‘typical example’ of a sandbank and finally the grain sizes on a sandbank (which concentrations of coarser grains would be accepted as ‘sandbank’). I go through these issues one by one in the following.

Water depth

The water depth was most debated. In the original definition in the Annex I of the Habitats Directive habitat type 1110 is defined as ‘sandbanks slightly covered by seawater’, and as mentioned the interpretation of the word ‘slightly’ was approached very differently in the member states. At the time the meetings in the MEWG started, Germany and the UK were already working on the designation process in the marine area. Germany had come far in their process and submitted their full set of Natura 2000 sites already the year after, and the UK scientific advisors were working on a series of sandbank sites. For the lack of a more elaborated sandbank definition on the EU level they were operating with national versions. While Germany did not mention the water depth at all in their national version, the UK introduced a very concrete interpretation of ‘slightly covered’, namely a 20 metre lower depth limit. Denmark had not started the designation process in the Danish offshore waters, but supported the UK 20 metres depth limit.

The discussions were both about whether there should be a lower depth limit at all and about, if so, how it should be defined. I introduce the main discussions in the following. First, the depth limit was discussed in

ecological terms, that is, in relation to the sandbank's function as a habitat for marine life. Secondly, the depth limit was discussed in relation to the legal aspects of interpreting the directive, and thirdly it was discussed how the lower depth limit could be defined in ways that were scientifically operationalizable in the designation process.

Ecological soundness

With regard to the ecological soundness of the depth limit the 20 metres in the UK national version of the sandbank definition were introduced, according to one UK scientific advisor, with direct reference to what they believed to be the original reason for adding sandbanks in the directive, namely as a feeding area for diving sea ducks:

> The UK version had a word; I think it was called 'slightly covered by the seawater at all times of the tide'. So it was always covered. And that word 'slightly' was missing from the German version. So in the first version of the definition of the manual, in the English version anyway, we said 'what does slightly mean?' [Laughter.] And so 20 metres was put in as being slightly because that was regarded as more or less the feeding depth of many sea ducks – that the thing was originally suggested for. And if you go back further Germany suggested the habitat on the basis of sea duck feeding area.
>
> UK scientific advisor, interview November 2010

Furthermore, according to another UK advisor, skipping any lower depth limit would change the habitat type mentioned in the directive – 'slightly covered by seawater' refers to a particular habitat type which differs in important ways from deeper sandbanks because of the sunlight:

> If you go back in time as to why that particular habitat's there, it's because it's a nearshore feature that might have some vegetation on in the photic zone [the upper zone in the water mass where the marine life is affected by sunlight, ed.], and particularly seagrass, there's some sandbanks like those. And in other areas it's also a feeding ground for relatively shallow diving sea duck. And I believe that's why it's put on in the first place; essentially it's for the near shore version of a sandbank. So you can get lots of different sorts of sandbanks, you can get sandbanks which come out at low tide all the way down to ones that are 100 metres deep, and they'll all be very different biologically, but there's quite big step between sand that is within the photic zone, in other words the sun can get to it, and sand that isn't. There's quite a big step in biology at that stage.
>
> UK scientific advisor, interview October 2010

One of the German representatives argued that UK defended the 20 metres depth limit because they had already come far in their designation process, taking an outset in the 20 metres.

Denmark supported the 20 metres depth limit and held that habitat type 1110 was originally added as a coastal, and hence shallow, habitat type. This appeared, among other things, from the list of species present. Denmark also reminded that habitat type 1110 in the Interpretation Manual referred to a combination of the Palaearctic classification codes 11.125, 11.22 and 11.31. These codes cover, a Danish representative pointed out in a mail:

> * 11.125: Shoals - shallow waters over permanently submerged elevated features of the sea-floor. In general underwater bank of sand not far below the surface of the water, making it dangerous to boats.
> * 11.22: Sublittoral soft seabeds - mostly animal communities colonizing soft sediments such as mud, sand and gravel and the infralittoral and circalittoral zones.
> * 11.31 Atlantic eelgrass meadows - eelgrass beds dominated by Zostera marina, established between the base of the intertidal zone and a depth of about 10 metres in Atlantic and North Sea waters. (Danish mail cited in European Commission 2006)

All three codes refer to very shallow and mostly coastal areas, Danish representatives argued – hence, in the offshore environment only very shallow sandbanks should be included. The UK supported this view. Furthermore, both UK and Danish representatives argued that the species mentioned in the original version were all coastal species.

The German scientific advisors, on the other hand, argued that from an ecological perspective it did not make sense to restrict the water depths of sandbank habitats. According to one of those who took part in the discussions in MEWG, their starting point was that what makes a sandbank productive is its slopes – hence, sandbanks are ecologically important at any water depth:

> The principal focus we gave the whole debate was that we said the sandbank is not protected because it is a sandbank but because it has a certain ecological function in the marine ecosystem. And all mountain-like structures in the sea attract biodiversity, attract marine life and have a key function in the marine ecosystem. That's why sandbanks, if they have a slope degree and a certain top area, are ecologically particular and worthwhile to be protected. And it is no matter if it is at 10

metres depth or if it is at 50 metres depth. The function of itself was the target of the habitats directive.'

German scientific advisor, October 2010

To sum up, Germany, Denmark and the UK alike referred to ecological arguments for either maintaining or excluding a lower depth limit in the definition. The debate, however, also concerned the ways in which the lower boundaries of the sandbank should be defined in the definition. One suggestion was to use the 20 metres, but other approaches were proposed. Besides from disagreement about how deep the sandbanks should be, there was also some debate about how the lower boundary should be described in order for it to be instructive in the designation process:

Scientific operationalisation

The third issue that was discussed in relation to the lower depth limit was how it should be defined in order for it to be consistently usable by the scientific advisors. As referred above, the lower depth limit was defined in biological and hydrological terms in the subgroup's first proposal at the second MEWG meeting: "The lower limit of a sandbank is determined by e.g. the loss of primary production at the sediment surface, decreased wave or current exposure or disappearance of typical sandbank biocoenoses." (European Commission 2006, p. 12) One argument for using such biological parameters was that the purpose of the designation was to protect biological diversity. Some biological conception of what constitutes a sandbank habitat type and of the biological values that should be protected would make sense. However, the MEWG group members agreed that such parameters – the loss of primary production, decreased wave exposure and typical biocoenoses for a sandbank – were difficult to measure. At the final meeting with experts a UK representative furthermore pointed out that for the offshore marine area the existing data is insufficient for making confident statements about the change of the biology. And a German representative argued that any biological criteria would take intensive sampling to use. Mathematical solutions, the representative argued with reference to the by then completed German process, were much easier to operate.

Legal aspects

With regard to the legal aspects of interpreting the directive, the main issue was the extent to which the definition could and should be amended, following the extension of the Habitats Directive to the offshore marine area. As mentioned, the MEWG was established in order to develop more instructive guidelines for the application of Natura 2000 in the offshore waters. However, there was disagreement about what this involved. According to German representatives, the extension of the Habitats Directive to offshore areas

required an adaptation of the definition, which from the beginning was developed for coastal areas. One of the scientific advisors who took part in the negotiations argued in an interview that:

> At that time – and that is all what we worked up – apparently nobody was really aware that the Habitats Directive would have power also beyond 12 nm. […] Since it [the Greenpeace judgment] was clear that EU waters would also cover all the EEZ of member states, and by then also sandbanks deeper than 20 metres would be quite logical, because EEZ's are clearly in most countries much deeper. And that was the basis of where we came from when we redefined or made clear what sandbanks are we talking about.
>
> German scientific advisor, October 2012

On the grounds that the Habitats Directive has been extended to areas that were not in the minds of those who wrote the definition from the outset, the German logic was that an extension would also imply an adaptation of the Habitats Directive, including widening the sandbank habitat type definition to cover deeper banks.

However, both the UK and Denmark pointed to legal problems in such a widening of the definition with reference to the wording in the name in the Habitats Directive, namely 'sandbanks slightly covered by seawater all the time'. By excluding any lower depth limit from the definition would go beyond interpreting the current habitat type in the directive. It would be to change the current habitat to include deeper sandbanks and, in so doing, to amend the directive. There might be a problem, a Danish representative admitted at the final meeting with independent experts, with the Annexes being insufficient, as they were originally drafted to cover coastal areas. But this should not be solved by redefining the habitat type. Such an amendment would be a legal issue as it would impose new obligations on the member states – something that lay outside the terms of reference and powers of the working group. As a UK representative formulated it in a mail before one of the meetings, "it opens the door for all sandbanks to be in the frame for designation as SCI irrespective of whether they are slightly covered or considerably covered by seawater". (European Commission 2006, p. 27)

Hence, both Danish and UK representatives argued that removing the reference to any depth limit would require a political amendment of the Habitats Directive according to article 19 of the directive: "Such amendments as are necessary for adapting Annexes I, II, III, V and VI to technical and scientific progress shall be adopted by the Council acting by qualified majority on a proposal from the Commission." (European Commission 1992, article 19) On this background Danish and UK representatives stressed that skipping any reference to what 'slightly' means could be legally challenged. Before the final meeting with

independent experts, a Danish representative thus set out in a mail to "remind the coming group of experts, that the scientific work is limited by such legal considerations." (European Commission 2006, p. 25) As a response, one of the independent experts at the final meeting pointed out that the annexes had already been amended several times, for example to incorporate new classification systems and to add new habitat types in connection with the uptake of new EU member states. The main issue, the expert argued, was not the legal aspects, but to find tools that would be operational for the member states.

To sum up on the discussions about water depth, the different positions on how it should be described in the definition were both held with reference to ecological arguments about at which depths the sandbank was most important as a habitat for marine life, to which kind of criteria would be scientifically practicable during the implementation and to how much the definition could be stretched without overstepping the legal authority of working group.

Dogger Bank as an example

Besides from the lower water depth limit, another highly debated issue was the extent to which the Dogger Bank should be mentioned in the guidelines as a typical example of a sandbank habitat type. Germany, who was chairing the subgroup and coordinating the process, advocated the inclusion of the Dogger Bank as an example of a typical trans-frontier sandbank, and the bank was mentioned in the definition sent out for review before the fifth meeting and likewise in the version debated before the final meeting with invited experts. According to one of the German representatives involved in the process, Dogger Bank provided an illustrative example:

> In principle a huge, submarine sandbank, that fulfils the key ecological functions. The Dogger Bank is an ecosystem in itself in the North Sea. Through its sandbank properties. And that is why it could have been an ideal example to explain to everybody what we mean by that definition.
>
> German scientific advisor, interview October 2010

Both Denmark and the UK insisted that the Dogger Bank should not be mentioned. First of all it was argued that this was to designate sites at the level of the European Commission – something which according to the Habitats Directive should be left to member states. In a mail a Danish representative pointed out that:

> […] the overall purpose of the definition is not to specify certain areas that should be designated. On the contrary it is for the member states to apply the criteria laid down in Annex III and relevant scientific information when identifying territories that should be proposed to the Commission according to Article 4 of the Directive (stage 1). A definition of a habitat type is therefore by virtue of

> a general nature. By referring to Dogger Bank in the definition of sandbanks, the scientific margin of discretion left to member states in applying the criteria is thus too restricted. (European Commission 2006, p. 16)

This argument was supported by the UK. The two member states further argued that using the Dogger Bank as an example of a 'typical' sandbank did not help clarifying the definition. A UK representative argued that the Dogger Bank is not a typical case and hence a bad example in terms of providing guidance. One of the invited oil industry representatives suggested that a coastal sandbank would provide a better example of a trans-frontier bank, likewise on the grounds that the designation should be left to the member states. The coast of Belgium, the Netherlands, Germany and Denmark, the stakeholder argued, would provide a less controversial example, much of which was already designated.

Furthermore, a Danish representative argued in a mail that the example offered no guidance on how to define and delimit a sandbank,

> since Dogger Bank itself has no clear boundaries. To the best of Danish knowledge, no generally agreed definition of the Dogger Bank exists and it is questionable to what extent if at all the Bank exceeds into Danish territory. If the Commission is aware of any such definition of the Dogger Bank, could you please inform us? (European Commission 2006, p. 16)

According to one of the German representatives I interviewed, Denmark did not want the Dogger Bank included as an example because they did not want to designate a site on the Dogger Bank. The German representative further argued that the Danish reluctance to designate sites on the Dogger Bank had to do with their oil interests.

The coordinator of the subgroup proposed a new formulation of the Dogger Bank example where it was specified that the Dogger Bank moves through the offshore Exclusive Economic Zones of the UK, The Netherlands and Germany, and where Denmark was left out explicitly. However, a UK representative protested the specific mention of member states:

> The UK is concerned that the revisions to the text under the Dogger Bank example seem to go as far as suggesting which Member States should designate the feature, which the UK feels is wholly inappropriate. The decision as to whether to designate the Dogger Bank is one for Member State judgment in view of the criteria in the Directive. (European Commission 2006, p. 28)

Both Denmark and the UK insisted that German national designation should not determine the processes in the other member states. In an e-mail a Danish representative pointed out that nothing was hindering Germany from nominating their part of the Dogger Bank:

> […] attention must be drawn to the fact that the Habitats Directive is a minimum directive. Even without altering the definition, member states are allowed to nominate as pSCI, areas which fall outside the scope of the directive. However, a voluntary nomination as pSCI, such as the German nomination of a part of the Dogger Bank, can by no means be determining for other member states obligations. (European Commission 2006, p. 18)

A UK representative likewise stated that with the introduction of the Dogger Bank as an example "the UK feels that […] the sandbank definition has been revised to assist one Member State in support of its voluntary designation which could arguably have been progressed under national measures." (European Commission 2006, p. 28)

In this way the Dogger Bank – and the potential implications of the definition for the member states' site designation on the Dogger Bank – was a direct reference point for the discussions about the sandbank definition.

Grain sizes

A final and less controversial discussion to be mentioned was about which grain sizes count as sand and to which extent other grain sizes can also be present on a sandbank. According to the first proposed definition at the second MEWG meeting, "Sandy sediments are mainly composed of grain sizes in the range of 0.06 – 2 mm, but patches of larger grain sizes may also be present on a sandbank." (European Commission 2006, p. 12) The formulation changes slightly during the process; in the last proposed definitions before the expert meeting the wording is: "They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank." (European Commission 2006, p. 14). A Danish representative comments the change in an e-mail:

> It appears that the Commission has taken a very broad approach to the physical characteristics of a sandbank. By including larger grain sizes, boulders and cobbles or smaller grain sizes including mud, it appears that the distinction to other marine habitats (e.g. mudflats) has become less clear. It is the Danish opinion that such habitat types should be covered only through a future adaptation of the annexes - not by broadening the current definition of sandbanks to this degree. In that light Denmark therefore suggests the definition amended in order to clarify that a sandbank mainly consists of sandy sediment of grain sizes 0.25 - 4.0 mm and that e.g. larger grain sizes, boulders and cobbles or

> smaller grain sizes including mud can be found on the sandbank, but only in very small quantities. (European Commission 2006, p. 16)

The discussion about grain sizes was, however, subject to less debate than the other issues.

Summary

The debate about the definition of the sandbank habitat type was kept in technical terms. The different positions were held with reference to which areas on a sandbank support the relevant ecology, to which criteria are scientifically operationalizable, and to which extent the definition can be stretched without overstepping the authority of the working group. However, member state representatives also suggested that national agendas lay behind the opposing views.

Common for all the discussions in relation to the sandbank definition, Germany advocated a wider definition while the UK and Denmark insisted that the Habitats Directive was a minimum directive and to a greater degree should leave it to the member states to define how and where it should be implemented.

Scientists or national representatives?

Until now I have been referring to the participants in the debate as member state representatives or simply 'Germany', 'UK' and 'Denmark'. I did this in order to focus on the issues discussed, in order to give an impression of member state positions and because this is also how the participants talked about it themselves. One important point to observe is that the debate is seen by the participants as a negotiation between member states. The different positions in the debate are taken to represent member states, and when the participants talked about each other they sometimes suggested that their positions were motivated by national agendas.

But in addition to being member state representatives or representatives for organisations the participants were also scientists, lawyers and officers. However, they would often participate as national representatives. From the data through which I have been studying the debate, namely through interviews with people who took part in the negotiations and through process documents, it has been impossible to differentiate between scientists, lawyers and national officers – it seems as if they are all first of all representing their member state. A representative from an environmental NGO, however, who was present at the first day of the final meeting, told in an interview about her observations of some of the tensions between national representation and scientific advice:

> The interesting point was that it had nothing to do with science why a certain group was for or against the definition as it was, or for or against any changes. For example the impression was that the Danish delegates, they simply did not want to designate the Dogger Bank as a Natura 2000 area.

> And that was independent of any morphological or biological or lots of other data, it was a decision that was taken in other places and where a justification had to be found. […] [A Danish national scientist] was leading the process for the guidelines and he was participating at meetings and up to the final discussions he was in charge and then suddenly people, other people took over and he didn't even say anything anymore. He couldn't have any influence anymore and it was not that the ministry of environment sent another conservation expert, but they sent lawyers, who suddenly entered into the debate first before the meeting when all the documents were prepared, and then during the meeting. And it was a lawyer talking also and, well as I said, representing obviously an opinion but not having the authority to change, decide or negotiate.
>
> UK environmental NGO, interview

The experts who were brought in at the end, and who were not representing member states, came to play an important role in resolving the disagreement. Even though they developed their advice on the background of the member states' inputs, their definition was taken as an authoritative compromise.

Thus different actors have had different roles: They have been representing member states, environmental interests or the European Commission, or they have been contributing with their expertise about the marine environment or about law. But often their roles have been a mix of all these kinds of representations. A statutory advisor representing a member state, for example, negotiates on the background of technical expertise as well as a national mandate. And the independent experts were not tasked with developing a purely scientific definition, but with developing a scientifically informed compromise between different national positions, and they have had to do so within the legal framework of the Habitats Directive. And with each of these different kinds of representations comes different perspectives on what constitutes a sandbank slightly covered by seawater. Let us turn to the final discussion in this chapter: Given its long and controversial history and the mixed representations involved in its production, what kind of object is the resulting definition of sandbank habitat type 1110?

Discussion

In this chapter I have accounted for the kind of framework the Habitats Directive defines for the scientific advisors' work during the designation process. How this framework manifests itself in a more practical way in their work is dealt with in the next chapters. But before we continue to the designation process in the member states I need to open two discussions about the Habitats Directive as an overall framework for the production of scientific advice. The first discussion is about what the history of its making says about the

resulting definition as an object – and, hence, about the kind of research question the scientific advisors are tasked with addressing. The second discussion is about the translation processes that have taken place.

What kind of object is the resulting definition of sandbank habitat type 1110? Is it a diplomatic agreement among member states? Is it a classification referring to the shared qualities of a group of habitats in the EU offshore waters? Is it a legal object? Is it science? Is it politics? It should be clear by now that it is a bit of it all. Its constitution rests on negotiations with references to everything from the particular ecology on sandbanks over the legal mandate of the working group to which characteristics are scientifically operationisable. It is the outcome of negotiations between member states that all have national agendas. It has been negotiated by scientists, national representatives, environmental NGOs and industry organisations, the European Commission and independent experts. The resulting sandbank habitat type definition represents what could be settled between all of the involved parties, within the framework of the Habitat Directive. And it has been developed, among other things, in consideration of which kind of sites it would require some member states to designate on the Dogger Bank. In other words: Sandbank habitat type 1110 is a hybrid – the outcome of works of mediation across the great divide in the Modern Constitution.

Nonetheless, the habitat type is argued to represent a group of habitats which requires protection. The member states' scientific advisors are now identify these representations in their member state's EEZ. And although the scientific advisors according to the Habitats Directive are to give advice exclusively based on science, such research question already in itself incorporates national agendas which fall outside what the directive defines as 'exclusively scientific': That which is not affected by socio-economic interests.

Turning to the second discussion, which translation processes have taken place between the initial drafting of the Habitats Directive and the publication of the revised version in the European Commission's guidelines? The sandbank habitat type was supposedly added to Annex I with reference to sandbanks along the German coast which serve as feeding grounds for diving sea ducks. At the time it was added the Habitats Directive was expected to cover land and marine areas up to 12 nautical miles off the coast – hence, it was added with coastal sandbanks in mind. Following the extension of the directive to the offshore marine area there was a need to develop a definition that made the sandbank applicable in offshore waters. As offshore waters tend to be deeper than coastal waters, this started a discussion about the water depth, and the resulting definition opens up for sandbank areas in deeper waters, if the areas "are part of the feature and host its biological assemblages". (European Commission 2007, p. 2) In practice this among other things allows German scientific advisors to find sandbanks at 60 metres depth.

Thus a line of translation starts from the political objective to protect biological diversity to protecting the habitats of diving sea ducks along the coast to protecting areas in the middle of the North Sea at 60 metres water depth where you may find marine life, but no diving sea ducks.

Another line of translation starts from the political objective to protect biological diversity to protecting important habitats to defining the boundaries of habitat type 1110 which, according to some scientific advisors in the process, are 'pretty silly' and remove their time and resources from work that could actually help protect biological diversity. Where the translation processes according to some scientific advisors have moved the practical implementation far away from the political objectives, it is according to other scientific advisors just a matter of being pragmatic and making the best of it. Nonetheless, something is lost, transformed and added in this process of translation from political objectives at the level of the European Commission to the framework within which the scientific advisors are to implement the directive in national EEZs.

In this chapter I have introduced the framework for the scientific advisors' work at the level of the European Commission. In the next chapter I turn to the scientific advisors' work to implement the Directive in their national EEZ. Their role is to provide the link between the internationally defined objectives and tools and the national environment and regulation. Their role is that of translation – from international to national, from overall objectives to concrete boundaries and regulative practices. And their role is to guarantee that this translation is scientific, objective and focused on environmental goals and not on socio-economic ones.

4 Drawing boundaries on the Dogger Bank

If you approach the Dogger Bank from the UK coast, diving along the seabed, you will see it rising suddenly off the flatbed, moving relatively steeply towards the top to the point where it is less than 20 metres below the sea surface. Coming from the North, on the other hand, you will hardly notice the slope – slowly, slowly it climbs upwards, almost resembling the surrounding seabed. Elsewhere it rises and falls, rises again and continues like this in a wavy formation upwards. Reaching the top of the bank in the Western end you will find an area that is less than 20 metres below the sea surface – a major, shallow flatbed lit by sunlight during daytime. If you continue to the very Eastern end it is more than 60 metres below the sea surface, only slightly shallower than the surrounding bottom and too deep for the sunlight to reach the bottom. The bank is mostly covered by sand as is the surrounding seabed, but here and there you will find patches of coarser sand, more gravelly sediment and cobble. The marine life varies slowly across the bank. As you move across the bottom you see hermit crabs, common starfish, green sea urchins and razor shells, sandmason worms, seapens and perhaps sudden high concentrations of brittlestar or sandeel. If you are lucky you will cross the course of a common grey seal or even spot the shadow of a harbour porpoise passing by. Now, as you move up the bank from either side, when do you enter the sandbank habitat? If you were to draw a line, where should it be?

Having been introduced to the Habitats Directive and the history of the sandbank habitat type definition, we shall now follow the scientific advisors' work with identifying representations of the sandbank habitat type on the Dogger Bank. I follow the work of two groups of scientific advisors, one tasked with designating sites in the UK EEZ and the other focused on the German EEZ.

If you ask the involved scientific advisors, they will disagree about the extent to which the Dogger Bank itself provides any guidance on how to define the boundaries of the sandbank habitat. The two case studies show that the scientific advisors do it very differently, and where the choice between methodological approaches in Germany seems to have been rather simple, it was not at all straight forward in the UK. In the study of the processes I have been focusing on what motivated the scientific advisors' choices about how to draw the boundaries of the sandbank habitat on the Dogger Bank. Doing so equips me in the succeeding chapters to discuss how different factors – the legal framework, the national agendas, the stakes, the variances on the Dogger Bank and the scientific advisors' roles – have defined, limited and in other ways influenced the scientific advisors' decisions about how to proceed. Hereby also how they have affected the final outcomes.

I first describe and compare the products of the German and UK designation processes, namely the resulting SAC boundaries. I argue that notwithstanding that they are implementing the same directive, following the same guidelines and operationalising the same habitat type definition, that they do so in more or less similar, bordering environments, and that they are supposed to apply standard scientific methods and not consider socio-economic factors, they still end up with very different objects. I then describe the designation processes in the two member states step by step, focusing on the backgrounds for the scientific decision making. The purpose is to explore why the two groups of scientific advisors to end up with different outcomes. On the background of these accounts I finally discuss the different kinds of criteria which have affected the scientific advisors' decisions throughout the process. I argue that besides from internal disciplinary criteria for scientific validity, the scientific advisors' decision making has been guided by, among other things, the regulative framework, policy objectives, national agendas, potential policy implications and interests. And that as many of these conditions differ in the two member states, so do the decisions and outcomes. But first, let us look at the outcomes – the sites which the two groups of scientific advisors argue make up the sandbank habitat on their respective parts of the Dogger Bank:

The resulting boundaries

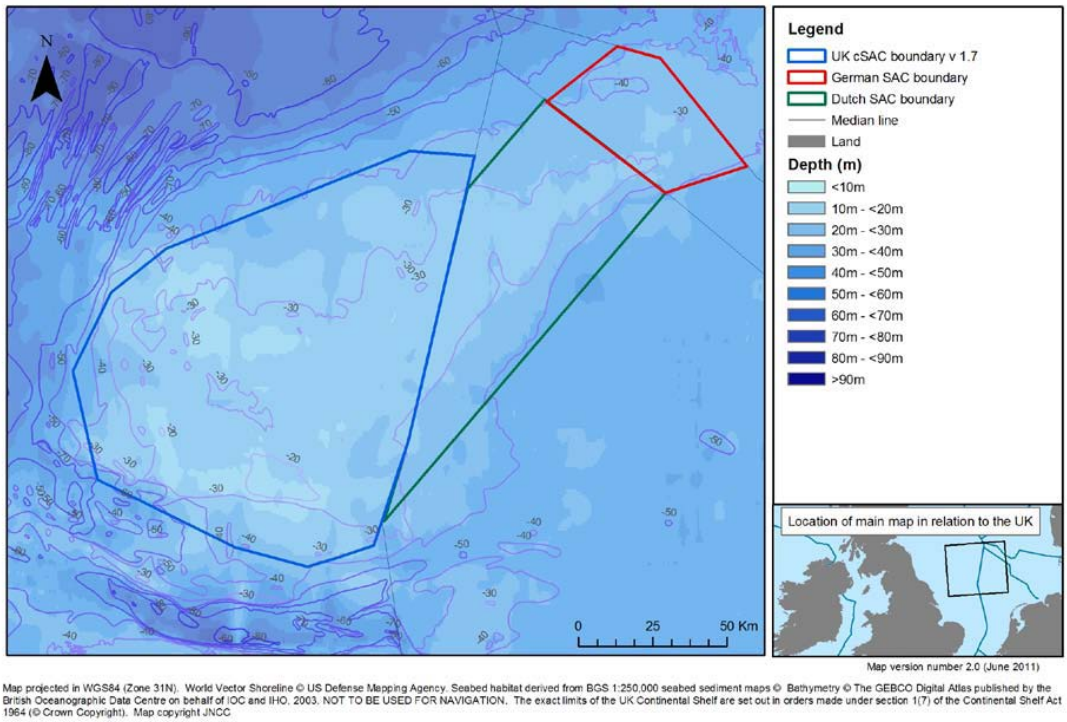

Figure 4 The final Dogger Bank SACs submitted to the European Commission by, from the left: UK, the Netherlands and Germany. (Joint Nature Conservation Council 26 August 2011, p. 15)

The Netherlands, Germany and the UK have all submitted their candidate SACs on the Dogger Bank to the European Commission. The primary feature to be protected on all sites is 'sandbanks slightly covered by seawater all the time'. The submitted sites can be seen together in Figure 4 on a map taken from the UK Dogger Bank SAC Selection Assessment. No site has been designated in the Danish EEZ – the Dogger Bank in this end, it is argued, is not a sandbank habitat. The UK and German sites are placed on each side of the Dutch site. The map gives a first impression of the sites and boundaries being different. The water depth, size and shape vary across the bank on the map. As regards the boundaries, the lines break at the borders between the member states' EEZs, and the boundaries of the UK and Dutch sites do not meet at the border. The UK Northern border is further to the North than the Dutch while the Southern border is further to the South than the Dutch. Let us have a closer look at the boundaries, focusing on the German and UK sites.

The German Dogger Bank SAC

Where the German boundaries are not defined by the borders of the German EEZ they are placed in relatively deep waters compared to the UK boundaries. The North-Western and South-Eastern boundaries correspond to the 40-metres isobaths, that is, the contour line marking where the water level is 40 metres. The Northern and Southern boundaries are deeper than 40 metres. In comparison the UK boundaries are between 30 and 40 metres deep with a few exceptions.

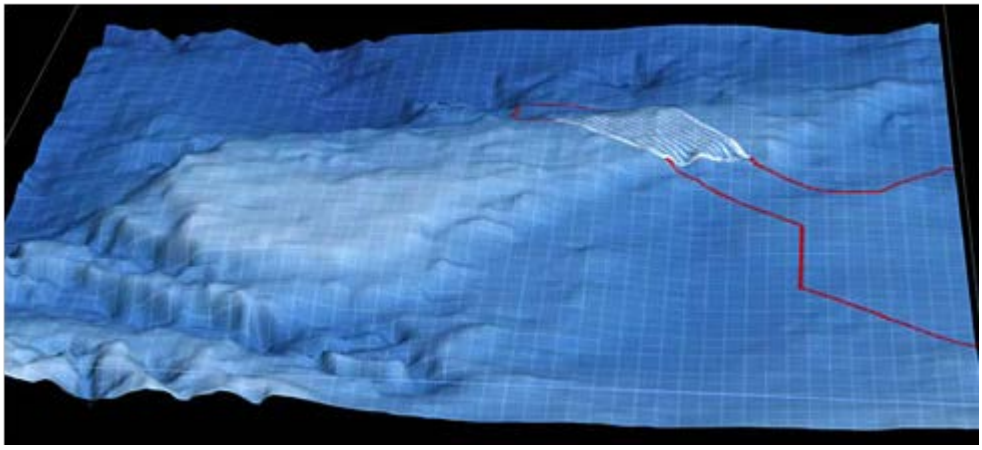

Figure 5 The German Dogger Bank SAC on a three-dimensional map. From BfN homepage (Bundesamt für Naturschutz).

The German boundaries were defined mainly on the basis of water depth. A computer model based on a number of mainly morphological criteria was used to define the boundaries. In general the boundaries were drawn where the change in slope degree is more than 0,5 degrees and the bank levels off to the surrounding sea bottom (Klein 2006). The map in Figure 5 shows the resulting boundaries on a three-

dimensional map of the sea bottom on the Dogger Bank. The red line shows the boundaries of the German North Sea EEZ. The white hatching shows the selected SAC.

The UK Dogger Bank SAC

As shown on the map in Figure 6 the UK boundaries are generally in shallower waters between 30 and 40 metres. Unlike the German boundaries their placements follow different principles round the site. The main extent of the bank and the Southern and Western boundaries has been defined on the basis of the same modelling principles as in the German case, likewise drawing the boundary where the change in slope is more than 0,5 degrees (the orange areas on the map in Figure 7). Some minor modifications of the Southern boundary have been made on the basis of a sub-geological survey determining the extent of the Dogger Bank formation (the thin blue line on the map in Figure 7); a depositional formation created at the

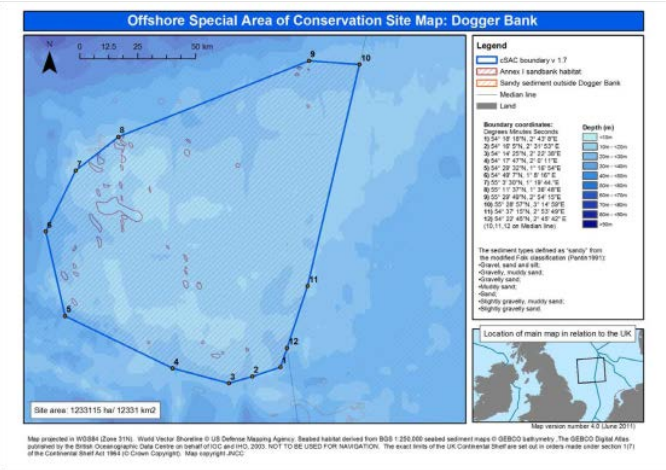

Figure 6 The final UK Dogger Bank SAC (version 1.7). (Joint Nature Conservation Council 26 August 2011, p. 6)

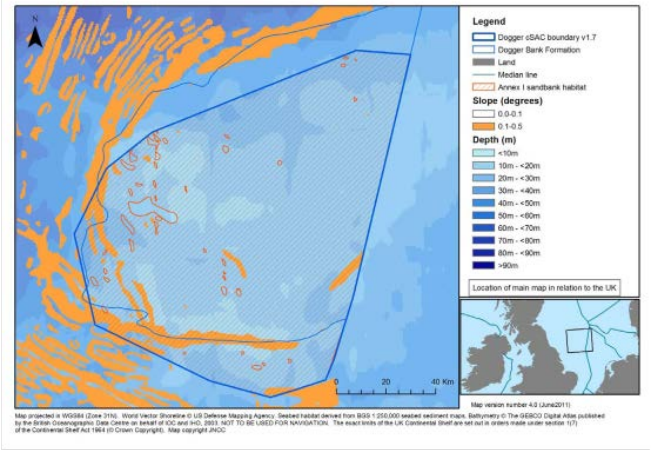

Figure 7 The final UK Dogger Bank SAC (version 1.7) with slope analysis and the Dogger Bank Formation. (Joint Nature Conservation Council 26 August 2011, p. 6)

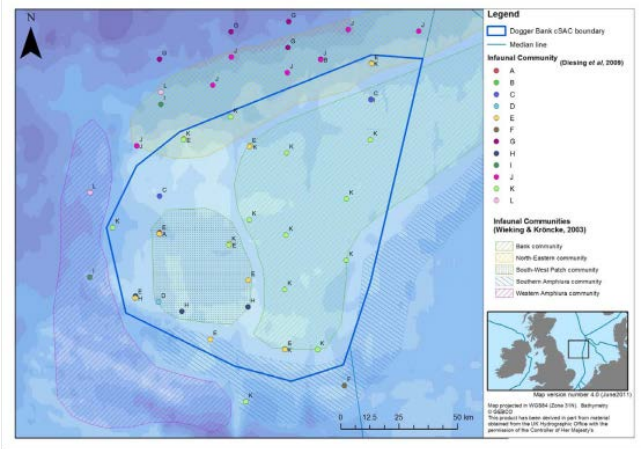

Figure 8 The final UK Dogger Bank SAC (version 1.7) with biological communities analysis. (Joint Nature Conservation Council 26 August 2011, p. 22)

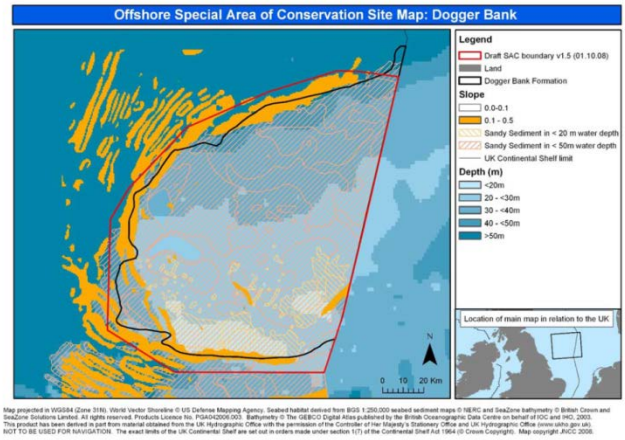

Figure 9 The second proposed UK Dogger Bank SAC (version 1.5) based on slope analysis. (Joint Nature Conservation Council 28 October 2008, p. 9)

end of the last ice age (Diesing et al. 2009). The Northern boundary is defined on the basis of biological communities and is drawn where there is a change in the biological communities on the bank, cutting off a community that is not considered to belong to the sandbank habitat feature (see the different communities mapped in Figure 8).

Discussion

The resulting German and UK SAC boundaries on the Dogger Bank, then, differ. First of all in regard to the water depth at the boundaries. The German boundaries are in 40 metres at the shallowest – that is, those boundaries that have not been defined by the borders of the German EEZ. The UK boundaries, on the other hand, are at no point 40 metres deep. Secondly because the German boundaries are generally drawn where the bank levels off to the surrounding seabed where the UK boundaries are further up the slope.

Would the UK boundaries have looked the same if German principles had been followed? The second set of boundaries which were proposed to government was actually based on a slope analysis alone in the same way as the resulting German boundaries (see Figure 9). When compared with Figure 7 it appears that particularly Northern boundary was different, following closely the orange areas where the change in slope is more than 0.5 degrees. The more detailed principles in the slope analysis are not outlined in this version of the SAC Selection Assessment Document, but direct reference is made to the German model as a basis for the UK SAC selection. However, one of the guiding principles in the German model is that the boundaries should generally be drawn where the slope levels off to the surrounding plains. Despite that they are based on the same approach, the UK boundaries based on the slope analysis are generally placed further up the slope. Key scientific advisors in the UK process have argued that deeper waters are less relevant to protect – however the SAC Selection Assessment does not tell whether the German model has been modified accordingly before it was applied in the UK (Joint Nature Conservation Council 26 August 2011). Nonetheless, the UK boundaries would have been different if the scientific advisors had followed the same approach. They might have looked like the boundaries in Figure 9, but most likely they would have been in deeper waters, meaning that the site would have been bigger.

Would the German boundaries have looked different if the UK principles had been followed? This question is more difficult to answer as while the UK scientific advisors made a slope analysis, which can be compared to the German slope analysis and to the present UK boundaries, the scientific advisors in Germany did not make sub-geological surveys and have not displayed maps depicting the distribution of biological communities and sediment on the Dogger Bank in their reports. Whether such data would have changed the boundaries, if the same principles had been followed, is hard to know. However, the boundaries would

probably have been in shallower waters. And given that the German part of the Dogger Bank is generally in deeper waters than the UK part, the site would have been considerably smaller.

The two groups of scientific advisors have both been identifying representations of habitat type 1110 on the Dogger Bank. Why did they end up with so different outcomes? A closer look at the scientific decision making in both processes, step by step, is helpful:

The designation processes

Taken together the territorial waters and EEZ surrounding the UK covers 773.676 square kilometres[2]. This is more than for any of the other EU member states. The area is 13,5 times bigger than the German territorial waters and EEZ, which covers 57.259 square kilometres, and the UK seas are of major importance to the UK economy. With regard to the Dogger Bank, the shallowest part – a rather large area where the bank is less than twenty meters below water level – Is in the UK EEZ. Already in the Dutch EEZ it is considerably deeper and in the German area it is nowhere shallower than 30 meters.

The shallowness in the UK area makes it more attractive to fisheries, but more importantly this is what makes the Dogger Bank an attractive site for wind farm development. The world's biggest wind farm has been projected there and is currently in the planning phase – a wind farm which plays a major role for the UK strategy to fulfil their EU commitment to obtain 15 per cent of their energy from renewables by 2020. The target capacity is 9 GW, but it is estimated to have the potential to produce 13 GW, corresponding to about 10 per cent of UK's total energy needs (Forewind Ltd. December 2011) – two thirds of UK's EU commitment to renewable energy supply. Germany also has plans about wind farm development, but the German part of the Dogger Bank is too deep to be a relevant site. Also very few German fishers have activities on the Dogger Bank, be it the UK, Dutch, German or Danish part. Oil-and gas pipelines run through the German and UK areas, just as some sand and gravel extraction take place in both areas, but all in all the economic importance of Dogger Bank in the German EEZ is insignificant.

The two cases are not treated symmetrically in the following accounts. The UK account is much longer and is described in greater detail than the German process. First of all, there is simply more process to describe in the UK case. Where the German process involved one version of boundaries and was submitted to the European Commission in 2004 after two years, the UK process involved several versions, and the resulting SAC was not submitted until August 2011.

[2] Source: http://www.seaaroundus.org/eez/. The site does not distinguish between territorial waters, which is the zone out to 12 nautical miles from the coast, and the Exclusive Economic Zone.

Secondly, it has to do with the kind of documents available on the two cases. One report on the German scientific basis for the designation describes the designation of all sites in the German EEZ in general terms (Von Nordheim, Boedeker & Krause 2006); another describes the scientific basis for the definition of boundaries of all sandbanks (ARGUMENT March 2003). Else from eight lines in the latter report, no detailed accounts of the particular process on the Dogger Bank. With regard to UK designation there are multiple reports available concentrating solely on the Dogger Bank and describing in detail the reasons for the placement of one or another part of the boundary and the related difficulties and uncertainties.

Thirdly, the asymmetrical treatment has to do with the point in time when I met the processes. As mentioned earlier, I met the German process several years after they submitted their site to the European Commission. The scientific advisors had a hard time remembering the details, and the process documents were no longer available or well forgotten somewhere in the archives. Reversely I met the UK process in the middle of the process where all decisions were still controversial and all the documents present, discussed and referred to. The scientific advisors I interviewed were able to tell me about their methods, decisions and considerations in great detail. The asymmetric treatment of the two cases, then, is in itself an element in the comparison: It shows some important differences in the two cases and how I had access to them.

During fieldwork it became clear that the UK process of defining the boundaries of the sandbank habitat on the Dogger Bank was closely interwoven with the process of considering whether harbour porpoise should be a feature qualifying for protection on the site. The periods of radio silence, the governments' rejection of the site at one point and the environmental NGOs' comments on the site had just as much to do with harbour porpoise as with the boundaries defined for the sandbank feature. And it as been difficult to determine whether some of the comments on the boundaries and the size of the site also had something to do with issues related to harbour porpoise. Hence, in order to account for the process of defining the boundaries and be true to the entanglements which I found affected the process in some way, I have included parts of the history about the harbour porpoises, too.

Now, why did the scientific advisors in the two member states end up with such different boundaries? Over the next pages I account for the two processes from the start.

Germany: Mathematical solutions – only a small window for scientists' decisions

At the time I turned to Germany in my fieldwork, I had been occupied with the UK case for a long while. The UK process had caused me frustrations and sleepless nights – I had been spending months trying to get hold of the progression of events and a number of different versions of boundaries and changes in

methodological strategies. In the fall 2010 where I made interviews, the UK process had lasted for perhaps eight years and was still not finished. Hence, it was a relief to turn to the German process. The same procedures had been followed for all sandbank sites in the German EEZ, and the methodology seemed simple and straight forward and did not depend on multiple scientific disciplines. There had only been one version of boundaries on the Dogger Bank, and the whole process of designating a full set of marine SACs including governmental approval and stakeholder consultation took two years before it was then submitted to the European Commission. I spent four days reading up on the German process, and when I took the small ferry to the Isle of Vilm, the small island off the coast of North-Eastern Germany where Bundesamt für Naturschutz (BfN) is situated – the German statutory agency tasked with implementing the Habitats Directive in the German EEZ – I felt more prepared than I have ever felt before interviews about the UK process. Excerpts from my notes and audio file from the first interview gives an impression of the attitude on the island:

> *The German scientific advisor I am interviewing is very kind and eager to give me the information I need, but he seems a bit impatient about the interview. We have been talking about the designation process for about forty minutes, and he is concerned on my behalf that we won't get to the really interesting issues before the time is up. He has tried a couple of times to turn to the issues he is dealing with at the moment, which is to develop management measures for the selected Dogger Bank site.*
>
> | | |
> |---|---|
> | German scientific advisor | […] are you dealing only with the selection process? |
> | Interviewer | I'll be focusing on the selection, and that's simply because it's… I have orders from my supervisor, you know, stop broadening what you want to look at. |
> | German scientific advisor | But the selection is not too difficult! In principle it's so easy. Cause you only need to follow scientific knowledge and logic, and also the procedure is so clear. The difficult part is if you come to the *management* of the site in line with the economic interests. *That's* really difficult. |

Political pressure to be fast

In 2002 the extension of the Habitats Directive to the EEZ was implemented in German law. Same year the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU[3]) asked BfN to initiate the designation of the German SACs. Two years later, in 2004, Germany submitted their full set of proposed marine SACs to the European Commission. Compared to the other EU member states this was very fast.

Different explanations have been given for why the German process was so fast, most of which relates to the fact that Germany had a green government at the time and that the BMU minister was green. According to a representative for a German environmental NGO it was the scientific advisors at BfN, which were very environmentally oriented, who wanted to take advantage of the green minister and government. According to a scientist involved in the process, however, the orders came from the ministry and had to do with an ambition to substitute nuclear power plants with offshore wind farms – something that required fast clearance on where the protected areas would be so the wind farm development could move forward. According to a scientific advisor to government, this – the process needing to be fast – was an important reference point when the scientific advisors made their methodological choices:

> What made us faster was that we had a very strong political pressure to do it as quick as possible. […] In 2002 I got the order. They didn't say you have to finish by 2004, but they said as fast as possible. And we managed to do it, *with* public hearing and everything, in 2004. And it was in principle not as difficult as many want to make it. It's as simple as that. I mean, if you ask the scientists when are you 100% sure that this site is the best one in the world, or in your waters, you will get the answer: First I need money, I need staff, and then I need 5 years, and then I tell you how far I am, and then I may need another 5 years, and… I mean, I was scientist myself for a long time of my life, and I know how scientists are thinking if they are not bound mentally also into the demands of the society or the political wishes. So far we started from different angle, we said we do it on the basis of best available knowledge, and not on ideal knowledge and wishful thinking: what we could do if we had 10 million Euros.
>
> German scientific advisor, interview

Moreover, BfN was funded substantially. Even though the UK coastal and offshore area is 13,5 times bigger than the corresponding German area, one of the UK scientific advisors I interviewed claimed that about the same amount of staff was involved in the offshore SAC designation processes in the two member states.

[3] Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit.

Where the UK designation process on the Dogger Bank was halted for periods because of lack of funding, the German scientific advisors were able to initiate a whole series of research projects from the very start.

Identifying banks

In September 2002 BfN organised a national status seminar. The purpose was to bring together the scientists and scientific advisors who would be involved in the designation process, to discuss the habitat type definitions and get an overview of existing science and data. One result of the seminar was a German version of the sandbank habitat type definition – the debate about a more elaborate common definition at the level of the European Commission had not started yet. The German version was focused on shape and sediment and did not hold any reference to lower depth limits.

BfN set out first to identify all banks, be they reefs or sandbanks, in the German EEZ. These mappings would then be overlaid with data about sediment and biological communities in order to determine whether the elevations were reefs or sandbanks. For the initial identification of banks BfN wanted to develop an approach that could be applied in other projects and member states, and which was "comprehensible not only to the experts in that scientific field but also to the broader public, administrative bodies and the political sector". This, BfN found, required a model that was simple and clear. Moreover, using their own term, it should be inter-subjectively verifiable, that is, anyone following the same method should arrive at the same result. It should correspond to the habitat type definitions in Germany and in the European Commission's Interpretation Manual – at this point in time the 1999 version (European Commission January 1999). Furthermore, the model should be operative, taking into account the limitations in the data, which was pieced together from existing data sets.

The consultant ARGUMENT was hired to develop the technical analysis regarding the first step in the designation process – identification of candidate areas based on morphometry alone (ARGUMENT March 2003). According to the report ARGUMENT had on beforehand been instructed by the BfN that a specific type of model – a TIN model (Triangular Irregular Network) of the seafloor – should be used for this initial morphometric analysis. The TIN model triangulates the available depth points represented by an x, y and z coordinate, so that the resulting TIN model is a three-dimensional model of the seafloor consisting of even triangular surfaces each with designations of average depth, slope and slope direction. The alternative – geostatistic analysis where a surface is fitted to the points by statistical means – was excluded on beforehand, according to ARGUMENT because it leads to information loss and because BfN had specified a TIN method beforehand. Moreover, where the geostatistic approach would require the modellers to make specific choices about which parameters to use for the analysis, the outcome of a TIN model follows more mechanically from the data.

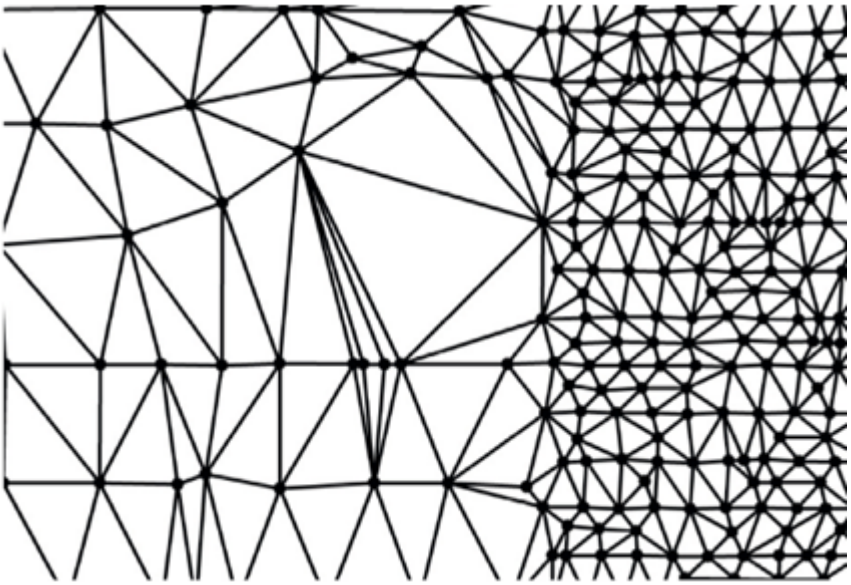

Figure 10: Example of a TIN model representing the connections between measurements with three coordinates. Illustration from the final German report on the site designation. (Klein 2006, p. 102)

The model was fed with existing data about water depth in the German EEZ. First of all they used digital data from surveys of the Federal Marine and Hydrographic Agency (BSH[4]). This data, however, did not cover the whole North Sea – hence it was supplemented with analogous sea maps that were digitised. As the data was collected for different purposes, using different methodologies and with different density, there were some problems in combining the data sets.

Once the seabed had been modelled in three dimensions, next step was to define the boundaries of the sites on the elevated banks. According to the ARGUMENT report a main objective was to present an analysis which was inter-subjectively verifiable, that is, testable across individuals, leaving as little room for interpretation as possible (ARGUMENT March 2003, p. 3). Hence, a set of criteria for defining the boundaries needed to be developed which according to Klein left only "a small window for scientists' own decisions" {{103 Klein, A. 2006/f, p. 97-98}}. At a status seminar in 2002, the following criteria were developed:

- Submarine banks are permanently submerged. [Below water level, ed.]
- They can be distinguished as independent elevations of the seabed.
- Their boundaries are generally marked by slopes of more than 0.5˚. However, if the density of the data is low (North Sea), slopes of up to 0.1˚ can also be included.
- Boundaries are generally drawn at the transition from the slopes of the bank into the surrounding plains.

[4] Bundesamt für Seeshcifffahrt und Hydrographie

- In more level areas they are marked by the straight line between the ends of the slopes as defined above.
- The line marking the slope area should be at least 3 times longer than the straight line […]
- The bank that the model accounts for must be bigger than 1 km2.

(Klein 2006, p. 101)

Colleagues from other governmental administrative bodies participated at the seminar and, according to one of the scientific advisors I interviewed, approved the model.

The TIN modelling exercise led to a set of boundaries for areas which, according to morphometric criteria alone, could be candidates for designation. The areas identified on basis of the TIN model analysis were then overlaid with data about sediment in order to distinguish sandbanks from reefs and other types of elevations. Some areas were excluded from the suggested sandbank habitat SACs on this ground but not on the Dogger Bank.

Finally the maps were supplemented with data about the biology on the bank. According to one of the German scientific advisors this was to see whether the biological communities on the bank were different from those on the surrounding sea bottom. If they were not different, the bank was not seen as biologically significant: "If you have the same benthic community on the bank as on the surroundings, then we say it's not a sandbank protected by Annex 1, because the feature or effects that come by the slopes, did not work".

Asked about whether the biological data changed the boundaries defined by the slope analysis on the Dogger Bank, however, he stressed the importance of abiotic criteria as the main guiding principle:

> No, we did not change the slope [according to biological data, ed.]. […] Because the effect of the biology is too fuzzy over time. Because you always want people to back your feature. And if you find a good abiotic characteristic like the slope, then it marks the end of the sandbank. If you say it's a community, well that might change over the years from time to time, and it's difficult to explain to the people what we detect in two years this way but then the population goes a bit back and we protect only this part; that makes no sense. So we're looking mostly for clear, abiotic criteria to define the borders of the biotope.

German scientific advisor, interview

According to this scientist biology is 'fuzzy' and changes over time. The boundaries of the protected site cannot change accordingly. So in order to ensure people's support for the site designation, it was found important to use "clear, abiotic criteria" that are more stable. Biological data was collected and used to cross-check, but was not given particular importance in the definition of boundaries.

Thus, taking an outset in a morphometric approach should ensure that the methodology was sufficiently instructive in itself and leave little room for interpretation in order for the result to be replicable and free of individual scientific advisors' judgment. It should further ensure that the boundaries were defined with reference to qualities which were considered more stable over time. Finally, before it was run the model could be reviewed by the relevant governmental bodies that would later consider BfN's advised sites. In this way the approach should ensure general acceptance of the designated sites.

Uncertainties

The TIN modelling exercise did, however, require some individual judgment. First of all the model was primarily fed with existing data about water depth. This data had been collected for different purposes using different methods, and there were problems in bringing all the data together in one model:

> We brought together all existing mapping information, and we have like all sea charts from the first world war. We tried to collect all maps. And bring them together with the actual bathymetry programmes of our hydrological institute. Which was in that time complicated, because had them in many different structures.
>
> German scientific advisor, interview

Moreover, with respect to some of the banks the scientific advisors had to make some decisions before the model could run the data – according to the German report because "the complexity of the natural conditions was only partly reflected in the available data set". Finally three types of decisions "for which a computer program is not suitable", and which "had to be made first by the analysing scientist", are described in the report:

- Inclined areas above the defined limit which represented the slopes of the bank into the surrounding plains had to be distinguished from areas with a structured relief surface on top.
- Slopes did not always reach the defined inclination fully or were not represented in the data as such.
- Marine banks could not always be identified as individual structures; they often overlapped each other.

(Klein 2006, p. 103-104)

The same three points are mentioned in ARGUMENT's report (ARGUMENT March 2003, p. 10). However, apart from these rather general reflections on difficulties in interpreting the data sets, there are no accounts of the kind of difficulties the scientific advisors encountered during the process. Both German reports account for the designation process in general and does not give more detailed accounts of the decisions that needed to be made specifically in relation to the Dogger Bank SAC. Neither do they account for the related complications and uncertainties specifically involved in the Dogger Bank SAC designation. Hence, when the difficulties takes up little space in this account, it is not because they were not there – they have just not been recorded in the material I have had access to.

Socio-economic considerations

The German scientific advisors I interviewed stressed the importance of not considering the potential socio-economic implications in the designation. However, they did exclude certain potential wind farm sites from the SACs. As mentioned in the previous chapter, if member states designate more than 60 percent of the total area of the habitat type in question in their EEZ, it will generally be accepted by the European Commission without further review. A general principle for the German scientific advisors was to strive for the 60 percent. Hence, certain areas could be left out. One of the scientists showed me a map of Sylt Outer Reef, another SAC in the German EEZ (see Figure 11):

> You may ask why this [the indentation on the Northern side of the site, ed.] is around here and not just a straight line. There was clearly at that time already an indication that there would be wind farm development in this area. But we felt again on the safe side, because this is more than 60 percent of the highest German density of harbour porpoise. So we said ok, in that case there is a justification that we do not go for 80 or 100 per cent and rather leave this out from the beginning. Because we would run into problems, and indeed nowadays here are some intensive wind farm development. So one can say in that phase, when we identified so to say the size after we made the scientific screening, there were some aspects that went in that we tried to avoid main problem areas when it was not necessary. That's ok.
>
> German scientific advisor, interview

Hence, the scientist argued, they managed to prevent problems by keeping wind farms out of the sites. Furthermore it is now implemented in German law that there can be no wind farming in Natura 2000 sites. Besides a small license given before the SACs were designated, there are no wind farms either planned or constructed on German offshore SACs.

BfN finally advised ten sites in the German EEZ to government. According to one of the scientific advisors there were no major problems with getting it through the cabinet. One of the reasons, the scientist argued, is that the main concerns would have been wind farm development, and with one exception the scientific advisors had managed to keep those areas out of the SACs. Another, again according to the scientist, was that the scientific advisors stressed that the site designation was merely the first phase, and that the socio-economic concerns would be taken care of in the second round when developing management plans for the areas.

Figure 11: The Sylt Outer Reef SAC in the German EEZ. Section from map on BfN's Natura 2000 homepage. (Bundesamt für Naturschutz)

To sum up, the German process was fast, among other things on request from BMU, the ministry, who wanted fast clearance on the location of Natura 2000 sites in the marine environment. A main criterion when choosing between different methodological approaches was that the methodology should be inter-subjectively verifiable, leaving little space for individual judgment. This led the researches to base the analysis on abiotic data and analysis and to prefer TIN modeling over geostatistical analysis. The main reason why BfN wanted an approach that left little room for individual judgment and hence was inter-subjectively verifiable was to make BfN less vulnerable to criticism about bias and uncertainty. A reason for basing the boundaries on abiotic criteria and not on analyses of biological communities was further that where biological communities may change over time the shape and depth of the banks were expected to be more stable. Again, the concern was to make the site boundaries less vulnerable to the potential criticism otherwise which might come if the boundaries were justified by an analysis of biological communities and the biological communities changed.

The UK: Multidisciplinarity, triangulation and external peer reviews

March 2009, Berlin – Paul-lobe House, the Parliament Buildings. *I am observing a meeting of the North Sea RAC's Spatial Planning Working Group. The public consultation on the Dogger Bank SAC is just about to start. A representative from the UK Joint Nature Conservation Council (JNCC), the governmental advisory agency tasked with proposing Natura 2000 sites for designation in the UK EEZ, is there to present the proposed site. She shows a number of maps of the proposed SAC on Dogger Bank and tells a bit about the public consultation which will start shortly.*

2nd October 2009, Clarington Hotel Sign, Stockholm, Sweden. *The European Commission has invited managers, policymakers, scientists and stakeholders to a 'Workshop and Concluding Conference on*

Maritime Spatial Planning'. One of the events on the agenda is a presentation on 'Cross-border cooperation on the Dogger Bank' by a representative from a Dutch research centre and a representative from JNCC. But the Dutch researcher gives the presentation alone. Later he tells me that the JNCC representative had been told not to talk about the Dogger Bank UK SAC proposal. The Dutch researcher had furthermore been asked not to show any maps of the proposed UK SAC boundaries.

***December 2009.** I am on the JNCC homepage where all meeting documents and minutes of meetings from committee meetings and Marine Natura 2000 Working Group meetings are available. But as the only ones, all hyperlinks to documents related to Dogger Bank are inactive and 'In confidence'.*

Months pass by. I communicate regularly with Peter Wright, one of the UK advisors. He can't tell me much, he says, and when he does, he only gives me a few hints and asks me not to take notes. Hopefully, he says, they will be able to open up again soon again and he can tell me what has been going on.

***March 2010, Copenhagen.** Peter Wright is in town to attend a meeting and meets me on a café. JNCC has a proposal ready, he tells, but is not supposed to bring up sensitive issues during an election process. He hopes he will soon be able to tell me more now the election is over.*

***June 2010.** In a mail I ask Susan Wood about status and the expected time frame for the selection and consultation process. They have issued advice to government, she replies, and hopefully they can get government approval to start the consultation in July 2010.*

As mentioned, my first many attempts to get hold of the UK designation process on the Dogger Bank were marked by confusion and frustration. I had difficulties in figuring out what was going on, and I was advised to postpone interviewing, because the people I wanted to talk with would not be wanting to talk about the Dogger Bank. It was easy to sense, though, that it was controversial and very complicated. When I finally left for the UK to make my first interviews I had been reading through several reports filled with maps of Dogger Bank showing the sandeel density, variations in sediment type, sub-geographic formations, epifaunal and infaunal communities, water depth and slopes, amount of sunlight reaching the sea bottom, distribution of different fishing activities in different seasons and sampling locations. Quite a lot of my research questions were about getting the course of events straight and making sense of the function of all these maps.

Early versions of SAC boundaries

The scientific advice on offshore SAC designation in the UK comes from the Joint Nature Conservation Council (JNCC), the UK governmental agency providing advice on conservation policies. The Department for Environment, Food and Rural Affairs (Defra) is the UK ministry responsible for implementing the Habitats Directive in the UK offshore waters – however, as the following account will show, during the designation process JNCC have also been communicating with a number of other ministries. After having provided an overview of the overall area of habitat types – in this instance the sandbank habitat type – in the UK EEZ, JNCC have been developing pSACs (proposed SACs advised to government) for individual sites in the format required by the European Commission. The sites are then advised to government for approval. Once the government has approved it, the site is sent out for public consultation before it either goes through yet a round of revision and government approval or it is submitted directly to the European Commission for final approval at the EU level.

The UK SAC designation on the Dogger Bank went through several phases, drawing on different strategies for defining boundaries. According to a former scientific advisor involved in the initial designation work, the very first outlines of a SAC on the Dogger Bank were focusing entirely on the areas that are less than 20 meters below sea level. This was, however, before the discussions in the MEWG about the sandbank definition where the 20 metres lower depth limit was debated. Proposed SAC version 1, which is considerably bigger, was the first to be formally advised to the government in December 2004. It was advised together with seven other sites and was planned to go out to consultation in the same round. According to one of the involved scientific advisors, version 1 was based on existing data:

> At that time we had no money for doing any additional surveys. So we were relying on existing data from academic studies from the marine research organisations in the UK and elsewhere and on some studies where there had been oil and gas developments, and there had been some sampling carried out around those. So we had a mixture of different sets of data. And we proposed, at that time there were no prospect of anymore money so we had to make a proposal on what we had.
>
> UK scientific advisor, interview

The proposed site was mainly underpinned by work done by Wieking and Kroncke who had written a number of papers on biological communities on the Dogger Bank (Wieking, Kröncke 2001, Wieking, Kröncke 2003, Wieking, Kröncke 2005).

While the other sites passed and went out for consultation, the Dogger Bank pSAC was held back. The Department for Energy and Climate Change (DECC) and Crown Estate did not like the justification for the

site. The Crown Estate is the property portfolio owned by the UK Crown –in principle they own the rights to the resources in EEZ to which the UK have exclusive rights.

I need to make a small excurse here. Why would DECC and Crown Estate bother about marine conservation? A the time JNCC advised the first pSAC on the Dogger Bank to government, a World Climate Conference was under preparation in order to follow up the Kyoto Protocol, which would expire in 2012. EU was planning to take a lead in the discussions, and EU member states would be required to cut greenhouse gas emissions by some percentage, which would require a drastic increase over a short period in the supply of energy from renewable sources – a transition DECC would be in charge of. And for the UK the marine area holds major potentials for wind and wave energy.

Wind farms on land and in coastal zones are often controversial, either because they take up space and collide with other activities or because they disfigure the view. Hence, in order to obtain the capacity needed for UK to fulfil their 2020 obligations, offshore wind farms are core. But they require rather shallow waters. Floating wind farms are under development, but the technology is not advanced enough for them to be suitable for major investments. Hence, shallow offshore sandbanks are ideal sites for wind farms. And Dogger Bank is the biggest offshore sandbank in UK waters. The size of the shallow area on the Dogger Bank furthermore has the advantage that it makes it possible to place many windmills in one spot, bringing down the high costs of developing and maintaining the infrastructure between the windmills and the coast.

In 2004 DECC was aware both of the need for some transition to renewables in the near future and of the potential of the UK offshore environment in this regard. The same is the Crown Estate, who will be giving the licenses for offshore wind farm development. And the prospects of a protected area on the Dogger Bank raised concerns.

DECC rejected the proposed site on the grounds that they did not find that the information underpinning it was sufficient. The scientific advisors had informed the government about shortcomings in the data, particularly as to where to draw the boundaries: “We said at the time that there was good justification for having a site at the Dogger Bank, but we weren’t very certain about where the boundary should be, because we didn’t have a lot of data and it didn’t help very much in defining the boundary.” DECC wanted a better scientific underpinning of the boundaries. Nonetheless, the government’s rejection was not expected by all. Where the offshore area in general was considered a “data-poor environment”, there was relatively more existing data on the Dogger Bank. One of the interviewed scientific advisors, who entered the process later, believed “there was a lot of surprise when we found there wasn’t enough information on the Dogger Bank, because widely regarded I think it is a quite researched area.”

Site boundary version 1.5

When the site was rejected, JNCC put the Dogger Bank SAC designation on hold for a while. There were two issues: First of all, they needed more funding to provide better justification for the site. They were hoping to persuade government to provide that. Secondly, there was still no agreement on a common sandbank definition at the level of the European Commission. While the definition was still unresolved, eventual new formulations might have implications on where the boundaries should be.

In 2005 the UK Marine Biodiversity Policy Steering Group was established. It consisted of representatives from Defra, DECC and DTI (Department for Trade and Industry – the ministry in charge of all oil and gas licensing). According to one of the scientific advisors,

> It's the group through which we get government-level comment on scientific advice. So we don't have to take any notice of what they say, but it's useful to have a discussion with them and they give feedback on things we bring to them. […] It's a way of getting comment and a viewpoint from other government departments who make decisions. Because it's offshore waters that we're talking about, the sites need to go through government approval at the UK Cabinet. The reason for having this group is to try and guess what the response will be to these proposals coming through the Cabinet for approval that we want to have an idea beforehand if there are going to be problems. So we can have some time to resolve those if we can. So that's the purpose of it.
>
> UK scientific advisor, interview

JNCC consulted this group regularly on the other site designation processes in the EEZ. Dogger Bank, however, was on hold until JNCC received more funding to collect more data. Finally, in 2008, JNCC received funding for the Dogger Bank designation, and a survey trip was organised. They took on a multidisciplinary approach. On a 19-day trip in April 2008 the staff onboard the survey ship *RV Cefas Endeavour* collected data on the sediment type, marine life, sub-geological features and bathymetry of the bank. On the basis of a number of different datasets a new site, version 1.5 (see Figure 12), was finally formally advised to government in October 2008.

However multidisciplinary the data was, the more dominating approach underpinning the boundaries of the site was an analysis of the slopes on the bank based on bathymetric data. The approach was inspired by the German TIN- modelling approach, and direct reference in the selection assessment (Joint Nature Conservation Council 28 October 2008) is made to the German report on the scientific basis for site selection (Klein 2006).

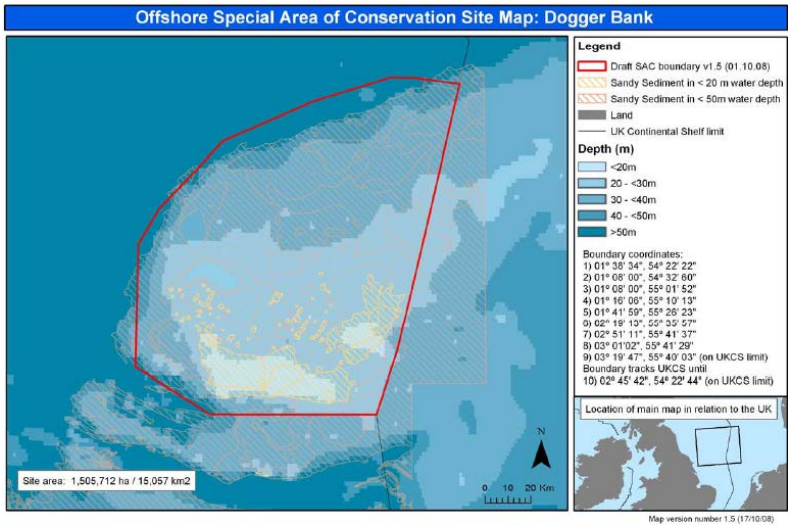

Figure 12 Dogger Bank SAC version 1.5. (Joint Nature Conservation Council 28 October 2008, p. 5)

There were some problems with applying the slope analysis particularly on the Northern slope closest to the border between the UK and Dutch EEZs (CEFAS 2008, p. 96-97). The slope on this part of the bank is very shallow – something which, one of the scientific advisors told me, made it hard to identify a line on the bank.

UK scientific advisor	…it was a very fine change in the slope, one degree change from effectively that to that [pointing out two spots in the room we are sitting], I mean it's incred.., when you call it a bank people realize what the slope angles are, you know you could roll a marble down it possibly but it's a very, very shallow slope..
Interviewer	So it was hard to determine the changes?
UK scientific advisor	Yes, effectively yes, you had to make a choice.

The problems with defining a slope-based boundary on the Northern end of the bank is likewise described in the report about the surveys that were carried out on the basis of the data collected in April 2008:

> In the northeast corner, the seabed is essentially flat with slopes below 0.1°. In such a case, a straight line should be drawn connecting slopes above 0.1° ... However, there is no information available where the closest slope above 0.1° is located (possibly on the Danish continental shelf). Therefore, an arbitrary straight line running from west to east was drawn, but should not be taken as definitive (CEFAS 2008, p. 96-97).

There were other problems with the slope analysis, too – problems making the scientific advisors supplement the morphometric approach inspired by Germany with other approaches. In the report making up the main reference in the SAC Selection Assessment – *Understanding the marine environment – Seabed habitat investigations of the Dogger Bank offshore draft SAC* (Diesing et al. 2009) – these problems and decisions about how to extend the definition are described in some detail:

- In the northwest, early Holocene sand ridges are stacked against the Dogger Bank. As these do not belong to the Dogger Bank, they were excluded, which forced us to draw the boundary across sloping areas in a straight line.
- In the southwest, the slopes are bifurcating, forcing us to make judgements which slope to follow. We decided to draw the boundary along the base of the slope that is closest to the summit of the bank and leads into a flat surrounding area of significant size. (Diesing et al. 2009, p. 96-97)

As the slope analysis of the UK Dogger Bank was not helpful in defining more exact boundaries on the shallow slopes, the boundaries in version 1.5 were adjusted and confirmed by, among other things, a sub-surface analysis of the geological formations which make up the Dogger Bank. On the basis of seismic survey data a number of formations were identified as deposits associated with different glacial periods. Figure 13 shows some examples of seismic lines collected on the Dogger Bank and the related interpretations. The Dogger Bank Formation, which is depicted as a grey-blue area on the top of the bank, is described as the youngest of the formations, left by retreating glaciers during the last glacial period (Diesing et al. 2009, p. 35). The Dogger Bank Formation is argued to dictate the shape of the Dogger Bank,

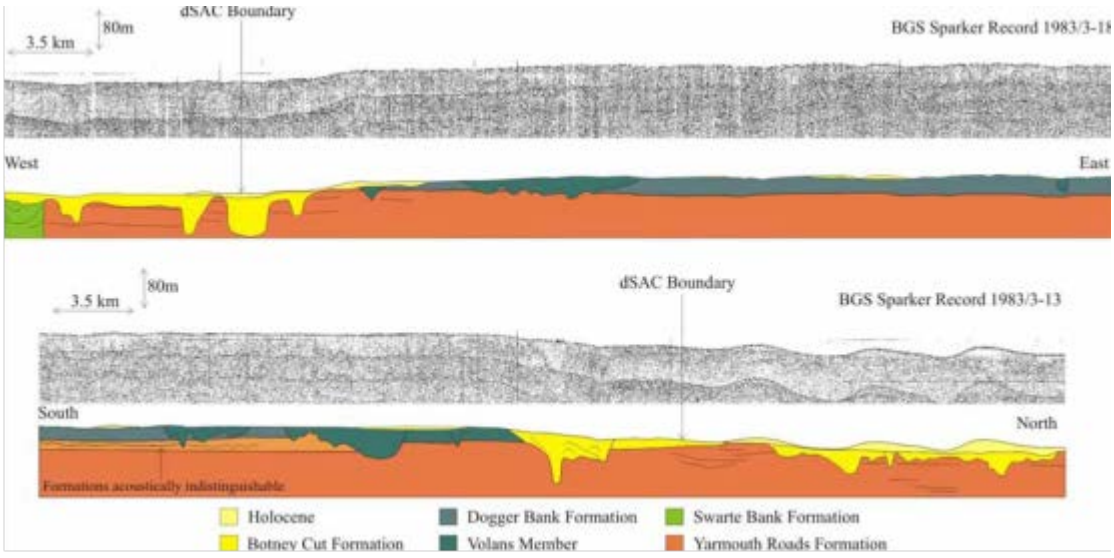

Figure 13 Seismic samples from the Dogger Bank and related interpretations (Diesing et al. 2009, p. 34).

and the boundaries of proposed SAC version 1.5 have been adjusted a few places according to the boundaries of the formation.

The reason why sub-geological surveys were at all considered for the designation, one of the scientific advisors told me, had to do with the logistic organisation of the survey:

> If we were just going out and collecting the data for the Habitats Directive, we wouldn't really be interested in the subsurface geology, but it was a joint survey with [...] a marine research institute and also British Geological Survey […]. So because they were taking the ship out – and it's expensive to take the ship out, there are the personnel – they also wanted to collect data to update their geological maps. […] So we had it available to use.
>
> UK scientific advisor, interview

But how could mappings of sub-surface geological formations help define the boundaries of a habitat for biological communities living in the water column, on the sea bottom or, at the deepest, in the upper sub-surface sediment? First of all, another scientist told, by helping to identify the particular sandbank type: "Well what makes the habitat out there really is this, it's a large lump of peri-glacial dumping, and the various sorts of sandbank are based on how they are formed originally […]. This is a glacial mound and it's a glacial mound sandbank so it's one of the categories of sandbank that we chose to go on."

The geological origins of the sandbank, the scientist explained, are relevant for its qualities as a habitat type because it controls the biology to some extent. For example, sandbanks made from drifting sand tend to have ripples, be steeper and be mobile. The Dogger Bank, being sandy sediment over hard substrata, is not mobile. And the slope is shallow – some places almost like a plain. The geology controls the biology because it defines the shape and mobility of the bank. Finally, while the geological typing of the sandbank also tells something about the mobility of the sandbank, it is useful in considerations about how close the boundaries should be drawn to the feature. If the sandbank is tidally generated, it might be mobile, why the boundaries should not be drawn closely around it. But Dogger Bank is sandy sediment on a glacial mound, which means that the boundaries can be drawn closely around it. The mapping of the Dogger Bank Formation led to minor adjustments of the boundaries, but was generally found to support the slope analysis.

Site boundary version 1.5, then, was mainly based on based a slope analysis inspired by the German TIN modelling approach. However, where the slope analysis was weak, for example in areas where the slope on the bank was very shallow, the approach was supplemented by other approaches. Finally, besides from

changing the boundaries and the scientific underpinning of them, JNCC in pSAC version 1.5 also added harbour porpoise as a qualifying feature on the site. Qualifying features under the Habitats Directive are the habitat types and species which are not just present, but also qualified for protection under the Habitats Directive on a particular site. In order for a species to be a qualifying feature it should be graded A, B or C on a site. This means that the site is considered essential for its life and reproduction. If it is graded D the species is present on the site, but the site is not considered important for it, and the species does not qualify for particular protection on the site.

In pSAC version 1.5 harbour porpoise was graded C and consequently a qualifying feature. The argument behind the grading was that whereas the site was big, a certain proportion of the population of harbour porpoise would be visiting the area.

External review

The proposed Dogger Bank SAC version 1.5 was published on the 28th of October 2008, and the first pre-consultation meeting was held in December. The consultation never started, though – the proposed site did not pass the internal consultation with government. The DECC and the Crown Estate were not satisfied with the scientific justification behind the site – neither for what concerned the size of the sandbank site nor for what concerned the grading on harbour porpoise on it. According to one of the scientific advisors, the assessment behind the Dogger Bank proposed SAC version 1.5 was well underpinned this time – DECC's concerns, the scientist argued, had more to do with the potential implications of the site:

> There obviously was a lot of information and we had obviously been out to do a survey, particularly to look at where the boundary should be. But because of the large size of the site and because of the interests of the number of industries in that area, they were very concerned this was going to cause them a lot of problems. And they realised that they could only argue with the case on scientific grounds, so they very closely questioned all of our recommendations and why we'd done this sort of statistical analysis and why we'd done that and where the data had… We applied the same methodology as Germany. […] But then they didn't like the slope analysis because there could be differences in the biological communities.
>
> UK scientific advisor, interview

During 2009 a number of meetings were held between JNCC and government. DECC hired the external research centre Hartley Anderson Ltd. to consider the justification of the boundaries. In the internal discussion paper *Dogger Bank Faunal Consideration* published in September 2009 Hartley and Anderson (Hartley, Anderson September 2009) questioned the scientific basis for the boundaries on a number of

points. First of all, on the basis of a cluster analysis of existing data on the biological life on the Dogger Bank Hartley and Anderson argued that the biology across the bank was rather uniform and that any attempt to divide the biological community into separate groupings would be arbitrary and subjective. Secondly they argued that as the slope analysis was indistinct on the shallow slopes, boundaries based on slope analysis would be arbitrary, too. What the data did show, they argued, was that the shallowest areas of the Dogger Bank were different from the rest. On this basis they suggested an alternative boundary focusing entirely on the shallowest areas with a depth criterion of 25-30 metres. As the internal discussion paper is confidential, the suggested alternative boundaries cannot be shown here, but the site is square and considerably smaller than the one proposed in pSAC boundary version 1.5.

Along with the internal discussion paper, which was given to JNCC, DECC requested more biological data in the scientific underpinning of the site, as this was more relevant for justifying a protected site with the objective to conserve biodiversity. Some of the involved scientific advisors I interviewed felt that the 2008 boundaries were well justified. Asked about whether the rejection had to do with the interests on the site, one of the scientific advisors said that:

> Yes I think you could safely say that if you want to put forward an area where there are a lot of industry interests, you need a stronger justification. Whereas if there were no industry interests in an area, they'll have a look at it and see if they think you've applied the guidelines reasonably well, but generally don't have a problem with it. But the Dogger Bank has a lot of industry interests there. And also the question of sandbanks and the definition of the habitat's extent is scientifically a very difficult one as well. So that makes it twice as difficult.
>
> UK scientific advisor, interview

Likewise another scientist argued that:

> UK scientific advisor: Plainly anyone who is looking at it will look at implications without a shadow of doubt. Yeah, what does it mean. If you were told by law to close whole the Southern North Sea, everyone would complain. Why? It's not because they close it, it's because of the implications and the socio-economics. So I think undoubtedly there would have been people looking at the socio-economic implications and saying 'is this just being lazy on the science?' And I think everyone understands perfectly well that you can't go on socio-economic. But on the other hand you think of the implications. Inevitably.

Interviewer So they wanted more justification for such a big site?

UK scientific advisor I think so. And that's… It's reasonable.

Even though there was some understanding among some of the involved scientific advisors for the need for more justification due to the potential socio-economic implications, it was still important to ensure that the scientific underpinning was not motivated by interests. The input coming from Hartley and Anderson was not considered free of interests because it had been ordered from DECC:

UK scientific advisor They were questioning the scientific justification. […] But because of the department that that question comes from, it certainly would be seen as possibly taking socio-economic factors into account.

Interviewer So they may argue in scientific ways, but…

UK scientific advisor …You know why they're arguing about it. And so, because of these questions, we had a lot of discussions with this person and we didn't agree. And so we had got to a point where we weren't going to agree, there was one point of view and another point of view, and it wasn't going anywhere.

In order to find a solution they needed a judgment from someone who would not be associated with any interests in the outcome, so two independent peer reviews were commissioned. Independency was ensured by hiring experts from outside the European context: One from Canada and one from the United States. The reviewers were asked to consider JNCC's scientific underpinning of the site as well as the input and proposed boundaries from Hartley and Anderson.

I have been asked not to go into details with the reviews, and the details may not be that relevant here, either. But basically one reviewer supported JNCC's proposed version 1.5 boundaries and commented that there was more documentation than what would normally be expected for that kind of policy implementation. The other reviewer argued that the justification was fine, but that there could also be justification for a smaller site looking at the continuity between the biological communities.

Harbour porpoise and wind farms

As mentioned, DECC also questioned the rationale behind making harbour porpoise a qualifying feature. Again, I need to make a small excurse. Why would DECC bother about harbour porpoise? In March 2008, half a year before JNCC advised the Dogger Bank pSAC version 1.5 to government including the C grading of harbor porpoise, the European Council agreed on the guiding principles of

the Climate and Energy Package. The so-called 20-20-20 targets defined in the package, which would finally be adopted by the European Parliament in December the same year, was by 2020 to cut greenhouse gas emissions by 20 per cent, increase energy efficiency by 20 per cent and obtain 20 per cent of the total energy in the EU from renewable sources. UK had committed to obtain 15 per cent of their energy consumption from renewables by 2020, and wind power was one of the main strategies to obtain this target. In June 2008, four months before JNCC advised the Dogger Bank pSAC version 1.5 to government, UK Prime Minister Gordon Brown gave a speech at the Government's Low Carbon Summit in London's South Bank. He presented 'The UK Renewable Energy Strategy' which was up for consultation – a strategy to fulfil UK's commitments under EU's Climate and Energy Package:

> Last year I committed our country to fulfilling our share of the European Union renewables target. This means that by 2020, increasing the proportion of our energy coming from renewable sources to 15%. Now we are setting out how we will achieve this, and let me just tell you this is a green revolution in the making. It will be a tenfold increase in our current deployment of renewables, a 300% increase on existing plans. It is therefore the most dramatic change in our energy policy since the advent of nuclear power and it will require an investment programme – and this is the huge opportunity – of around £100 billion over the next 12 years.
>
> It will mean by 2020 renewables accounting for over 30% of electricity supply, 14% of heat supply, up to 10% of transport fuels. It will save an additional 20 million tonnes of carbon dioxide a year, it will reduce our gas imports by up to 16%.
>
> And what does it mean therefore in real terms? Well first it will turn the North Sea and our other coastal waters into the equivalent for wind power of what the Gulf of Arabia is for the oil industry. This year Britain will surpass Denmark as the country with the highest operating offshore wind capacity in the world at over 400 megawatts. By 2020 we will have installed around 14 gigawatts, that is around 3,000 offshore wind turbines, meeting up to 50% of our renewable electricity. The North Sea has of course passed its peak in oil and gas supply, but it will now embark on a new transformation into the global centre of the offshore wind industry.
>
> UK Prime Minister Gordon Brown
>
> Speech at Government's Low Carbon Summit in London's South Bank, June 2008 (Brown 2008)

As mentioned, Dogger Bank is for different reasons by far the most important practical element in this strategy. The target capacity for the wind farm which has been projected there and which is currently in the planning phase is 9 GW; a big part of the 14 GW Gordon Brown mentioned in his speech. Hence, the prospects of a protected area on the Dogger Bank raise concerns, both at DECC and at Forewind Ltd.

But what are the concerns in relation to the grading of harbour porpoise as a qualifying species? According to a wind farm development representative and some of the scientific advisors and NGOs I talked with, the main concern is that harbour porpoise is sensitive to noise. This will not be a problem in the long run, but the construction phase involves a lot of drilling. Some of the informants I spoke with referred to an impact assessment ordered as part of the preparation of the construction of a tunnel on another Natura 2000 site where harbour porpoise and common seal is included as a qualifying species (Nehls 24 June 2009). The study draws on other studies which point to different ways in which noise may be harmful to harbour porpoise (Lucke et al. 2009, Southall et al. 2007, Richardson et al. 1998). For example, harbour porpoise communicate making sounds, and the noise may disturb their communication. Noise may also stress harbour porpoise so they stop their activities in the area, perhaps also leave it. Moreover, at very high levels, noise may cause temporary or permanent hearing impairments, which for harbour porpoise is particularly problematic because they depend much on their hearing.

Hence, there are concerns about what the implications will be for wind farm development if harbour porpoise is made a qualifying species on the Dogger Bank. An environmental NGO representative told me that wind farm developers could be requested to use mitigation measures, which could for example consist in stopping the boring activity when harbour porpoise enter the area or in drilling with gradual intensity, allowing eventual harbour porpoise in the area to leave before the sound becomes harmful. And a wind farm developer with activities elsewhere in the North Sea told that establishing offshore wind farms is extremely costly, and that such requirements could easily mean that it would not be economically viable.

Harbour porpoise grading – revisiting the rationale

While JNCC now worked on a new Dogger Bank SAC version they were under pressure from two sides. On the one side was the government; on the other the European Commission. A section from the minutes of meetings of the JNCC Marine Natura 2000 Project Group – the body in JNCC steering the selection advice process – shows some of JNCC's concerns. The section is about a bio-geographical seminar held by the European Commission with all the member states in the same bio-geographical region. A number of these bio-geographical seminars are held during the Natura 2000 designation process. The purpose is to coordinate the designation process in order to ensure a coherent protection of habitats and species across member states in the same region. The seminars are based on the member states' reports on status. The

following section from the JNCC minutes reports on one of the participants' account of the latest seminar. As the latest Dogger Bank pSAC for which harbour porpoise was graded C had not been approved by government, harbour porpoise was according to UK's latest report to the European Commission not graded as a qualifying species on the Dogger Bank.

> The UK could face infraction if we do not progress sites for Harbour porpoise. The Commission did not accept that there is not sufficient data for identifying life and reproduction sites for Bottlenose dolphin. It was agreed that there was not enough evidence from the SCANS photo data but [NGO representatives and scientists at the meeting] felt that other data indicating presence would be sufficient. […] (Joint Nature Conservation Council May 2009)

It appears from the minutes that following the report on the bio-geographical seminar the group discussed the pressure they face from the UK Government: "The present problem with DECC and Crown Estate blocking consultation on Dogger Bank mainly due to its Harbour porpoise grading was explained to the group. It was suggested that a review of marine mammal data may be required at this time." (Joint Nature Conservation Council May 2009)

Thus, JNCC were subjected to pressures from the European Commission, other member states, experts and environmental NGOs to advance their protection of harbour porpoise. JNCC feared infraction at the European Court – some of those who might raise a court case were the environmental NGOs. On the other hand DECC and Crown Estate had problems with their proposed harbour porpoise designation on the Dogger Bank and were blocking consultation.

Consequently, JNCC needed to be able to justify their advice. And according to one of the involved scientific advisors DECC were asking hard questions:

> In the 2008 version, that boundary, harbour porpoise was put in because our interpretation […] at that point was that if you went over a certain percentage of the harbour porpoise population you could put it in. So that size of site, put it in. […] Now we went and revisited our legal logic and now think that actually it's wrong. In other words you can't just do it on a percentage basis, because essentially then everywhere could be a site if you think about it. Because let's say you could choose any part, you could just choose any one percent of the range of the harbour porpoise and you then got a site. So you actually need something that says that this place is different from somewhere else, and there's nothing to indicate that this, let's say you took that lump of sea and you moved it North-Westwards and put it there, there's no difference! So it's not… The [criteria in the Habitats Directive say] 'only where there's a clearly identifiable area that is' – I am trying to get the exact word, and I'm

not particularly good at remembering them – 'that is essential for their life and reproduction.' Now if that could be there or it could be there it isn't essential [laughs].

UK scientific advisor, interview

According to the scientific advisors I interviewed they found DECC's critique to be right. And they changed their rationale for harbour porpoise grading on two grounds, both of which had to do with harbour porpoise being a highly mobile species. The first was legal and scientific, with reference to article 4.1 in the Habitats Directive: "For aquatic species which range over wide areas, such sites will be proposed only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction." (European Commission 1992, article 4.1) The scientific advisors found that they lacked documentation for the relative importance of Dogger Bank compared to other areas. They did not, however, collect more data. According to one of the scientific advisors, it would have been extremely costly as collecting data only on the Dogger Bank would not tell anything about the relative importance:

Then we wouldn't be comparing the Dogger Bank with anywhere else. To be scientifically valid, we would have to collect more data across the whole area to then identify whether there were areas that were more important for the harbour porpoise.

UK scientific advisor, interview

The second reason JNCC found for changing their rationale for harbour porpoise grading had to do with their approach to marine protected areas as a conservation tool. They found that for highly migrating species like harbour porpoise site-based protection does not make sense. Other measures would be more relevant:

The difficulty is that there's a bit a fundamental difference in view, in that JNCC's view is that for harbour porpoise, unless you have something to indicate that a site is particularly special for that species, we think that wider measures, fisheries management measures for by-catch, for noise or disturbance, are more appropriate for the conservation of the species than having a conservation objective on a site, just because they happen to pass to and fro.

UK scientific advisor, interview

According to another scientist,

A better way of doing conservation across the board is look at the threats to the things you're interested in looking after. Then you work out the best strategies to reduce those threats or get rid of

them even then sometimes. And protected areas is just a tool to do that. So for harbour porpoise we know the main threat is certainly bycatch [species caught unintentionally while fishing for other species, ed.]. So there are several ways to deal with bycatch. One of which is to ban the fishery, you pay fishermen to go away or stop fishing, using that method. You could put acoustic alarms on the nets. […] Other threats, there's probably a relatively minor threat from noise. So you're not going to be able to get rid of all the noise but you might be able to manage it a bit. And so on. So look at the threats and work on the threats.

UK scientific advisor, interview

One of the main concerns with grading harbour porpoise C or above on the Dogger Bank if it was not properly justified was that it would require management measures, no matter whether they found it relevant on the site or not. "Because", one of the scientific advisors argued, "otherwise there's no point in having it as a feature of the site." Such management measures would require proper documentation of the need for them, the scientist found, and that would be hard to provide: "We don't feel it's justified to identify conservation measures for that site that are different from the areas outside the site, when we've got no science on which to base that. So we're in a little bit of a difficult situation there." I suggested that the planned wind farm on the Dogger Bank meant that restrictive measures required more justification:

Interviewer	I guess that if it didn't matter, it might be easier to take on a very precautionary approach, but when it does matter, then… For example I believe that the wind farm site would clash with some of the conservation objectives.
UK scientific advisor	Yeah. The difficulty is that although we need to identify the site on scientific grounds only, when it comes to looking at the management measures for a site, then it does need to be in proportion to what's required. We shouldn't be bringing in very strict management measures if it's not justified to keep the site in good condition.

In this way, picking the right scientific rationale for designation still required some acknowledgement of the potential implications in order to consider how to weigh the uncertainties and the arguments against site-based protection of highly migrating species.

JNCC reconsidered their rationale for harbour porpoise grading. They found that site-based protection of harbour porpoise would not make sense unless it was possible to document the importance of the

particular site to harbour porpoise relative to the importance of other sites. Moreover, they found that the data they had did not point to such relative importance, and that it would be very costly to collect enough data to be able to say more about it. Particularly because other measures to protect harbour porpoise, like regulating the use of gill nets and noise, would be more appropriate and effective. On the Dogger Bank pSAC version 1.6, harbour porpoise was made a grade D feature, which means that it is assessed as present but not requiring more protection than elsewhere.

Site boundary version 1.6

Following the peer review process the boundaries were reconsidered, this time with greater emphasis on the biological data. The data gathered in April 2008 was analysed again, and four clusters of biological communities were identified – the ones that are illustrated on the map in Figure 14. The communities identified by Wieking and Kroncke were largely confirmed, but the improved spatial resolution of the new data made it possible to get a better impression of their spatial distribution. One of the communities, in deeper waters on the Northern slope and in more muddy sediment, was found to be different from the others. It had been included in version 1.5, but was now excluded by moving the Northern boundary southwards. The exclusion had nothing to do with the particular kind of community, but rather with the fact that it was different from the ones on the top:

UK scientific advisor	I'm not sure how familiar you are with the definition of sandbanks in the Habitats Directive, but it talks about how the sandbank might extend below 20 metres if the biological communities extend down. So that's what we had, we had the shallow water communities right at the top, from 15-20 metres there was another community that ran down to 35-40 and then it changed to a more muddy sediment and a different set of communities, and they were excluded from the revised boundary.
Interviewer	So the rationale was not that you did not associate the kind of community you found there with sandy sediment, but it was that it was not extending from the top?
UK scientific advisor	Yes. That was the key thing.

The Southern boundary was also moved a bit southwards, and version 1.6, the site marked with a red line in Figure 14, was finally approved by government during the summer 2010 and went out for public consultation in October. The consultation closed on 12 December 2010. The site received some rather critical comments from both the fishing industry and the environmental NGOs – however, as the focus in

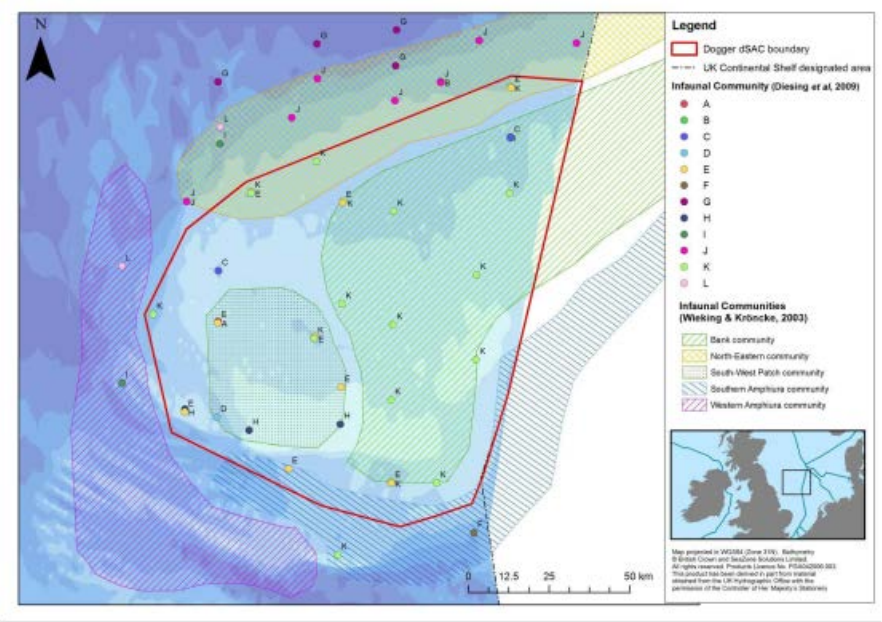

Figure 14 The UK Dogger Bank pSAC version 1.6 with biological communities analysis. (Joint Nature Conservation Council 20 August 2010b, p. 22)

this chapter is on the scientific decision making process, the consultation responses are treated in the next chapter. The consultation responses were considered and in October 2011 the site was finally submitted to the European Commission without amendments.

Scientific decision making on the Dogger Bank

As the two accounts show, the designation processes in Germany and the UK turned out very differently, both with regards to the time frame, the amount of controversy, the methodologies used and the outcome – the resulting boundaries. In this final section I discuss what framed the scientific advisors' decisions about which methods to use.

Methods operationalising the Habitats Directive

First of all, the scientific advisors have been occupied with finding methods which could operationalise the Habitats Directive and for example translate the sandbank habitat type definition to particular sites on the Dogger Bank. The sandbank definition is a core reference throughout the process.

Particularly the UK scientific advisors continually make references to the sandbank definition in the reports and in interviews. First, they have been working with different interpretations of the wording 'slightly covered by seawater' in the definition. The first versions, which were never proposed to government, were entirely areas in waters less than 20 metres deep. Later versions were deeper, but still focused on rather shallow waters. Secondly, they have operated with different interpretations of what it implies for areas to be "part of the feature and host its biological assemblages" when they extend below 20 metres. In the final version they interpret it as housing biological communities which also occur in the areas which are less than

20 metres deep. On this background they cut off a biological community which they have identified on the northern slope of the bank.

With regard to the grading of harbour porpoise, in their final pSAC the scientific advisors have taken an outset in the formulation in Article 4.1 in the Habitats Directive that for highly migrating species sites should be selected "only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction" (European Commission 1992, p. 6). The scientific advisors found that the data they had could not point to any clearly identifiable area essential to the life and reproduction of harbour porpoise.

With respect to the German Dogger Bank SAC, it was submitted in 2004 when the work to review the sandbank definition started. Hence, the scientific advisors took an outset in the older definition. They did not operate with any interpretations of what 'slightly covered' means – their TIN model generally defined the boundaries where the bank levelled off to the surrounding sea bottom, no matter the depth. Thus the German scientific advisors have been operationalising the sandbank habitat type by identifying banks with slopes elevated from the surrounding sea bottom and with sandy sediment. All in all, besides from focusing on elevations and sandy sediment the details of the sandbank definition was not a core reference point during the designation process.

What was given weight in the Habitats Directive, however, was the principles related to the area of habitat. That when a member state designated 60 per cent or more of the overall area of the particular habitat type within the EEZ, it would generally be accepted by the European Commission without further evaluation. The German scientific advisors strived to designate more than 60 per cent of the total area of habitat. Hence, they also felt safe when they chose to leave out certain areas because of the prospects of wind farm development in the area.

All in all, in despite of several actors having criticised it for being too detailed and rigid, the Habitats Directive does hold some room for interpretation. And as the UK and German processes show, there are multiple ways of operationalising it within national frameworks. However, being able to account carefully for the relation between the sites on the one hand and the sandbank definition and the criteria in the Habitats Directive on the other has been core in both processes.

Methods useful for drawing lines

The scientific advisors have been tasked with identifying representations of sandbank habitat types defined by boundaries in order for it to become a SAC. Hence, the scientific advisors in both Germany and the UK have been looking for methods which could draw lines on the Dogger Bank. In Germany they chose an

abiotic approach, among other things because biology was considered 'fuzzy': It required a lot of individual judgment about where the biological communities start and end, and the communities may change over time. An abiotic, mathematical model was designed based on a number of criteria, most of them about how to draw lines. For example "Boundaries are generally drawn at the transition from the slopes of the bank into the surrounding plains", and "In more level areas they are marked by the straight line between the ends of the slopes as defined above." (Klein 2006, p. 101)

In the UK the first pSAC advised to government was rejected on the grounds that there was not enough data underpinning the boundary. The scientific advisors had told government that there was enough justification that there was a sandbank habitat on the Dogger Bank which should be protected, but that they were less certain about the boundaries. It was on this basis that DECC rejected the site – they wanted more science to underpin the boundaries.

In pSAC version 1.5 the boundaries are primarily based on the same TIN modelling approach as in Germany – however, it is not useful on the North eastern edge of the bank, where the slope is shallower than 0.1°: "In such a case, a straight line should be drawn connecting slopes above 0.1° ... However, there is no information available where the closest slope above 0.1° is located" (CEFAS 2008, p. 96-97). Hence they choose in this SAC version to draw an "arbitrary line" as the method cannot help draw it – however, as the line is 'arbitrary' and not supported by method, it is stressed in the report that it "should not be taken as definitive" (CEFAS 2008, p. 96).

What makes it important to underpin the boundaries in the UK is first of all that DECC and Crown Estate finds that the site is very big. It is not the site as such, but the particular placement of the boundaries, making the site so big, that worries them. Hence, they request more justification for the particular boundaries.

In this way, when choosing between methods an important criterion is whether they can draw lines, as it is the particular boundaries of the sites that the scientific advisors are tasked with defining.

Methods providing proper, disinterested and scientific explanations

Scientific advisors in both member states put an effort into choosing approaches that would ensure a proper scientific underpinning of the site. First, both groups strived to provide scientifically, as opposed to randomly, defined boundaries. In the UK the need to underpin each boundary carefully developed throughout the process as a consequence of DECC's quest for more data. When the first version was advised to government the scientific advisors told that while there was enough documentation to stress the need for a site on the Dogger Bank, the specific boundaries were not well underpinned because of lack of

data. DECC wanted more documentation for the boundaries – hence, the boundaries in version 1.5 were accompanied by a number of different data sets, and the specific boundaries were underpinned in greater detail, primarily on the basis of a slope analysis. Where the slope analysis was not helpful in defining the exact placement of the boundary, it was mentioned in the report. One place with the comment that it was simply a 'choice', and that for the same reason this particular boundary should not be taken as definitive. Elsewhere the slope analysis was supplemented with a sub-geological analysis in order to underpin the particular course of the boundary.

In Germany, the attempt to provide scientifically defined boundaries manifested itself in the choice of a mathematical approach. Once the criteria for the model had been defined, the result should follow rather mechanically independently of individual scientific judgments and hence also to provide replicable results.

Secondly, both groups put an effort, however differently, into keeping the scientific underpinning of the sites disinterested. Where the German scientific advisors dismissed most consultation responses on the grounds that they were informed by interests, UK scientific advisors did not rely on the review report commissioned by DECC, which was an involved actor, but hired external reviewers from the US and Canada in order to ensure that the reviewers were outside the European context and free of any interests in the political outcome.

Methods accepted by government

With regards to the designation process the governments are the clients who ask for scientific advice. They are obliged to designate sites according to the Habitats Directive, and the sites they designate are supposed to be defined exclusively based on science. In Germany as well as in the UK they hire the national agency delivering scientific advice for nature conservation to provide the scientific basis for the designation. And in both designation processes the scientific advisors put an effort into meeting the government objectives within what they find to be reasonable limits.

In Germany the environmental minister wanted a fast process in order to be able to proceed with wind farm development. The scientific advisors chose to base their designation primarily on data about water depth – existing data which at the same time would be relatively simple to analyse. They furthermore chose a process through which they could identify all relevant areas in the EEZ at once. They were funded substantially by government and assigned a whole series of research projects the same year as the extension of the Habitats Directive to the EEZ was implemented in German law.

Furthermore, before they ran the TIN model they invited all relevant governmental bodies to review the definition of a bank they intended to use in order to get approval on beforehand and prevent criticism on the approach at a later stage.

In the UK, on the other hand, some ministries, particularly the Department for Energy and Climate Change, and also the Crown Estate, had major concerns about whether a SAC on the Dogger Bank would collide with the development of the wind farm. In doing so the SAC would also collide with the main element in UK's strategy for meeting their EU 20-20-20 obligations. Particularly the prospects of having special obligations to protect harbour porpoise on the site were concerning, mainly because harbour porpoise are sensitive to noise. Noise would inevitably dominate the drilling during the construction phase when placing the multiple windmills. Accordingly, DECC questioned the scientific basis for the boundaries of the site and rejected it two times. First they rejected it on the grounds that there was not enough justification for the site. The scientific advisors then took on a multidisciplinary approach, made several surveys on the Dogger Bank and revised the site on the basis of a combination of very different data types and analyses. DECC then rejected the site on the grounds that they wanted more biological data to justify the boundaries such a big site and because they did not follow the logic of JNCC that lay behind the C-grading of harbour porpoise. With regard to the boundaries, JNCC then advised a new site where they put greater emphasis on the biological data. With regards to the harbour porpoise grading, the scientific advisors revisited their own logic and found that it was wrong. On the new site they, graded harbour porpoise D, meaning that it is present but does not require particular protection. While still drawing on practices for maintaining the boundaries between science and politics, for example by using external peer review to consider DECC's comments on the boundaries, the scientific advisors have been trying to meet the government's claims.

Throughout the process the scientific advisors met with the UK Marine Biodiversity Policy Steering Group consisting of representatives from the relevant ministries, that is, Defra, DECC and DTI (Department of Trade and Industry – the ministry among other things in charge of all oil and gas licensing). The purpose was to foresee potential problems and take hand of those before the site was submitted for governmental approval in the Cabinet.

Thus the scientific advisors in both member states did much to accommodate their governments. They did, however, put some effort into producing disinterested advice. In Germany, the ministry of oil questioned some of the advised sites – however, the scientific advisors stressed that they could not consider industry interests in the initial designation of sites, but that such concerns would be taken care of in the next phase when working out management plans for the designated sites. In the UK, the scientific advisors found it hard to accept the site suggested by an external reviewer which had been hired by DECC. In response they

hired two independent advisors in order not to be open for the critique that they had been drawing on scientists hired by one of the interested parties.

Methods dealing with wind farms

An interesting observation concerns the way the two groups of scientific advisors deal with potential wind farms. In Germany they choose to keep an area out of the SAC on Sylt Outer Reef, and they explicitly do so because a wind farm is being planned on the site. They justify their choice by arguing that the resulting set of reef SACs covers more than 60 percent of the overall area of reef habitat in the German EEZ and more than 60 per cent of the harbour porpoise population. Still, in the interviews they stress the importance of not considering socio-economic concerns in this initial designation. This does not seem to fit with the choice to exclude an area on Sylt Outer Reef on the grounds that a wind farm was being planned there and that not designating it would avoid problems.

In the UK, on the other hand, the scientific advisors have major difficulties on the Dogger Bank because of the planned major wind farm on the site. The dialogue, however, was kept scientific, and DECC's concerns were formulated as questions about the methodological approach and the data. And when an external reviewer hired by DECC questioned the reasoning and suggested another site, JNCC finally hired two external reviewers because they were concerned about the disinterestedness of the reviewer hired by DECC. On the basis of comments from these two reviewers the scientific advisors reworked the analysis and finally advised a site on which they had excluded a major area to the North – part of the area where the projected wind farm was planned to be built. The new placement of the Northern boundary is defined on the basis of an analysis of biological communities on the bank and with reference to the sandbank habitat type definition, and according to one of the scientific advisors they could have chosen a whole series of different boundaries which could have made sense scientifically. In this instance, the scientific advisors have had to define and choose between different scientifically underpinned boundaries. What differs, however, is the justification and the implications. With regards to the justification, the different boundaries for example differ with respect to the extent to which they are defined with reference to the biological life on the bank or not. And which of the boundaries proposed by the scientific advisors makes up proper justification in light of the potential implications of the site has to a large extent been defined by DECC and Crown Estate. With regards to the implications the final boundary excludes part of planned area for wind farm development whereas the full wind farm site is within the two former boundaries. The scientific advisors, one could argue, have been insisting on scientific methodology throughout the process – however, they have been willing to discuss which kind of scientific methodology should underpin the boundary. Perhaps the approach is best captured in a quote from one of the scientific advisors: "I think

everyone understands perfectly well that you can't go on socio-economic. But on the other hand you think of the implications. Inevitably."

Summing up, the two groups of scientific advisors operated with very different strategies in their way of dealing with wind farms: Where the German scientific advisors on the one hand insisted on being scientific in their approach, they also explicitly excluded an area from a SAC on the grounds of the potential socio-economic implications. They did not deal with the planned wind farm in their choice of scientific methods. And where the UK scientific advisors likewise insisted on being scientific, they negotiated their scientific approach with DECC and Crown Estate and ended up with boundaries that are both scientifically defined and accepted by government.

Methods fitting the policy objectives

Occasionally, both groups of scientific advisors have been referring to the policy objectives about the protection of the sandbank habitat type and harbour porpoise when they chose between methodologies. For example the scientific advisors in the UK analysed the biological communities more carefully as part of the underpinning of the last pSAC – on request from DECC who wanted more biologically underpinned boundaries in order to justify a site for the protection of marine life. In Germany they generally placed the boundaries at the feet of the bank where the slope levels off to the surrounding seabed – because, one of the scientific advisors argued, any slope is productive as a habitat for marine life.

Methods fitting the time and resources available

The work of both groups of scientific advisors was restrained by limited resources. In Germany, the funding was substantial, however the timeframe was very short, which caused the scientific advisors to focus particularly on existing data. In the UK, there was very little funding to begin with, but four years after the first proposed SAC was rejected on the grounds that there was too little data to underpin the boundaries, more funding was granted for the designation on the Dogger Bank, allowing the scientific advisors to take on a multidisciplinary approach based on new data. In relation to the grading of harbour porpoise, however, some of the scientific advisors told that they had not had funding enough to assess in greater detail the importance of Dogger Bank for harbour porpoise. And according to one of the involved scientific advisors, an assessment of the relative importance of Dogger Bank for harbour porpoise compared with other areas would have been very costly as it would require data collection over the whole UK EEZ.

Methods dealing with potential criticism on beforehand

As the former discussion shows, a core consideration throughout the scientific decision making in the two member states was how to deal with potential criticism. When German scientific advisors let relevant government bodies review the definition of banks which they operated with in their TIN model before they

ran it, they did so in order to prevent criticism about the approach at a later stage. When UK scientific advisors consulted the UK Marine Biodiversity Policy Group, they did so in order to be able to resolve potential problems before the site had to go through an approval process in the Cabinet. When the German scientific advisors based their designation on abiotic data, one of the reasons was that biology is less stable and changes over time, and that eventual changes in the biological communities on the bank might occasion criticism if the boundaries had been based on a biological analysis. When the German scientific advisors avoided main potential wind farm sites on the sites they designate, they did so in order to prevent major problems related to the designation as well as to the later management of the site.

Summary

> [The Member States'] choice of sites is an exclusively scientific exercise undertaken using standard selection criteria specified in Annex III of the directive. (European Commission 27 December 2002, p 8)

According to the Habitats Directive the designation of Special Areas for Conservation for the protection of biological diversity is supposed to be an exclusively scientific exercise. The identification of representations of the listed habitat types, including the definition of their boundaries, must not involve socio-economic considerations. However, the designation processes on the Dogger Bank in the German and UK EEZs turn out to be very different, both with respect to the time frame, the methodological approaches and the resulting boundaries. While working within the common framework of the Habitats Directive and defining the boundaries of the same habitat type based on the same overall criteria, the scientific advisors' decisions about data, methodology and analysis have involved multiple considerations which have to do with the national framework within which they work and with the character of their particular part of Dogger Bank. The scientific advisors' work, one could say, has involved fitting the directive to the national framework while translating the sandbank definition to boundaries on the Dogger Bank.

Within the national framework, the scientific advisors have been considering the time and resources available, the national government and agenda, the potential implications, interests and interest groups. Furthermore, they have been dealing with a particular section of the Dogger Bank, and each section has either invited or resisted particular ways of drawing lines on it. When the processes turned out so differently in Germany and the UK, first of all it is due to national differences when it comes to all of these elements. And where the choices seemed straight forward in Germany, it is not because the scientific advisors could act more independent from the particular national conditions. Rather, it is because dealing with the national conditions in Germany involved substantial funding from the very start, a pressure to be

fast, less potential implications and a strategy – and possibility – to keep 'potential problem areas', in this instance potential wind farm sites, out of the SACs they proposed. Where the choices were complicated and conflict-ridden in the UK, it is due to the UK EEZ, and in particular the Dogger Bank, being important for the UK strategy for renewables and for a range of UK industries – in particular with regards to the Dogger Bank wind farm development.

The need according to the Habitats Directive for the designation of sites to be "an exclusively scientific exercise undertaken using standard selection criteria" (European Commission 27 December 2002, p 8) images scientific advice as a process that is detached from national agendas and interests. The word 'standard' suggests that the exercise can be used everywhere. The German and UK processes on the Dogger Bank, however, show that at least in these two cases such image of scientific advice is far from the actual practices involved in the national implementation of international environmental policy.

At the end of this account it is hardly surprising that the resulting boundaries in the UK and Germany are different. They are produced within two different national frameworks, which have affected the scientific decision making differently. When the boundaries do not meet or break at the borders between member state EEZs it illustrates that the scientific advisors work for different governments, that their advice have different potential implications, that they have been working within different time frames and with different amounts of funding, that different stakeholder groups are involved and that the relationship between the governments and statutory advisors is organized differently.

In this chapter I have focused on the scientific decision making during the process of defining boundaries of SACs on the Dogger Bank. I have listed a number of different criteria which were important when scientific advisors chose between different methodological approaches. But which criteria are their methodological choices and other decisions in the process evaluated against by stakeholders? As shown in this chapter, governments can be stakeholders, too, and the account of the statutory advisors' work has also involved accounting for the German and UK governments' claims to the scientific advice. But as the accounts also show, the scientific advisors are aware that their work will also be reviewed by others. For example, one of the German scientific advisors argued that some of their methodological choices were made, among other things, "Because you always want people to back your feature." In the next chapter, then, I turn to the consultation process to see which kinds of criteria for scientific validity the science is evaluated against by interest groups outside government.

5 The Consultation Review

Research science and regulatory science are evaluated on different grounds and by different audiences. With regard to regulatory science, it is evaluated among other things on the grounds of the political decisions they feed into. And it is evaluated by scientific peers as well as decision makers, stakeholders, the media, the public and a range of other actors. In the case of Dogger Bank, these others include the European Commission and the European Court.

The audiences may have rather different claims to science. In the former chapter I showed, among other things, which kind of criteria the science was assessed against by governments. In this chapter I focus on two other stakeholder groups (indeed, both the UK and German governments showed to be stakeholders, too). By digging into the consultation responses, the communication between the stakeholder groups and the statutory advisory agency and interviews with stakeholders, I describe the kind of quality criteria against which the science is assessed in this part of the review process. That is, some of the criteria the scientific advisors have had to relate to as a consequence of being reviewed not just by peers, but also by parties with interests in the outcome.

In this chapter I introduce some of the core issues which two groups of stakeholders, namely the environmental NGOs and the fisheries industry organisations, raised in relation to the pSAC. I draw on the consultation responses, communications between the stakeholders and JNCC, interviews and observations from two pre-consultation meetings and one consultation meeting.

I focus entirely on the consultation responses to the UK Dogger Bank pSAC. I do so for two reasons. The first is that the German Dogger Bank SAC stakeholders I have been interviewing have little or no memory of the scientific justification for the site and the consultation process. One explanation probably is the time frame – that the consultation process took place in 2004, six years before my interviews. Another, however, is that the consultation process was very fast, concerned all pSACs in the German EEZ at one time and did not involve lengthy reports accounting for the boundaries of each site. There may simply not be that much to remember. This difference between the two consultation processes is interesting and could be an argument for comparing. However, for lack of data to do so I focus on the UK process. The second reason for focusing on the UK Dogger Bank pSAC consultation responses is that the purpose of this chapter is to give an example of the kind of evaluation regulatory science undergoes when presented to stakeholders.

Focusing on the UK allows me to give a more detailed introduction to the issues. And one case suffices to give an example of the way policy issues affect the claims science is subject to.

Among the consultation responses to the UK Dogger Bank pSAC I focus entirely on those coming from the environmental NGOs and the fisheries industry organisations. However, the environmental NGOs and fisheries industry organisations are but two of several stakeholder groups in the process. Naturally another important stakeholder is Forewind Ltd., the wind farm developer who is in the process of planning the development of the world's biggest wind farm on the Dogger Bank. Other stakeholders are the oil and gas industry and sand and gravel extraction industry. And as already shown different branches of the UK government and the Crown Estate are important stakeholders. I focus on the environmental NGOs and fisheries industry organisations for two reasons. First of all, my intention in this chapter is not to give an exhaustive introduction to the full spectrum of stakeholders and of all of the discussions. My main point is to give a flavour of the kind of discussions which arose during consultation and to show how what it takes to scientifically justify policy depends on what should be justified and to whom. That is, to explore the ways in which it depends on the stakes and stakeholders who are to evaluate the scientific justification. Showing how two different stakeholder groups respond differently to the designation suffices in this regard.

Secondly, these are the stakeholders whose responses it has been easiest to access. Indeed it would have been useful to look into the responses from the wind farm industry, particularly Forewind Ltd., as they are core stakeholders on the site. However, it has not been possible to get in contact with them to make interviews, and I was not admitted to a consultation meeting where they were present. One explanation could be that they have wanted to keep a low profile due to their stakes in the issue and due to their need to find a good stand with all of the other stakeholders relating to the bank. Another could be that as their interests are already represented in government, they do not need to be aggressive about their views on the designation process and choose to keep a low profile in general. Whatever the reason, I have only been able to talk with a member of another wind farm company with projects elsewhere, who could share some more general insights with me about wind farm developers' stand in relation to Natura 2000 sites, harbour porpoise and sandbanks.

The chapter is divided into two sections. The first accounts for the two stakeholder groups' comments on the pSAC. The second accounts for their reflections on the process, the role of science and scientific advisors and the kind and degree of stakeholder involvement. I keep the presentation of the environmental NGOs and fisheries industry organisations separate in order to give an impression of the connection between stakes and stakeholder groups on the one hand and the way they evaluate the site and science on

the other. It is important to note that there were variances between the approaches represented within each stakeholder group – however, the shared views were dominant. Moreover, within each stakeholder group there was a high degree of communication across organisations in order to coordinate their responses and strategies, and there were several joint consultation responses with more than one organisation signing.

It is also important to note that one of the organisations from which I bring excerpts from interviews and consultation responses is the North Sea Regional Advisory Council (North Sea RAC). The North Sea RAC is an umbrella organisation where environmental and fisheries industry organisations are supposed to give joint responses to the European Commission on fisheries management issues. The origins of their comments, however, are generally not difficult to identify as either the environmental NGOs or from the fisheries industry organisations. Hence, quotes from this organisation have been categorised accordingly, as originating from either environmental NGOs or fisheries industry organisations.

As the purpose of the chapter is to give a flavour of the discussions, leaving the more analytical layer to the next chapter, I let the stakeholders lead the word in this chapter by using many quotes. The intention is to give a 'thick' impression of the stakeholders and the logics behind their arguments and to do so in a loyal way.

The chapter concludes with a comparative discussion reflecting on the kind of criteria the science is evaluated against in this consultation review process, and on the way the particular decision stakes of the two groups affect which criteria they set up.

In the following section, then, I present the main issues in the two stakeholder groups' evaluation of the Dogger Bank pSAC and added features, particularly with regards to the scientific justification.

The consultation review

On the 20th of August 2010 JNCC opened the twelve week public consultation on the Dogger Bank pSAC with a letter to a long list of stakeholders. Three main documents were made accessible for the consultation. The SAC Selection Assessment Document accounted for the scientific underpinning of the site and added features (Joint Nature Conservation Council 20 August 2010b). The Draft Conservation Objectives and Advice on Operations was an initial draft report about the sensitivity and exposure of the protected features on the bank to pressures associated with human activity and, on this basis, advice on management measures (Joint Nature Coservation Council 27 April 2010). Finally, a draft Impact Assessment document was made available for the consultation, accounting for the potential socio-economic impacts

from the SAC (Defra Marine Biodiversity Policy, Joint Nature Conservation Committee 12 July 2010). In the formal consultation letter opening the consultation, stakeholders were invited to comment on the scientific justification of the site as well as on the economic impact assessment, but were reminded that:

> The possible SAC at Dogger Bank has been put forward by JNCC to the UK Government on the basis of selection criteria contained within the EC Habitats Directive Annex III, and EC Guidance on implementation of the Natura 2000 network in the marine environment. Selection of sites and their boundaries must be based on the selection criteria and relevant scientific information, not on socio-economic grounds, so marine activities information provided for the site-specific Impact Assessments will not be used to modify the possible site boundaries but could be used to inform possible management measures. (Joint Nature Conservation Council 20 August 2010a)

Hence, with regard to the designation of the site – the boundaries and the added features – stakeholders were only invited to comment on the scientific basis for the designation. Comments on the economic impact assessment would not be included in an evaluation of the boundaries or added features. Economic impact assessments are mandatory for this kind of regulation measures in UK law. Furthermore, socio-economic issues may be considered in the development of management plans. Hence, comments on this document would be inputs for the next step after the designation, namely the development of management plans for the site.

Before and during the consultation period JNCC corresponded with a number of stakeholders, both via e-mail and at meetings. In the following I give an impression of the discussions, starting with the environmental NGOs.

Environmental NGOs

Let me start with an event that took place during the consultation period:

> *JNCC's offices in Peterborough, November 2010. JNCC has invited a number of environmental NGOs to a joint consultation meeting on the proposed Dogger Bank SAC. I am observing the meeting. Representatives from a number of environmental NGOs are sitting at the table, and three more are joining us via Skype and phone. In the room we also have Patricia Wood, one of the key persons in the Natura 2000 SAC selection on Dogger Bank, and Robert Foster and Simon Harper, two of the other scientific advisors involved in the Dogger Bank SAC selection. On the screen, participating from the JNCC office in Aberdeen, is Agnes Shaw, who is the main person on the harbour porpoise advice, and*

Jeremy Wright, who is in charge of the stakeholder consultation process. In advance all of the NGOs have received the SAC selection assessment explaining the scientific basis for the proposed protected site.

Patricia Wood has just given a presentation of the proposed SAC, the rationale behind it and the consultation process. After the presentation Robert Foster takes over and asks if there are any comments or questions? Natalie Turpin, one of the NGO representatives in the room, says that she mainly wants to talk about harbour porpoise. Patricia says that Simon wants to zip off before the harbour porpoise comes up. Scattered laughter around the table. So before they talk about that, she would like to know if anyone has comments or questions to the sandbank justification? No, nobody wants to talk about the sandbank feature. The impact assessment asks Robert? Silence. 'No? You'll be happy if it has an impact, then', says Robert. Scattered laughter again.

Robert	Okay, thanks, Simon. [Simon gets up and leaves.] Okay, the topic of the afternoon I think is harbour porpoise! [Some joke, laughter.]
Natalie, NGO	Do you want to say something about the rationale or do you just want us to leap in with questions?
Robert	Er, I suppose I could just outline briefly where we are and how we got there with harbour porpoise. As you know there was a recommendation put before the Joint Committee in 2008, which after some vexing recommended that harbour porpoise be a grade C feature of the site, added onto the sandbank. So it's still a sandbank primary feature, but had harbour porpoise added. And that decision was taken on consideration of a number of factors under the EU guidance on population density, bla bla bla. Er… That recommendation sat for a while with government, and eventually we were asked to really firm up our information base on that, really provide justification as to exactly why it was that we had included harbour porpoise. And effectively I think government was after convincing arguments as to why harbour porpoise was recommended as a feature of the site. On my read of the original recommendation it was by no way a clear cut decision, and I think the thing we really had to focus on was the scientific rationale for the harbour porpoise inclusion. So that led to a period of deliberation which meant backwards and forwards to Joint Committee, and under reanalysis it really emerged that

there actually wasn't the convincing argument that government needed to include harbour porpoise as a recommendation, or at least for us to recommend it to them as a grade C feature. So that really resulted in the recommendation that you see today, with harbour porpoise being a non-qualifying presence. […] Now I don't think I will pretend that it was an easy decision to make, but it was…

Natalie, ENGO — No, that's clear.

Robert — …I think it was one we had to re-examine.

The environmental NGOs did comment on the sandbank feature in their consultation responses – particularly they were concerned about the reduction in size of the site from the previous version. However, as the above excerpt shows, the main concern was about the grading of harbour porpoise. The discussions they led with JNCC were mainly focused on the use of data, the interpretation of the Habitats Directive, and on the environmental NGOs suspicion about whether the scientific advisors at JNCC had been making their decisions under pressure from economic interests – something which, they stressed, was not legally feasible according to the Habitats Directive. I go through the discussions one by one:

The use of data

Several of the environmental NGOs commenting on JNCC's site designation on Dogger Bank bemoaned that JNCC were late to collect data and designate sites, either out of concern for the short consultation process, the postponed protection of the features or, as the Royal Society for the Protection of Birds pointed out, the lack of information to users of the sea in order for them consider the relevant conservation issues in their planning of future activities: "The resulting lack of clarity about the location of important and sensitive areas at sea (due in no small part to a lack of investment in strategic survey and monitoring) causes investor uncertainty." (Royal Society for the Protection of Birds 12 November 2010, p. 3)

The environmental NGOs generally found that JNCC put too much emphasis on the lack of data. Excerpts from the correspondence that took place just before and under the public consultation illustrate the main issues. In May 2010 The Wildlife Trusts sent a letter to JNCC raising concerns about the status of harbour porpoise on the site which was just about to go out for public consultation. JNCC responded by referring to a sequence in the Habitats Directive stating that "For aquatic species which range over wide areas, such sites will be proposed only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction" (Joint Nature Conservation Council 25 May 2010). The letter then briefly lists the available data and concludes that

> […] upon closer review, we have no evidence that the Dogger Bank dSAC is more important for the species than other parts of the southern North Sea, as there is no significant difference in density of harbour porpoise within and outside the dSAC. We therefore have no evidence to indicate that the Dogger Bank site is "essential to the life and reproduction" of the species, as required under Article 4(1) of the Habitats Directive for aquatic mobile species which range over wide areas, and therefore there is no requirement to identify this site for harbour porpoise.

Some of the responding environmental NGOs, however, found that if JNCC took on a precautionary approach there should be enough data to designate sites for harbour porpoise. They criticised JNCC's reference to lack of data as a reason for not designating harbour porpoise. For example, the World Wildlife Foundation wrote in their consultation response:

> Whilst we recognise and applaud the need to ensure decisions can be robustly defended, there is a danger that the criteria are being taken out of context and to perverse extremes. The criteria are not individual hurdles that must each be passed before progressing to the next. They are to be applied using expert judgment, as a whole and in the context of the precautionary principle, to the best available scientific data, in order to identify sites. Similarly, if there is no data to support a decision in relation to a particular criterion, it does not "score" a negative point – it is simply neutral until such data exists (or is collected). (World Wildlife Foundation December 2010, p. 4)

Likewise, another NGO argued in an interview that the lack of data and hence the high levels of uncertainty could not be used as an argument for regulating less – rather, it required JNCC to be more precautionary in their approach:

> You know, we would say in the context of the limited information that you've got, you need to go with the best available information and you need to make a precautionary judgment and how precautionary you need to be should be proportionate to how uncertain you are. So if you're pretty sure you only need to be little bit precautionary. If you are very unsure you need to be quite a lot precautionary.
>
> UK environmental NGO, interview

Lack of data, the interviewee argued, is mainly a problem because JNCC has not taken on a precautionary approach:

> So this is the problem. The UK applies a data hungry approach in a data poor environment. […] So they have to decide. It's one or the other. You either take the German approach and you say I don't have very much data, but I will use the best available information I have and because I know it's limited, I'll be precautionary, but I'll stick to it, that's fine…Or you say: I'm gonna have loads of data so you go out and collect loads. But it's being stuck in the middle, that's the UK's problem. It refuses to do either.

The Whale and Dolphin Conservation Society, on the other hand, argued in a letter to JNCC that there was actually quite a lot of data and hence that lack of data could not be used as an argument for not regulating: "Despite a wealth of relevant scientific research, ongoing monitoring and continuing assessment of the UK's cetacean species, the harbour porpoise is currently completely unprotected" (Green et al. February 2012, p. 30).

Some environmental NGOs also questioned why JNCC had not collected more data. WWF wrote in their consultation response that:

> Specifically in relation to the Dogger Bank site the scientific basis for the harbour porpoise relies heavily on snap shot i.e. July 1994 and 2004 SCANS data. […] Whilst this, in combination with other data, constitutes best available information, WWF seeks clarification on why further research hasn't been commissioned, as was the case in other Member States for example Germany, the Netherlands and Eire. (World Wildlife Foundation December 2010, p. 6)

In an interview a representative from another NGO wondered why JNCC, in light of the amount of time the process had taken, had not collected more data. In their consultation response, the NGO representative said, they would point out that:

> You have known for decades that you needed to designate these sites. And you have known for decades what you were looking for. And for decades you've refused to get out there and look. And now you're telling me that you're not sure about the science behind the sites. Well, of course you're not sure, because you've not looked.
>
> UK environmental NGO, interview

The fact that JNCC did not collect more data on harbour porpoise and that the lack of evidence was referred to as the main argument for not making harbour porpoise a qualifying species on the Dogger Bank,

SAC gave rise to speculations among the environmental NGOs. One of the environmental NGO representatives argued in an interview that "uncertainty makes the sites more vulnerable to non-scientific objections". JNCC and the UK government, the representative argued, were abusing scientific uncertainty for political purposes. Hence they were not following the claim in the Habitats Directive about the need to designate sites on a purely scientific basis:

> The UK government would tell you they always select purely on the basis of science. But I think some of our concerns about what have happened on the Dogger Bank come down to the use and almost the abuse of scientific uncertainty. So that happens on two fronts; the first is the UK has been very slow to identify sites, and part of that is it doesn't carry out systematic, comprehensive survey. And then it says 'because I've got no data I can't designate a site'. But that's why they don't do the survey. […] 'If I don't go and look, I don't know what's there and I won't have to designate it'. So you get this kind of vicious circle going round. So that's the first way they exploit it, and then the second is – […] the government agencies, who are responsible for nature conservation, they come up with an original boundary, and I think they do it quite honestly on the basis of science. And I think that where there's uncertainty they generally try to take a more precautionary approach. But then depending on how political a site is, and Dogger Bank is just about as politically sensitive as it gets, because of fishermen, also because of wind farms – that's probably almost a bigger issue in the UK at the moment; they want to build lots of wind farms on the Dogger Bank – other bits of the government start to exploit that uncertainty to make the boundary shrink. So for Dogger Bank in the UK we started with a proposal like this [marks an area on the table with her hands, ed.] and then several times – the government's consulted itself, not anybody else; just other government departments – and each time they nibble away at the uncertainty, and the boundary gets smaller. So they end up moving from a precautionary approach to something at the opposite end of the spectrum. To a minimalist approach. And I think that's because of uncertainty; if there wasn't scientific uncertainty, if they could be robust in their defence, you wouldn't have that problem. But mounting a robust defence in the context of scientific uncertainty is a hard thing to do. So I think it's abused, it's exploited, the uncertainty. To make the sites get smaller.
>
> UN environmental NGO, interview

To sum up, environmental NGOs were concerned about the way JNCC was handling scientific uncertainty. Some environmental NGOs found that scientific certainty was in favour of the environment and, vice versa, that scientific uncertainty was an opening for economic and other non-conservationist interests. In that

regard one can say that certain science was tasked with 'speaking truth to power'. In direct continuation of this, a general notion was that the more uncertainty, the more precaution should be taken in favour of the environment. However, environmental NGOs generally did not consider JNCC's approach precautionary. On the contrary, JNCC were criticised for using scientific uncertainty to take precaution in the favour of industry interests. Hence, some environmental NGOs suspected JNCC and government for not collecting more data on harbour porpoise in order to maintain the high level of uncertainty and hence the loophole for economic interests to affect the site designation.

The interpretation of the Habitats Directive

Other issues taken up by the environmental NGOs were related to JNCC's interpretation of the Habitats Directive. I mention two of them here, both related to the harbour porpoise grading. The first issue concerns whether the site-based approach, which dominates in the Habitats Directive, is mandatory or in some instances can be substituted with 'other measures'. The second issue concerns how 'good population density' should be interpreted when considering whether a species qualifies for particular protection on a site.

Starting with the site-based approach: When the consultation for the Dogger Bank pSAC started, JNCC had not submitted any sites with harbour porpoise as a feature requiring particular protection under the Habitats Directive. Hence, the decision also to change the status of harbour porpoise on the Dogger Bank and make it a non-qualifying feature triggered reactions among the environmental NGOs. In a letter to JNCC WWF, WDCS, the Marine Conservation Society and the Living Seas referred to the Marine Atlantic Seminar in March 2009, where representatives from the European Commission, stakeholders and member states with responsibilities in the Atlantic biological region evaluated the status of SAC and SPA designation:

> As you will be aware, the conclusion of the Marine Atlantic Seminar in Galway (March 2009) was that the UK was "Insufficient Moderate" in respect of the only site proposed for the harbour porpoise (at that time Dogger Bank). We understand the JNCC is now proposing to remove the harbour porpoise from the Dogger Bank pSAC site details, which would place the UK in the deeply regrettable position of proposing no cSACs for the harbour porpoise and no cSACs in which the harbour porpoise is recognised as a qualifying feature.(World Wildlife Foundation et al. 22nd June 2010, p. 1)

In their response, however, JNCC stressed the problems related to site based protection. A link in the letter directs the reader to a paper which was provided for an internal discussion at a JNCC meeting:

> Harbour porpoise and all other cetaceans in UK waters are wide-ranging animals that change their spatial distribution over many timescales. Harbour porpoise is widely distributed, mainly in continental shelf waters. Satellite telemetry studies have revealed relatively large movements of tagged animals (at the scale of 100s of kilometres), including one from Danish waters into UK waters east of the Shetland Isles, long-term changes in distribution are apparent for the North Sea, where the area of highest density of porpoises has shifted several 100 km southwards in the last decade […]. The nature and scale of these variations highlights the difficulty of defining important areas for harbour porpoises. (Pinn et al. December 2009, p. 7)

Given the problems related to site based conservation of harbour porpoise, in their letter JNCC further stress the importance of wider measures:

> Recognising the wide-ranging nature of harbour porpoises, and as many of the threats occur throughout their natural range, there is a need to manage effects to this species at an appropriate spatial scale. Therefore the wider measures of Article 12 are imperative in ensuring the favourable conservation status of the species.
>
> Where a species is not in some way demonstrably dependent upon a site, working to find ways to minimise the significant threats across the entire species range through the measures under Article 12 is likely to have far greater conservation benefits for the species than site based measures. (Joint Nature Conservation Council 23 September 2010)

The JNCC discussion paper to which the letter links up further lists the most important threats for harbour porpoise, including noise disturbance and bycatch (that is, when harbour porpoise are caught in the process of fishing for other species), the most relevant management measures in this regard and the importance of applying such measures across the entire UK waters.

In their consultation response WWF replies by referring to the requirements in the Habitats Directive:

> It is settled case law of the European Court of Justice that Member States are required to implement a site based approach to maintaining Annex I habitats and Annex II species at Favourable Conservation Status (FCS) across the territory of the European Union in accordance with Articles 4 and 6 of the Habitats Directive. Legal advice procured by WWF (attached) reinforces this view, emphasising that Member States cannot discharge their duties in this regard through the adoption of

> "wider measures") (such as controlling bycatch) however valuable such measures may be. (World Wildlife Foundation December 2010, p. 3)

In the interviews I asked some of the environmental NGOs about why they felt so strongly about insisting on member states' need to take on the site based approach in the Habitats Directive even for highly migrating species. One advantage from the perspective of environmental protection, for example, could be that it applies to the whole marine area and not just to a particular site. One of the environmental NGOs replied that Marine Protected Areas was one of the few legal requirements they could hold member states up to in the offshore marine areas:

> […] at the moment we have hardly any effective conservation measures at sea, and the only, or the best leaver to secure any is a protected area. […] The only mechanism to get a nature conservation control through the Common Fisheries Policy as it currently stands is to have a Natura 2000 site, which makes the European Parliament competent authority, which means that if damage is occurring they'll have to do something. So it's a leaver. So those fisheries measures might be just as useful if it wasn't a site, but we wouldn't get them if it wasn't a site. So I think [when we work for Marine Protected Areas, ed.] it's partly their actual genuine value as the best tool and partly their power as a leaver to get other tools.

Holding JNCC up on the site-based approach dominating in the Habitats Directive, then, was a core argument in the environmental NGOs' criticism of JNCC's decision not to make harbour porpoise a qualifying species on the Dogger Bank.

Regarding the issue about population dentity, another point raised by the environmental NGOs in relation to the interpretation of the Habitats Directive was the way JNCC followed the designation criteria. In a mail to The Wildlife Trusts in May 2010 JNCC argued that "we have no evidence that the Dogger Bank dSAC is more important for the species than other parts of the southern North Sea, as there is no significant difference in density of harbour porpoise within and outside the dSAC". WWF and others, however, responded in a letter to JNCC in June 2010 arguing that JNCC have put too much emphasis on one out of different designation criteria (World Wildlife Foundation et al. 22nd June 2010). The environmental NGOs refer to an ad hoc meeting in 2000 in the European Commission where they settled three additional criteria for site designation specifically for harbour porpoise – criteria that are also listed in the European Commission's guidelines published in 2007:

Areas can be identifiable on the basis of:

i. Continuous or regular presence of the species (although subject to seasonal variations);
ii. Good population density (in relation to neighbouring areas);
iii. High ratio of young to adults during certain periods of the year.

(World Wildlife Foundation et al. 22nd June 2010)

In a responding letter to WWF in September 2010 JNCC argue that they have been relating to all three criteria in their decision about harbour porpoise. They evaluate each of these criteria in the letter and conclude that where there is continuous or regular presence of harbour porpoise on the Dogger Bank, there is no evidence to indicate that there should be a high ratio of young to adults at certain periods of the year. And with regard to the population density in relation to neighbouring areas, the available data does not indicate that the population should be denser within the Dogger Bank SAC than in the neighbouring areas.

In their consultation response, WWF again question the emphasis JNCC have given to the criterion about population. They further stress that regarding this one criterion JNCC are wrong to interpret 'good population density' as meaning better than neighbouring areas. WWF bring an excerpt of the minutes of a meeting from a MPA subgroup meeting in November 2009, where they discussed the criteria in the selection guidelines: "The selection guideline 'Good population density' (in relation to surrounding areas)' (3.3.ii) is ambiguous. It may mean 'no worse than' surrounding areas, rather than 'better than' surrounding areas." (Minutes of meeting from the MPA Working Group meeting in December 2009, quoted in World Wildlife Foundation December 2010, p. 5) In continuation of this WWF stress that:

> It is WWF's (and counsel's) view that population density within the site is required to be 'no worse' than surrounding areas. In relation to the Dogger Bank dSAC, it is widely acknowledged that somewhere in the region of 2.1 % and 3.9 % of the national population of harbour porpoise is present within the pSAC during the summer months. In our view, this clearly affords the population a score of either a B or C in accordance with Commission Decision 97/266/EC. (World Wildlife Foundation December 2010, p. 5)

The environmental NGOs, then, emphasised the need to comply to the Habitats Directive, among other things stressing the site-based approach and questioning JNCC's interpretation of 'good population density'.

Under pressure from political interests

Many of these points raised by environmental NGOs were closely linked up with an overall concern that JNCC's advice had been produced under pressure from economic interests and, hence, scepticism about the degree to which the advice was 'exclusively' scientific. The concerns were voiced both in the communications with JNCC, the consultation responses and in the interviews. The influence of economic or other interests on the scientific advice was insinuated with reference to a number of different factors:

First, several mentioned the close communication between JNCC and Defra on the one hand and DECC on the other, indicating that DECC, whose interests were associated with wind farm development on the Dogger Bank, had been affecting the scientific advisors' decisions. RSPB, for example, noted in their consultation response that

> During this time we are aware that there have been a series of reviews of the science underpinning this site, including commissioned peer reviews of recommendations made by the Government's independent advisor (the JNCC), and also reviews by other Government Departments which do not have any explicit nature conservation remit. (For example, the Department for Energy and Climate Change identified itself as having commissioned such a review at the November 2009 meeting of the Offshore Renewable Energy Environment Forum, OREEF). (Royal Society for the Protection of Birds 12 November 2010, p. 5)

The communication between JNCC and DECC, RSPB noted, coincided with changes of the pSAC boundaries, reducing the overall size of the site:

> Through these iterations of the dSAC proposal, both the area of the site and the number of features for which the site is proposed have decreased. These changes have coincided with two rounds of consultation of Defra, the UK's devolved administrations and other Government departments (see 'Document version control' table, SAC selection document (version 6)). (Royal Society for the Protection of Birds 12 November 2010, p. 5)

RSPB then suggested that the changes have been made to accommodate economic interests:

> While we do not possess relevant detailed knowledge about the habitats and non-avian species at this site, we cannot do other than question the motivation behind these changes, and the scientific validity of the resulting proposal. As is correctly stated in the 'Explanatory notes' provided with the JNCC's letter to stakeholders of 20 August 2010, 'selection of sites and their boundaries must be

> based on the selection criteria and relevant scientific information, not on socio-economic grounds'. We seek urgent reassurance that this is indeed the case in relation to the Dogger Bank boundaries and features. (Royal Society for the Protection of Birds 12 November 2010, p. 5)

As mentioned, other environmental NGOs likewise referred to the close negotiations between JNCC and DECC and the coinciding changes of boundaries and harbour porpoise grading as an argument that JNCC had been adjusting their advice in order to accommodate DECCs interests on the Dogger Bank.

Secondly, some environmental NGOs argued that while JNCC took another approach than the neighbouring member states on the Dogger Bank, both concerning the boundaries and the harbour porpoise grading, the scientific advisors must have been acting on other grounds than purely scientific ones. WWF, for example, argued in their consultation response that they believed it was

> […] extremely unlikely that an ecological boundary for harbour porpoise based on presence, population density, ratio of young to adults, and other biological elements would mirror a political boundary and that there would currently appear to be no scientific justification for a different level of importance to be assigned to the Dutch and German sectors of the Dogger Bank and the UK sector of the Dogger Bank. (World Wildlife Foundation December 2010, p. 7)

Along the same line RSPB argued in their consultation response that

> [...] level playing field and consistency issues are priorities for the European Commission, and Member States should be aware that they will have to demonstrate that any inconsistencies are scientifically valid and have not been made for anything other than scientific reasons. Given that the UK Government approach appears to differ from that adopted by the Germany and the Dutch Governments in relation to both the boundaries and features of the Dogger Bank, would suggest that the UK may have made itself vulnerable in this regard. (Royal Society for the Protection of Birds 12 November 2010, p. 9)

Along the same line, the North Sea RAC argued in their consultation response that they noted:

> […] with concern that the approach adopted by the UK to boundary setting and features of interest for the Dogger Bank pSAC is inconsistent with that that taken by the German and the Dutch Governments to their components of the Dogger Bank. As was made clear at the recent Marine Natura 2000 experts meeting in Brussels in September 2010, level playing field and consistency

> issues are priorities for the European Commission. Member States were made aware of the need to demonstrate that any inconsistencies are scientifically valid and have not been made for anything other than scientific reasons. Given that the approaches adopted by both Germany and the Netherlands would seem more inclusive and more precautionary than that adopted by the UK (in relation to both boundaries and features) the UK appears open to criticism in this regard. (North Sea Regional Advisory Council December 2010, p. 6)

As it appears from the quotes, the difference in approaches is criticised on two backgrounds. One is the claim in the Habitats Directive that member states should take on a coherent approach in order to ensure that the sites together form an EU-wide network of protected areas, covering the most important species and habitats not just within but also across member states. Another is the claim in the Habitats Directive that sites designation should be an exclusively scientific exercise. The reasoning seems to be that if all member states had followed exclusively scientific procedures, they would have been approaching the site designation in more or less the same ways and arrived at more or less the same conclusions. While the scientific advisors in the UK are taking on a different approach from that of scientific advisors in Germany and the Netherlands, the difference is taken to be a sign of political influence.

Thirdly, several environmental NGOs pointed to the changes of the boundaries of the Dogger Bank pSAC and other SACs, leading to a reduction in the size of the sites, as an indicator of the influence of economic interests on scientific decision making in JNCC. WWF, for example, argued that:

> WWF is also aware of a recent pattern in the reduction of coverage of area for pSACs for sandbanks as they move through the consultation phase and query why this is. For example, in August 2010, the UK Government announced submission of 12 marine cSACs to the European Commission. Six of these sites (Bassurelle Bank, Haisborough, Hammond and Winterton cSAC, Inner Dowsing, Race Bank and North Ridge cSAC, Margate and Long Sands cSAC, North Norfolk Sandbanks and Saturn Reef cSAC, Shell Flat cSAC) include the feature 'sandbanks which are slightly covered by sea water all the times' (1110). Between formal consultation on these sites as pSACs and their submission to the Commission as cSACs, 5 of these 6 sites were subject to what JNCC, Natural England and CCW described in their letter to consultees of 20 August 2010 as 'minor boundary changes as a result of …consultation'. […] Crude calculations would suggest a net loss of 107,461 ha of sandbank habitat across these five sites between consultation and submission, for which, as far as we are aware, no adequate scientific justification has been given. WWF, along with other NGOs, therefore requests clarification on the

> scientific rationale for removing qualifying Annex I habitat from the boundaries of these candidate SACs. (World Wildlife Foundation December 2010, p. 3)

RSPB also noted that several sandbank sites had reduced in size and argued that:

> While a detailed scientific justification for these changes has been requested from the UK Government (most recently at the meeting of the Natura 2000 and Ramsar Forum meeting on 28 September 2010), none has been received, and the JNCC, NE and CCW Report on the 2009 – 2010 consultation, while making reference to this issue, did not address it in the associated commentary. (Royal Society for the Protection of Birds 12 November 2010, p. 7)

The reduction of the Dogger Bank SAC is accounted for in scientific ways in the SAC Selection Assessment Document – however, RSPB missed such explanations for the other sites, and both RSPB and WWF quoted JNCC for stating that the sites had been reduced as "a result of … consultation". It was not the reduction of the Dogger Bank SAC alone, but the general pattern that sandbank sites tended to be reduced in size during the process, that raised suspicion: Whether the sites started out being defined on the basis of science and then, due to pressure from industry interests, was reduced. One of the environmental NGO representatives I interviewed argued that it was natural that it was always sandbanks which would reduce in size. It is much more difficult to negotiate the extension of a reef, which stands out from the surroundings, than the extension of a sandbank.

Fourthly, WWF questioned the exclusively scientific background of the advice by referring to the motivations presented by JNCC in the minutes of a meeting where the harbour porpoise grading had been discussed. At the meeting JNCC apparently debated the potential outcomes and risks from either upholding the conservation status of harbour porpoise as a qualifying species (grade C) on the site or revising it to grade D:

> The paper confirms that "*The following scenarios, outcomes and risks have been distilled following extensive discussions between JNCC senior management and government departments*". In addition to matters scientific, the Joint Committee were clearly advised to consider the following matters: (i) the fact that Defra would be unlikely to obtain Cabinet Committee clearance to formally consult on Dogger Bank with harbour porpoise as a C-grade feature (and the fact that, in reality, Defra would be unlikely to seek clearance on that basis); (ii) that "JNCC support company staff" could be put in an untenable position with stakeholders if the Committee upholds a Cgrade; (iii) the possibility of legal challenge from NGOs in the event of a D-grade consultation; (iv) the possibility of infraction

> proceedings on the part of the European Commission, on the basis that other Member States who have included harbour porpoise on their sections of Dogger Bank; (v) the possible resource implications of assisting Defra in defending infraction proceedings; and (vi) the potential impacts of fisheries restrictions, albeit in the context of harbour porpoise conservation. (World Wildlife Foundation December 2010, p. 4)

The minutes of meeting shows that JNCC has debated the conservation status of harbour porpoise on the basis other criteria than those which WWF find to be scientific. One environmental NGO representative told me that they considered the minutes to be the closest they could get to document that JNCC were not strictly scientific in their approach, and that economic and political considerations were affecting the designation.

Summary

The environmental NGOs, then, both focused on the interpretation of the Habitats Directive and on the disinterestedness of the science. The strong focus on science in the Habitats Directive functioned as a lever for environmental concerns, and the need to designate sites exclusively on the basis of science was seen as a principal issue to hold the member states up to – something which to some made the Dogger Bank an iconic case. Note that the environmental NGOs at no point use arguments which from a conservationist perspective advocate the need to conserve biological diversity and to protect harbour porpoise. The arguments are all about the need to comply with the Habitats Directive – about the need of the UK to follow their legal obligations. Holding the UK up on their need to comply with international legislation is no doubt a core strategic lever for the interests of the environmental NGOs. It may be expected to hold more persuasive powers than arguments which from an ecological perspective stress the need to protect harbour porpoise. And due to the design of the Habitats Directive, holding the UK op on their legal obligations also entails holding them up on the need to designate sites exclusively on a scientific basis.

The environmental NGOs' evaluation of the scientific underpinning of the Dogger Bank pSAC demonstrates how the validity claims against which scientific advice is evaluated differ from the kind of validity claims which count in traditional peer reviews. The validity claims may be related to internal scientific disciplinary codes, but they are also affected by the policy objectives, the stakes, the legislation, the scientific process and by strategic considerations about which arguments may hold most persuasive power. But do such claims affect the scientific decision making? The debates I have accounted for here were led after the final pSAC version was advised to government, and even though the debates apparently did not affect either the boundaries or the grading of harbour porpoise. However, the scientific advisors have been foreseeing that their advice would be subjected to such an evaluation, just as they have been aware of the possibility of a

court case. Hence, they have been considering this in their scientific decision making. The scientific advisors have not been producing proven facts, but they have been producing justified SAC boundaries and justified harbour porpoise grading, and what it takes to 'justify' in this case goes beyond internal disciplinary epistemic claims about scientific validity. One of the main differences is the audience, which besides from disciplinary peers also consists of groups with interests in the outcome.

Back at the consultation meeting in JNCC's offices in November 2010, where we started out, we sense the how these validity claims manifest themselves in the ways that necessitates statutory scientific advisors to keep them in mind:

Before the meeting at JNCC, one of the organisations had issued legal advice on JNCC's selection of SACs for harbour porpoise. The advice was sent to JNCC prior to the consultation meeting. According to the advice, "It is not lawful for the UK to rely on "wider measures" in order to achieve or maintain favourable conservation status for the harbour porpoise as an Annex II species." Further, "The UK cannot lawfully decline from listing the harbour porpoise as a qualifying feature on the Dogger Bank cSAC site details on the basis of observed population density being no greater than neighbouring areas." At the end of the consultation meeting Nathalie refers to the legal advice they sent in. She asks if they have had a look at the legal opinion they sent in:

Natalie, NGO	Do you think you will be in a position to give us any response on the legal side or not? I mean, we are gonna send it as part of the consultation response anyway.
Robert, advisor	We must have a look. We don't have an in-house lawyer, so at least we can't…
Natalie, NGO	I mean, one thing I wanted to say is we have an annual meeting in the European Commission in November which a lot of the other NGOs are going to go to as well. Ehm.. Obviously you won't have a decision until March, I mean… We will certainly be raising this as an issue of concern with them.
Patricia, advisor	We are aware of this already.
Natalie, NGO	Yeah, ha ha. Exactly.
Robert, advisor	We expect nothing less.

Natalie, NGO Yeah, exactly. But you know, it's polite of us to…

Robert, advisor Sure.

Natalie, NGO …tell you that I think. And I mean obviously we will wait until the final decision is made, and then we may go on to sort of complaint.

The fisheries industry

> The boundary is just a line on a chart that just means nothing. But when you move to the stage of applying management measures, I think that's when it all gets very tense, potentially tense.
>
> UK fisheries representative, interview

Compared to the environmental NGOs the engagement of the fisheries industry organisations in the scientific basis for the pSAC boundaries on the Dogger Bank was sparse. Some fisheries industry representatives expressed frustration about that the process was split up in two, where the first step is about boundaries and the second about management measures. Their comments on the boundaries, some argued, depend on the management measures, that is, the degree to which it will affect their fisheries on the bank. One of the informants I interviewed who was in close contact with the fisheries organisations said that:

> Until I mentioned it, the fishing sector wasn't even aware that the boundary shrunk by 18 per cent [in the 2010 version compared to the 2008 version, ed.]. I mean I pointed it out to them and even then they didn't get a huge reaction. To them it's just a bloody great area whether it's 18 per cent plus or minus. It's not really what they're worried about.
>
> UK environmental NGO representative, interview

Moreover, the fishers are currently under pressure from many sides. While Marine Protected Areas are being designated not only as part of the Natura 2000 network, but also under a number of other international conventions including OSPAR and the Marine Strategy Framework Directive, a growing number of wind farm sites are under development which will also exclude fishers from particular areas. Besides from that they are concerned about other restrictions on their fishing including quotas and restrictions on their days at sea. Hence, the Natura 2000 site designation is just one among several important issues. According to one of the persons involved, "this actually is just a sheer capacity issue of trying to fight on so many different fronts from the fishermen's point of view. Just can't deal with the amount of consultations that's coming at them."

As a result, fisheries representatives have been focusing their efforts on what they found to be most important. And with regard to the Dogger Bank pSAC, they have been particularly focused on the socio-economic impact assessment, which accompanied the SAC Selection Assessment. According an NGO representative working closely together with the fisheries industry organisations, the fishers "feel that their strongest card to play is in the impact assessment, there's not an awful lot they can do about science." Notwithstanding, they actually did comment on the science, just as they related to the science and the designation process in the interviews. I introduce some of the points they made in relation to the Dogger Bank pSAC in the following, focusing on their comments on the science, but also introducing some of the other issues they commented on.

Stakes

First, however, a few lines about the fisheries industry's stakes on the Dogger Bank. The Dogger Bank is an important fisheries site. Its importance is significant for UK fishers as well as for fleets from the Netherlands, Denmark and Norway. According to a representative for a Danish fisheries industry organisation,

> It is the most important area for sand eel in the North Sea. Some years we probably get about 70-80 % of our total catch on the Dogger Bank. It can amount to 200.000 tons, 200.000-250.000 tons some years. Then we have the Danish Seine fisheries with five to ten vessels, which land about 1000-1500 tons plaice. And then we have three or four net fishing vessels, which fish turbot. They can probably land up to 50-100 tons from out there. And then the Southern part of Dogger, or just South of it, we have a period with some sprat fisheries, some pelagic fisheries. That's the Danish fisheries we have out there. And far the predominant value simply comes from these sand eel. That is big quantities. And then you can multiply that quantity with 1,60 Danish crowns. Then you can see how many millions that is. 250.000 times 1,60, that's 400 million Danish crowns. That's an eighth part of the value of Danish fisheries. Plus all the rest, perhaps we are up to about a seventh part of Danish fisheries which is caught around Dogger Bank.
>
> Danish fisheries industry representative

In a document submitted by fisheries industry organisations in the UK, Netherlands, Germany and Denmark as an input to the development of management plans, the Total Annual Catch in EU waters for sand eel in 2011 is 374.420 tonnes. Out of these, 320.000 tonnes were caught in the Dogger Bank region.

To the fisheries industry, then, the SAC designation on the Dogger Bank is about their incomes and their future in fisheries. At one of the pre-consultation meetings I attended one of the fisheries industry

representatives argued that it had was hard to understand why that kind of concerns were not valuable arguments in the designation process. It also gave rise to hard feelings towards the environmental NGOs who, some felt, could say what they did for free. For example, one of the fisheries industry representatives I interviewed told me that:

> You can just as well throw everything the NGOs have written [as part of the Dogger Bank SAC consultation, ed.] in the bin, because it's a damn lie. When you think about what the NGOs write, you always need to be aware that the NGOs they are living in a bloody fantasy world; it costs them nothing to write all the things they do.
>
> Danish fisheries industry representative, interview

The connection made here between knowing about the socio-economic consequences and knowing about the need for management measures was made by others fisheries industry representatives, too. Socio-economics, one can say, were by some considered as a reality-check requiring the involved actors to think twice, because statements are not for free.

The management objectives

Generally the fisheries industry representatives, I interviewed, had informal talks with or observed at meetings, had some difficulties with the management objectives. Their criticism was in turn directed towards Marine Protected Areas as a tool for biodiversity protection, the need to protect sandbanks and the need to protect harbour porpoise.

Regarding marine protected areas as a tool for biodiversity protection, the main objection was that prohibiting particular fisheries activities in an area will displace the fisheries to other areas. And this can potentially increase the impact of fisheries on the environment:

> There is a reason why some areas of the North Sea are fished a lot. That's of course because they produce a lot of fish. If you close these areas you will force the fishers to fish in other places which don't produce as much as these areas, and then we actually have to fish much more to catch the same quantity. And of course you can preserve a sandbank by saying you can't fish there. But I think you have to look at the whole system and consider if it really is that beneficial that we preserve some areas which tolerates being fished on at the expense of allocating the fisheries to other areas where they have to fish twice as long to catch the same quantity. Fundamentally we end up impacting much more.
>
> Danish fisheries industry representative, interview

The UK National Federation of Fisheries Organisations (NFFO) further argued in their consultation response that not considering the effects of displacement from marine protected areas on the environment is unscientific:

> […] no consideration appears to have been given to the wider scientific implications of the designation of such a vast area. We do not accept that factors relating to the interrelationship between human use of the marine environment and its conservation should be considered to be non-scientific as far as designating MPAs are concerned, indeed we consider it to be non-scientific and partisan to ignore them. These factors are evidenced, for example, in the following scientific literature: […] (National Federation of Fishermen's Organisations December 2010, p. 2)

Then follows a list of references to scientific literature and a number of quotes about the relation between displacement and the effect of marine protected areas. For example, one of the quotes is from a journal article by Simon Jennings who argues that marine protected areas should be accompanied with strategies to limit displacement, and that "this is best achieved by making a priori assessment of the potential effects of pressure displacement" – something which, he argues, should be an integrated part of providing advice on the designation of marine protected areas (Jennings 2009, p. 18). In their consultation response NFFO criticize the statutory advisory agency for not including assessments of potential displacement in their considerations about the boundaries of the SAC. Several other fisheries industry representatives argue along the same lines.

Fisheries industry representatives also argued that displacement of the fisheries could result in more discard. Within fisheries, discard refers to the act of throwing bycatch, i.e. unwanted catch, back into the sea, and it is illegal in the EU. According to some of the fisheries industry representatives the fisheries on the Dogger Bank, particularly on sand eel, is very clean, meaning that it involves very little bycatch and hence also very little discard. Hence, displacement of the fisheries to other areas could increase the amount of discard.

Besides from that, one of the consultation responses more generally questioned the value of site based protection on the basis of lack of evidence documenting the potentially positive effect on the overall pressure on fish stocks and on the value to biodiversity beyond the site (North Sea Regional Advisory Council December 2010, p. 13).

Regarding sandbanks, fisheries industry representatives generally had major difficulties in understanding the value to biodiversity of protecting sandbanks. At one of the pre-consultation meetings I attended, one of the participating fishers' representatives said that "I think it is incredible the amount of resources that

are put into protecting 15.000 square kilometres of sand". Two of the fisheries representatives I interviewed referred to the background for adding sandbanks to the Habitats Directive in the first place. One of them said that:

> We think it's a little strange. And we talked to people and some of the people we talked to were involved in the original negotiations that led to the habitats directive. And cause we've often wondered why there is a need to protect a large area of sand, its highly mobile anyway. And people within the JNCC have told us it was a proxy for seabirds; they wanted to do something to protect the seabird. Seabirds are often associated with sandbanks that are covered by water at some points. And that's why sandbanks were included in the Habitats Directive.
>
> UK fisheries industry representative, interview

The other argued that keeping this background in mind and considering the 20 metres depth limit, it does not make sense to designate sandbanks in the middle of the North Sea:

> You can say that the habitat which has been designated on the Dogger Bank is named 'sandbanks covered by seawater all the time down to 20 metres'. How can you then suddenly designate sandbanks at 50 metres depth in that regard? I think that's shambolic. Because if you dig into it, then the definition of these sandbanks which should be protected at the time when this habitat type was added, that was about some foraging areas down in Germany, where I think there were some birds which ate fish or something, very close to the coast. So these areas they have never been intended to be designated in the middle of the North Sea down to 50 metres depth. That was never the intention. Some have simply made use of the directive. I think it's disgusting.
>
> Danish fisheries industry representative, interview

These arguments concern a mismatch between the original intention with adding sandbanks in the Habitats Directive's Annex I and the actual implementation. Another argument which was mentioned by several fisheries industry representatives concerns the logic behind protecting sandbanks when considering the effect of fishing on a sandbank. According to one of the representatives,

> You can understand with the reefs [which also require protection under the Habitats Directive, ed.].You take a beam trawler across a reef, you're gonna do damage. But taking a beam trawler over sand that is already in motion and will be vastly changed from one month to the next. It's just a bit strange. So we don't agree with the fundamental rationale. So we see it in terms of another piece of

> damn stupid European legislation added to a list of damn pieces of stupid legislation that has compromised proper fisheries.
>
> UK fisheries industry representative, interview

The notion that the Dogger Bank is highly dynamic was based, among other things, on the fishermen's experiences from fishing in the area. For example, one interviewee referred to a story told by one of the Dutch fishers:

> Edwin Leemans, you know Edwin? He told me an example […], after a recent storm […]a wreck of a vessel was exposed on the sandbank, and so sand something to the depth of about 5 meters had been taken off. And he said, within a few days or a week or so, it had disappeared again, submerged again, so I mean, fishermen believe it's a highly dynamic environment.
>
> UK environmental NGO representative, interview

Along the same line of reasoning another representative argued that compared to other habitat types sandbanks are almost designed to be fished:

> For some habitats it might be a good idea, right. Some habitats are very vulnerable to fisheries. I do think that it makes sense to protect for example a bubble reef from bottom-towed gear. [...] But at the same time I think that some habitats are so dynamic that they are almost designed to be fished. And among those are actually sandbanks […]. Far the most sandbanks are at low water depths, they are very affected for example if there is a storm then the sand will be messed around, and if there is a stream then the sand will be messed around. A bit like what happens if you tow a trawl over the sand bottom. So the sandbank is kind of used to these influences, so a fishery which takes place on a sandbank has a minimal impact on the habitat. I am not saying that it has no impact, but the impact is minimal compared to how we affect just about all other habitats. So if you wanted a fishery which affected the ecosystem the least possible, then you should fish on all sandbanks.
>
> Danish fisheries industry representative, interview

On the background of the same logic, and with reference to the problems related to displacement, NFFO conclude in their consultation response that "it is likely that the Dogger Bank should be identified as a region reserved for fishing activity with greater protection being afforded to more vulnerable or sensitive habitats which are subject to less natural disturbance." (National Federation of Fishermen's Organisations December 2010, p. 6)

In general, then, there was little acceptance from the fishing industry regarding the usefulness of marine protected areas as a tool for biodiversity protection and in particular the meaningfulness of protecting sandbanks. Their criticism both had to do with the interpretation of the Habitats Directive, which they found was flawed, and with the biological meaningfulness of protected areas and of sandbanks. Some of their criticism was informed by their experiences as practitioners, for example their knowledge about clean fisheries on the Dogger Bank, about that they would have to go elsewhere and fish if the area was closed, and about the kind of sediment they tended to find on the anchor when fishing on the Dogger Bank.

The science

The fisheries industry organisations also criticised the scientific underpinning of the site. A point of criticism was that the scientific advisors had described the Dogger Bank as a homogeneous area. This was not consistent with what the fishermen experience during their fishing practices on the Dogger Bank. According to one of the fisheries industry representatives,

> […] the issues have been to challenge the view that Dogger Bank is a monolithic area, a uniform sandbank. From a fisherman's point of view they identify a range of different bottom types from parallel ridges, gravel and sand, sandy areas. So to put a single very large boundary around the Dogger Bank, and say well "we're protecting the feature here". It seems very very strange to fishermen because it's actually many different types of substrate, indicated by the different types of fisheries that take place in it. So, in that sense, there is I think a sense of resignation, as I said early it's just another piece of strange madness generated by a machine versus the … I think fishermen understand that marine protected areas have a role but I don't think that this kind of generalised approach helps an understanding what it is you're trying to protect and why you're trying to protect it.
>
> UK fisheries industry representative, interview

Another point of criticism about the scientific advisors' assessment of the sediment on the Dogger Bank, likewise on the basis of the practical experiences from fishing on the Dogger Bank, concerned the thickness of the layer of sand. One of the interviewees argued that:

> Well, there are areas where there is a lot of sand, but I believe that the greatest part of the Dogger Bank consists of a clay bank with a thin layer of sand on the top. […] Big parts of this area consist of gravel and stone bottom and have nothing to do with a sandbank. And in big parts of the area there is perhaps 2-3-4-5, perhaps 10 centimetres of sand, and below the sand you find clay. And then, if you really want the sandbank, then you need to move more out to the edge, and then there can be

> some greater concentrations of sand, where there is deep sand of many metres. But you won't find that on the top of the bank. I don't believe so at least. I build this on the fact that I have been fishing myself out there with my father with Danish seine fisheries, and about each time we took up the anchor there was a big lump of clay on the anchor. And that doesn't come by itself; that's because there has been some clay just underneath the sand.
>
> Danish fisheries industry representative, interview

NFFO points both to the homogeneous character of the sandbank and to the thin layer of sand in their consultation response:

> In point of fact (as was raised with JNCC at a meeting on 9th November 2010) – we dispute the scientific assertion that the whole area proposed is a sandbank. It is in fact a rocky formation that is partially covered by sand as is demonstrated by the rocky gullies that transverse it with marl beds to the East. It is not a homogeneous stretch of sand. The survey work that has been carried out covers, proportionately, a relatively small area and is not representative of the seabed as it is known to fishermen. The uniformity of the area is therefore also disputed by MPAC. (National Federation of Fishermen's Organisations December 2010, p. 2)

Opposite the environmental NGOs, both the NFFO and the North Sea RAC – most likely on the basis of inputs from fisheries industry representatives – argued that JNCC had been too strict in their implementation of the Habitats Directive, making the site much bigger than what was required. NFFO, for example, argued in their consultation response that:

> In Section 8, "Site Boundary" the JNCC lays down the basis by which it has adopted the site boundary; the position adopted is the maximum which may adopt rather than the minimum which they are obliged to observe. We see no necessity for the adoption of this extreme position. It should be perfectly possible to adopt an intermediate position based on a finer grain assessment of the feature. (National Federation of Fishermen's Organisations December 2010, p. 2)

The reasoning here is that there is some room for the scientific advisors to manoeuvre within the framework of the Habitats Directive – an opening which allows the scientific advisors to have some more ethical considerations about how big the site should be.

The fisheries industry representatives generally seemed to be content with the scientific underpinning of the harbour porpoise grading. Opposite the environmental NGOs, the fisheries industry representatives I interviewed mainly had issues with the Dutch and German decision to make harbour porpoise a qualifying

species in their areas. The main criticism is much along the UK scientific advisors' logic behind not making harbour porpoise a qualifying species, namely that 1) there is not enough data to indicate that the Dogger Bank is more important for harbour porpoise than other areas, and 2) harbour porpoise is a migrating species, which makes it difficult to point to particular sites that should be more important than others. One of the fisheries representatives argued that the logic behind the harbour porpoise grading in Germany and the Netherlands is flawed:

> I think that the argument for protecting harbour porpoise in the Dutch area was that while they didn't know where these harbour porpoise were then this area could be just as good as any other area. I don't know how scientific that argument is. […] They have *no clue* about how many harbour porpoise are out there, or if the Dogger Bank is an important area. I would say that that is a fact.
>
> Danish fisheries industry representative, interview

The fisheries industry organisations, then, were also critical about the scientific underpinning of the site. However, they were not occupied with the degree to which the designation was motivated exclusively by science. Instead, the main point of criticism was the homogeneous description of the bank which did not correspond with fishers' experiences from their work on the bank.

Socio-economic considerations

Even though JNCC reminded at the opening of the consultation that "Selection of sites and their boundaries must be based on the selection criteria and relevant scientific information, not on socio-economic grounds" (Joint Nature Conservation Council 20 August 2010a), fisheries organisations in their consultation responses pointed to the need to consider socio-economics in the designation. The North Sea RAC, for example, argue in their consultation response that:

> Within the UK's obligation to meet its requirements for designating sandbank habitat, it should be possible to reduce the extent of the Dogger Bank pSAC or adopt comparable areas in the North Sea, thereby relieving pressure on an area that is of critical importance to European fishing fleets, and also alleviating damage (caused by increasing discarding and inflicting benthic damage) resulting from displacement to other areas.
>
> A better balance between environmental and fishing interests would enhance respect for and compliance with the management measures that are likely to be introduced. (North Sea Regional Advisory Council December 2010, p. 2)

A similar point was made by NFFO who also argued that the major site designation was an unnecessarily strict interpretation of the Habitats Directive when considering the serious implications for fisheries:

> We also query the necessity for the huge size, 12,000km2, of the proposed SAC. Much is made of the Commission's requirement for between 20 and 60 % of a habitat to be designated. With the Dogger Bank as proposed, the approximate percentage of 30 % is reached. Since this represents approximately 10 % of "sandbanks" in UK waters it would be perfectly possible to reduce the extent of the area or adopt comparable areas within the North Sea thus relieving the pressure on areas that are of critical importance to the European fishing fleets. (National Federation of Fishermen's Organisations December 2010, p. 2)

Hence, again the fisheries industry organisations points to the room for manoeuvre for the scientific advisors within the Habitats Directive and argue that a more moderate application of the directive in the form of a smaller site would be appropriate both because the site is important to fisheries and because it would result in greater support for the site among fishers and hence also better compliance with the regulation.

Summary

The prospects of a protected area on the Dogger Bank, then, raise concerns among fishers as it potentially has major impacts on their fisheries. However, they are more interested in the development of management plans than in the initial site designation, as it is the particular management measures that will affect them. Moreover, it is only in the second phase of developing management plans that socio-economic interests can be taken into account. On top of this the fishers' organisations have been overloaded with other consultation processes, for example in relation to other marine protected areas and to wind farm development, particularly on the Dogger Bank.

They have, however, commented on a number of issues in relation to the site designation. First of all, they have questioned the very idea of marine protected areas as a tool for biodiversity protection, mainly on the background that protected areas displace fisheries to other areas which may be more vulnerable, which may require more effort to catch the same amount of fish, and which may increase the amount of discard. Fishers also questioned the need to protect sandbanks, which they find are highly dynamic and tolerate better to be fished on than other habitat types.

Secondly, fisheries industry organisations commented on the science, which they found is flawed on a number of different grounds. They find that the homogeneous description of the Dogger Bank as a sandbank is not consistent with their own experiences from fishing on the bank. They have argued that the

sediment on the bank is heterogeneous, and one argued that in many places there is clay few centimetres under the sand. Some seemed to support the approach taken by the UK not to make harbour porpoise a qualifying species on the grounds that it would require data that showed that the area is more important to harbour porpoise than other areas.

Finally, some fisheries industry organisations argued that socio-economic considerations should play a larger role in the designation.

Stakeholder evaluation of the process

Having presented some of the issues and arguments presented by the two stakeholder groups on the pSAC and added features and the scientific justification for it, this section concentrates on the way the groups reflected on the process, on their strategies and on the role of science and scientific advisors. Again, I begin with the environmental NGOs.

Environmental NGOs

As mentioned earlier, one of the main points of criticism from the environmental NGOs was that they believed the scientific advisors had been under influence from political interests. They suspected this to be the case with regard to the boundaries of the SAC, which they believed had shrunk, not only on the Dogger Bank but on all sandbanks sites in the UK. And they suspected it to be the case with regard to JNCC's decision not to make harbour porpoise a qualifying species. Unlike the fisheries organisations, this point of criticism was also raised as a comment to the site designation during the pre-consultation and consultation process – hence it was treated above, in the section about the consultation review.

However, during the interviews they also shared a number of other reflections on the role of science and scientific advisors in the designation and on the way the designation process had been managed. One of the issues was about the role of science for environmental regulation. Another is about the role of scientific advisors:

Science as Natures' representative

A general approach to science among environmental NGOs was to see it as a core lever for environmental regulation. The stress on science in the Habitats Directive, several of the interviewees argued, was an efficient way of highlighting environmental considerations over socio-economic ones. For example, one of the environmental NGO representatives I interviewed said about the claim in the Habitats Directive that:

> The approach is very sound. Because the reason that Natura 2000 was designed the way it is – the reason the Habitats and Birds Directives were written was that everything we tried before was

> failing. To protect biodiversity. And the approaches in the past have involved balancing – that awful word – balancing the environment with a whole lot of other things, and the environment always loses when you do that. Because there's always stronger voices elsewhere. So the reason why the directives were written the way they are and requires that when designating a site all you think about is science, is because we already know that other approaches don't work. You just don't protect the right bits if you don't take that very clean approach.
>
> UK environmental NGO, interview

Taking a 'very clean' approach and following purely scientific logic was by several interviewees seen as the same as giving environmental considerations priority over others. The same logic lies behind the claim in the Habitats Directive. Hence, some of the environmental NGOs described it as an important principal struggle to hold the member states to the need to designate sites exclusively on the basis of science. According to one of the environmental NGOs, the Dogger Bank was iconic in this regard, which was a reason why they felt so strongly about it. One of the environmental NGOs I interviewed also described how insisting on the scientific approach was also an efficient way of putting pressure on the member states, given the legal requirement:

> We want to see sites designated purely on science, they say they're designating sites purely on science, so we can comment on the science, and we can be very rude when we think they're not only using the science. Which is effectively what we do. And the fact that the Commission guidance on the case load is quite clear, makes that quite a strong argument, so for us that's good given that our job is to protect stuff. That gives us some useful levers to protect it.
>
> UK environmental NGO, interview

Along the same line, several saw the role of science as that of speaking truth to power. For example, when the UK finally submitted the Dogger Bank SAC as a candidate SAC (cSAC) to the European Commission, Chris Butler-Stroud wrote on the Whale and Dolphin Conservation Society website:

> I have to say that I have a lot of time for the UK Environment Minister, Richard Benyon and his civil servant team, but I sometimes wonder at the advice that they receive. Speaking truth to power is the responsibility of NGOs, but it's also the responsibility of the statutory agencies that we trust to look after the interests of the wildlife and natural environment around us. I do wonder however if those who have the ear of government sometimes get too many political signals […]. (Butler-Stroud 2011)

Again, 'political signals' are described as opposed to science and environmental concerns alike, leaving scientists as spokesmen for the environment.

Scientific advisors as policy advocates

Even though the environmental NGOs stressed the importance of the need for scientific advisors to be disinterested in their approach, some of them also found that the scientific advisors should advocate the policy they were advising. That is, in this case marine protected areas as a conservation tool and the need to protect sandbanks. For example, one of the environmental NGOs argued that scientific advisors should advocate marine protected areas to fishers and criticised JNCC's failure to properly do so:

> There's a lot of scepticism amongst the fishing sector about the potential for these areas to actually generate better fishing opportunities in terms of Callum Roberts' idea that these areas become areas of fish stock regeneration, which then spill over to the other side[5]. And I think in the case of the Dogger Bank I think JNCC were floating this idea with rather little evidential base, so it didn't get much attraction as a selling point to the fishing sector. […] So I don't think JNCC sold that idea particularly well, and there was a very high level of uncertainty around that point, whether designating very large areas of sandbank will actually generate better fishing opportunities that might compensate for some of the loss of income by being displaced from fishing grounds.
>
> UK environmental NGO, interview

One environmental NGO also argued that scientific advisors should advocate the need to protect sandbanks, likewise arguing that JNCC had failed:

> I think that's been another difficulty for the fishing sector that they don't understand the concept clearly about biodiversity protection when it comes to sandbanks. They can see it more clearly with a Lophelia reef or even a Sabellaria reef. But sandbanks – there's a whole array of perceptions in the fishing sector around sandbanks, where it's just – they just don't get it. And actually, this hasn't been helped by JNCC, who haven't strongly – certain individuals haven't strongly protected the rationale behind sandbanks.
>
> UK environmental NGO, interview

[5] The spillover effect is the idea that neighbouring areas to protected sites profit from the increased production of fish and other biological life within the site. While the idea has been a popular argument used to convince fisheries industry stakeholders of the benefits from protected areas, there has been much debate about whether there was evidence for it. Callum Roberts, whom the environmental NGO refers to, is the lead author on a paper from 2001 arguing, on the basis of two case studies, that the spillover effect it is real. (Roberts et al. 2001)

Some environmental NGOs also found that the scientific advisors had downplayed the potential consequences of protected areas for stakeholders – something which, they argued, would make them unpopular further down the line:

> NGO 1 There's an interesting history that comes back to this disingenuous point of stakeholders. There's a long history in the UK, particularly with marine protected areas, but also on land, of introducing the designation and saying 'it will be fine, it won't affect you'. Or 'it will be fine; it will only affect you inside the site'. And that's not true. […] It's really unfair on the stakeholders, and it's very interesting when you compare that to the Dutch approach. Because the Dutch have always said 'it's a Natura site, everybody out'. And now, ten-fifteen years later they're starting to say 'ok, maybe that was a bit of an overreaction, some of you can come back in, and we can have some fishing and we can have some this and we can have some that'. So both sides are backpedalling, but the Dutch are backpedalling in a way that makes them popular [laughs], and the UK are backpedalling in a way that makes everybody hate them. So I think there's a real kind of expectation management thing about the approach.
>
> NGO 2 Yeah. And actually, you know, in its most extreme it leads to a situation where the fishing sector can't understand why the site is being designated at all. There's no front foot argument for why this is an important area for nature conservation, cause there are so many caveats always and so many 'well, don't worry too much, 'cause we won't change things as much' – people will begin to say, 'well, what's the point?' You know.
>
> NGO 1 Yes, if you don't need to change things, why do you need to protect it? It is a *very good* argument, you know. *Very* good argument.
>
> UK environmental NGOs, interview

Likewise some environmental NGOs criticised JNCC for not having collected more data, arguing that by maintaining high levels of uncertainty undermines the legitimacy of the process:

> They play it back to the folio, the refusal to survey. Because they think by not surveying they'll get away with not designating it. They don't. All they do is they make designating harder, and they make it harder on everybody, they make it harder on the likes of us, because we have to fight to get sites, and then we have to fight to stop them getting smaller. And they make it harder on the likes of fishermen, because you know; there will undoubtedly be some sites out there with big bits, big areas

> inside that shouldn't be. That *have* been included on the precautionary principle, even if we didn't realise it was precautionary at the time. Because of the uncertainty. And, yeah, it just erodes confidence in the process for everybody I think.
>
> UK environmental NGO, interview

In this way the scientific advisors were by some expected to advance the legitimacy of the regulation they provided advice for. In part by providing solid science to convince the opponents, and in part by advocating the importance of the policy. That is, to advocate the conservation of sandbanks, the site based approach to harbour porpoise protection and the effect of marine protected areas as conservation tools and as measures with side-effects that are also beneficial to fishers.

Summary

To sum up, science plays a core strategic role for the environmental NGOs. Science is perceived as an important lever for environmental concerns, and it is also seen as a strategic point to raise in their communication with JNCC. Furthermore, the environmental NGOs I interviewed found that the statutory advisors had an important role to play as advocates for the management measures they were providing advice for, and the interviewees did not find that the scientific advisors had fulfilled their task in this regard – on the contrary; they had been exposing the uncertainties and had not been clear about the need and potential effects of protecting the bank.

The fisheries industry

The fisheries industry representatives I interviewed also commented on the science, but their frustrations also concerned the priority given to wind farm interests over fisheries interests and a general feeling of not having any influence on the process:

Prioritising between wind farms, fisheries and conservation objectives

Also members of the fisheries industry organisations were convinced that JNCC have been negotiating with the Department of Energy and Climate Change, and that particular consideration has been shown for the wind farm development on the Dogger Bank. And some had difficulties understanding how JNCC could designate a protected area on the Dogger Bank and then allow wind farm development. Particularly because they expected some degree of regulation of the fisheries. For example, one of the fisheries industry representatives argued that:

> I think there is incredulity how on the one hand you could have something that is supposed to be protected for something special and on the other hand you plug a very large wind farm the size of

> North Yorkshire. I mean if you say you're in the UK that the Dogger Bank wind farm is the size of North Yorkshire- that's one of the biggest if not the biggest county in England. […] It does raise question how you could designate this as something that is special and needs protection from something that has relatively light impact, fishing, to something that is permanent and dramatic as a massive wind farm. These two things don't seem to coincide. That's why there's been these prolonged discussions within the UK government between departments of whether the two things can coexist. But I think they came to the conclusion that they can't coexist but that's Realpolitik.
>
> UK fisheries industry representative, interview

Some fisheries industry representatives argued that wind farms were going to be allowed on the site unlike some fisheries activities because wind energy is of high governmental priority. According to one, the priority given to wind farms could be explained by the seriousness of the issue of climate change:

> Completely internal government, we've heard. A, it took a long time, it's a long process and we would only hear indirectly that there were heated discussions going on in a civilised way of course. And – but no, we were kept out of that process. And of course in a way we've been here before because in the 1970s the need to develop offshore oil was a national priority. It was about saving the British economy which was at the time was in trouble. And now we're not talking about saving the British economy, but we're talking about saving the planet. And so there's a very high political priority given to the expansion of offshore wind farms that override anything like fishing.
>
> UK fisheries industry representative, interview

According to another informant often working together with the fisheries industry organisations, the high priority given to wind farm development was due to economic considerations:

> I might have mentioned this to you before, but there's a very strong sense that there's a hierarchy of human use in the North Sea in which fishing comes very very low as an activity and that hierarchy is based, if you like, on a value to national economies per unit area. So wind farms are right at the top because they you know, you're generating electricity per square meter of sea bed and it's a highly concentrated activity and oil and gas production would be exactly in the same category, whereas fishing is highly dispersed over very large areas. So it's the value it generates per unit/area of sea bed is very very small, so the perception amongst the fishermen is that is makes very hard for them to argue their case against these big industries which have very very high value per unit/area.
>
> UK environmental NGO representative, interview

The fact that the development of a major wind farm would be allowed within the Dogger Bank SAC, while they could foresee regulations on their own fisheries activities, raised frustrations among fishers and brought them to question the legitimacy of the SAC and particularly of the process.

The role of science

A frustration that was generally shared among the fisheries industry stakeholders concerned the claim in the Habitats Directive that the initial designation should be based exclusively on science. They gave different reasons for their frustrations.

First of all they were frustrated for the obvious reason that it affected their livelihoods. The Dogger Bank is, as mentioned, of great importance to the fisheries industry both in the UK, the Netherlands, Denmark and Norway. Depending on the management measures the SAC designation can have major consequences, both for the fisheries and for the processing industries on land. There was a sense of unfairness among some fishers who found that decisions affecting them in this way should as a minimum be made in some kind of consideration of these effects.

Secondly, the claim in the Habitats Directive was by some seen as a top-down measure which did not draw on newer insights about the need for stakeholder inclusion and transparency. They also pointed to the value of obtaining legitimacy among fishers, for example by the increased compliance with regulation measures which could be expected on that account. One of the informants often in contact with the fisheries industry said that:

> [There is] a lot of unhappiness amongst the fishermen about the Habitat's Directive being seen as out of step with modern thinking about transparency, stakeholder inclusiveness, bottom up approaches, micromanagement and all these sort of things. It chimes very strongly with the criticisms on the Common Fisheries Policy itself which is very top-down command and control. And it doesn't give any responsibility to the fishermen to devise their own solutions and to be part of the solution making. So it's very much in that kind of…sort of cultural, you know ethic that they speak about now.
>
> UK environmental NGO representative, interview

Thirdly, some held that scientific advisors should draw on the insights from fishers' practical experiences from fishing on the Dogger Bank. One fisheries industry representative used Habermasian terms to describe the difference between the logics of scientific and fishermen's knowledge:

> I think it's a traditionalist approach to science. And in that sense I think it's, it adheres to a model of science that is instrumentalist. So it's a model of science that says "we, the scientist have to maintain

> our purity. What we do is produce robust, impartial science. And if we engage too closely with the fishing industry we become tainted by dirty politics or filthy lucre or money". In some way, their science would be devalued. And I think that model has been the dominate model within ICES [the International Council for the Exploration of the Sea[6], ed.]. There's an alternative model, which is the communicative model of science: There is no absolute truth, there is large uncertainty, and we can best achieve good science through communication, through discussions with stakeholders including the fishing industry. And by talking together, and working together, more than talking, working together through fishery-science partnership projects, we can identify the areas of uncertainty and agree what the uncertainties are. And that will help us arrive at a conclusion. The science is always provisional in this model, rather than an absolute truth which only scientists in a kind of priest-like way can deliver. I think that the Natura 2000 model is predicated on the instrumentalist view of science that in terms of site selection the boundaries ought to be [defined] solely [within] the realm of since. And I think that's bad and I don't agree with it.
>
> UK fisheries industry representative, interview

Mind the language here sticks out from the other fisheries industry representatives. The representative quoted above is a sociologist hired to represent the fishers. However, the logic the representative uses is merely a more academic version of notions that were widespread among the fisheries industry representatives: That fishers due to their practical experience and their stakes know more, or at least know more about the local conditions, than scientists who do not spend as much time at sea and whose livelihoods do not depend on knowing for example where to find the fish.

Finally, several stressed the need to negotiate with fishers in order to take account of potential side effects. According to one fisheries industry representative,

> If you could have discussion [between fishers and scientific advisors, ed.] about the site and particularly the shape of the boundaries, you can arrive on a recommendation that will deliver protection to the features but at the same time allow fishing to continue in the areas where they

[6] ICES, the International Council for Exploration of the Sea, is an intergovernmental scientific advisory organisation providing advice to the ICES Convention's member states, which includes all states bordering the Baltic Sea and North Atlantic. Hereunder ICES provides advice for fisheries management in the EU. ICES tend to be the main reference regarding scientific advice for fishers with activities in EU waters.

> need to fish. And I think if you don't do that there's a big danger of having knock-on consequences, unintended consequences. One of them, potentially, in the Dogger Bank is displacing.
>
> UK fisheries industry representative, interview

The need to designate sites solely on the basis of science, then, was criticised for excluding those who would be affected by the policy, for being top-down and for not being transparent. Fisheries industry representatives further argued that by taking on this approach the resulting conservation policy underpinned by the science might not be perceived as legitimate by fishermen, something which might also affect their compliance with the regulation. Finally, the knowledge base for the sites would not benefit from fishers' practical experiences from fishing, just as the designation would not take their inputs into account about for example displacement, that is, where they might fish instead if they were cut off from fishing on the Dogger Bank.

In continuation of this, some arguments were given for involving fishers in the scientific process. One of the fisheries industry representatives requested more close partnerships between the statutory advisors and fishers:

> The ideal process would be the ability to sit down and say "yes you have a legitimate ability; you've got a legitimate role which is to identify areas for marine protected areas. We have a legitimate role to catch fish and to help provide food security for the nation. And we therefore need to engage closely with each other and build trust." And that might sound a little bit, I don't know, pious. But if you look at the oil industry which has excluded fishermen from large areas of the North Sea, there's actually a very good working relationship between the oil industry and fishing industry. Built over 20 years, our organization at different levels is engaged with the oil industry in inter-governmental discussions but also commercial arrangements. Where fishing vessels provide guard ship duties for sensitive areas and so there's some money going back into the fishing industry. And I think that's a useful and interesting model about how something like that could go. And if statutory advisors are using commercial fishing vessels to obtain scientific data in fishery-science partnerships that break down barriers and help to build up the trust in an ideal process would be very different from, coming along to RAC talking to people at my level but not really engaging or providing a reason why fisherman would think that this is a legitimate process. I give the example of oil as quite a successful model of engagement between two industries that you might say are, on the face of it, are going to be in conflict.
>
> UK fisheries industry representative, interview

According to two of the interviewees, however, fishers are mixed about sharing their information with scientific advisors.

> Of course there are different layers of concern. For a start, there's tension between defending fisher grounds from poorly designed marine protected areas or wind farms or dredging areas. On the other hand there's commercial confidentiality: Fishermen are not eager to hand over their plotter chart, their information, to anybody. So there's a movement, a recognition in the industry that the least worst option is to lose some commercial confidentiality; we need to use our information to defend our fishing grounds. And I think there's a bit of a shift going on because of what's happened. […] I completely recognise the German position [the German fishers' organisation has not wanted to share their information about fishing activities with BfN, ed.], that's a position that's voiced around the [UK fishers' organisation] table as well. But at the same time there's a recognition that the world is different, the world is changing, and unless you can provide very precise information there's a danger that marine protected areas will be designed in an way that end the ability to fish in particular areas.
>
> UK fisheries industry representative, interview

To summarise, several had a hard time accepting that sites should be designated solely on the basis of science and that socio-economic concerns could not be taken into consideration. Some found the claim to be out of step with newer management approaches within fisheries where stakeholder involvement, cooperative management strategies and transparency are buzzwords, and some also found that the experience based knowledge of fishers was neglected. The fisheries industry representatives I talked with wanted to a greater degree to be involved in the scientific process. Some fishers were reluctant about sharing their information, they argued, but they increasingly saw the need to do so in order to flag their interests.

While several complained about the claim in the Habitats Directive that the designation should be based on science alone, there was, however, some doubt whether the scientific advisors had actually been doing this. First, one of the fisheries industry representatives argued that some scientific advisors have a strong bias towards conservation and almost act like environmental NGOs. Important to note, this criticism was not directed towards JNCC but towards Natural England, the statutory advisors providing advice for site designation on land and in the national waters up to 12 nautical miles off the coast. However, it affected the fishers' general feel towards the designation process. Their resignation, the informant told,

> […] hasn't been helped by the statutory advisors overstating their case, because if you look at the politics there's been a lot of empire building going on in Natural England. In the early days it was very

> much flexing its muscle – it saw itself having a role in fishing management as well as nature conservation advice and was very hard to differentiate sometimes from a green NGO. So there's a conflict in the roles. […] I went to a reception in Parliament at which a speech was given by the then chairman of Natural England. And he said – it was a fire and brimstone kind of speech – fish stocks are crashing everywhere, and he said 'it's the Wild West out there, there's no regulation'. And there was Natural England and particularly the Marine and Coastal Access Bill which was going through parliament, so he was naturally on a white charger on the cavalry come to save the world from over-fishing. And I wrote to the chairman afterwards, and said that I just didn't recognise the picture that's being painted. And it's a picture that's being painted for political reasons; it's about a young organisation stretching its muscles out. I think that has been clawed back and I think that as ever in this world, it's a lot to do with personalities, and some of the personalities at the top of that organisation are very aggressive in pursuing their role and made some outrageous statements. […] It's not for a young upstart organisation like Natural England to take on the mantle of absolute rulers. It's very much in those terms. I think things have changed a little bit, I think they've realized, there's a recognition that is not their role – fisheries management is not their role. That if they behave like an environmental NGO, they will be treated like an NGO, as a lobby group not as somebody that is presenting their objective information.
>
> UK fisheries industry representative, interview

Another industry representative argued that it was economic interests which led the scientific advisors to designate sites offshore on the Dogger Bank:

> I think it indicates that the Commission has said to the different member states: 'You need to designate some sandbanks'. And if you look inshore you see a lot of traffic and ship routes and also a lot of fisheries and quite a lot of oil activities or something, and then they have said that 'well, there is an awful lot of sand out here in the middle of the North Sea, and then we designate those areas, and then we solve the problem by doing so.' That's how I think it has happened.
>
> Danish fisheries industry representative, interview

Hence, while the fisheries industry representatives generally found the claim in the Habitats Directive highly problematic, some also found it problematic if the scientific advisors seemed to be biased towards conservation or if they seemed to take economic interests into consideration, for example by giving priority to wind farm development or by focusing on offshore areas rather than inshore.

Stakeholder involvement

Finally, while there was a lot of frustration about the role defined for science in the Habitats Directive, which gave fishers' economic concerns little or no weight in the designation process, the general feeling communicated during meetings, I observed, in interviews and in consultation responses was that there was very little stakeholder consultation. An analogy to trains and cars was used several times, both at meetings and in interviews:

> You could say an analogy would be that the fishermen are being told that they are driving a car and they are told "here's the car, here are the keys, there are a number of destinations in terms of establishing a network of marine protected areas. It's for you, the stakeholders, to drive that car in its general direction". And the fishermen feel that they are not in a car, they are in a train and that they've been invited to sit in the train, that it's going to the destination, and it's going to the destination very fast.
>
> UK fisheries industry representative, interview

This feeling in itself created much frustration and reluctance to participate in the process. According to one of the fisheries industry representatives, it was almost impossible to get to change any boundaries:

> A lot of these areas were designated long time ago. I think they could have involved stakeholders a bit more in the designation of those Natura 2000 areas; I don't think they have been so god at that. And if they have asked about something it has been almost impossible to change these boundaries. They haven't involved stakeholders a lot in the designation of these Natura 2000 sites, not in Denmark either. And if once they had drawn a line on a map, no matter who has done it, then it is almost impossible to change it. I don't think any stakeholders have changed any lines on a map. […]These consultation deadlines and things on Natura 2000 sites, it is something they have to do, but if you haven't affected these boundaries before the consultation starts, then you only have a five per cent chance to get anything changed. You can just as well skip to write these consultation responses. It is so seldom you get anything out of it.
>
> Danish fisheries industry representative, interview

This experience of not having a say in the designation process kept some of the fisheries industry organisations from investing much time and effort in the process. The representative quoted above could not even remember if they had written a consultation response or not.

As earlier mentioned, another background for not engaging particularly in the designation process,

however, was that the boundaries are less important to fishers than the particular regulation measures which will influence their fisheries on the SAC. Moreover, inputs about socio-economic interests are only welcomed in relation to the development of management plans. Hence, as the process moved into this second phase of developing management plans, fisheries organisations were preparing to be more intensively involved. One of the UK fisheries industry representatives, for example, found that at the upcoming meetings about management plans for the Dogger Bank SACs in Germany, the Netherlands and the UK "we're finally talking about management measures […]. I think that's a bit where the fishermen really wake up and smell the coffee. I think that there will be a huge interest in this meeting, and the Dutch want to send along about sixty fishermen […]."

Summary

When evaluating on the process, the main issue for fisheries industry organisations was the lack of stakeholder involvement and the lack of priority given to consider fishers' interests. Similarly, their evaluation of the scientific outcome primarily concerned the way the quality had been affected by lack of inclusion of fishers, of their experience-based knowledge about the Dogger Bank and of their knowledge about where they would potentially fish instead, if they were displaced from the Dogger Bank.

Discussion

Both stakeholder groups were critical about the site designation and the science underpinning it, but their criticism was very different and most often opposing, and their comments to the science as well as their notions about the role of science were also very different.

Starting with the management objectives, the environmental NGOs found site based protection to be an important management tool for biodiversity. Asked about the efficiency of site based protection for highly migrating species, however, some mainly argued that it was better than nothing, and that the Habitats and Birds Directives, which were mainly based on marine protected areas, are about the only legislation environmental NGOs can hold the member states up to in the offshore waters of the North Sea. Fisheries industry representatives, on the other hand, found marine protected areas highly problematic, because they tended to displace the fisheries, often from areas with high catches and little bycatch to areas with smaller catches and more bycatch, which eventually could lead to more fisheries activities and more discard for the same amount of fish. On this background they both found that other management tools should be considered and that potential displacement should be taken into consideration in the designation of sites.

With regard to the science, both groups repeatedly pointed to the scientific uncertainties, mainly with reference to the little data that was available in the offshore environment. The discussions concentrated in part on the way the scientific advisors interpreted the data available and the advice they gave on this background, in part on the degree to which JNCC should have collected more data. With regard to the scientific advisors' interpretation of the available data, environmental NGOs found that they had not been precautionary enough. High uncertainty requires a high degree of precaution, some of them argued. This point was particularly pinpointed in relation to JNCC's reasoning that as there is lack of evidence of the importance of Dogger Bank to harbour porpoise they would not make harbour porpoise a qualifying species on the site. Likewise, they found that the uncertainties regarding the range of sandbanks had been misused during the consultation with stakeholders, something which generally caused sandbank sites to shrink during the process. The fisheries industry organisations, on the other hand, found that the scientific advisors had been interpreting the Habitats Directive too narrowly, and that they could have found justification for a smaller site on the Dogger Bank. One argument was that given the uncertainties JNCC could have strived for a better balance between environmental and socio-economic concerns. Further, some argued that the approach taken by other member states by making harbour porpoise a qualifying feature on the Dogger Bank SAC because they needed to designate sites and because the presence of harbour porpoise on the bank was at least as good as in the surrounding areas was 'unscientific'. Finally, several organisations could not recognise the image of Dogger Bank as a homogeneous sandbank and requested a more nuanced description of the bank as a basis for the designation. Taken together, opposite the environmental NGOs one can say that the fisheries industry organisations found that JNCC generally were interpreting the uncertainties in favour of the environment. And that JNCC had been too precautionary in their approach, for example by designating a major site when they could have justified designating less. A major issue for both stakeholder groups, then, is the scientific advisors' ways of making judgments, not only by looking at the uncertainties but also keeping the policy implications in mind.

Both groups also expressed concerns about the way JNCC had been negotiating with DECC, and both suspected that the scientific advisors had been considering wind farm development in their advice. However, the two groups had very different issues with this. The environmental NGOs were principal. They saw 'pure' science as a lever for environmental policy, and the claim in the Habitats Directive that the designation should be based on science alone is a principal point to hold the member states up to. As there are many economic interests on the Dogger Bank, this designation was almost iconic for them. The fisheries industry organisations, on the other hand, had nothing principally against the idea of considering socio-economic issues in the designation; on the contrary, they stressed the need to do so and requested a better

balance between environmental and economic concerns. Their issue in relation to JNCC's presumed considerations of wind farm interests in the designation was instead that they found that their own interests were given too little relative priority. Furthermore, in anticipation that the regulation within the SAC would put more restrictions on fisheries than on wind farm activities in the area, some of them had a hard time understanding how wind farms could be less harmful to the sandbank habitat than fisheries. A main difference between the two stakeholder groups, then, was that as the need to be scientific was an important strategic issue for the environmental NGOs, fishers did not have anything principally against paying regard to socio-economic interests; on the contrary they argued for the need to do so.

Representatives from both stakeholder groups also commented of the role of scientific advisors as spokesmen for the environment. Some environmental NGOs argued that this was indeed their role. On the one hand some argued that they acted as spokesmen for the environment in their very quality of being scientists, that is, science was seen in itself as a lever for environmental policy, and the role of science as speaking truth to power. On the other hand some argued that scientific advisors should go further and do advocacy for the policy they advised. A fisheries industry representative, on the other hand, was frustrated about what was experienced as scientists acting as environmental NGOs. The representative found that they should keep out of politics if they wanted to be seen as providers of objective science. Environmental considerations should not be promoted in the disguise of science. Hence, there were some fundamental differences in the ways members of the two groups of stakeholders saw the links between scientists and the environment. Whereas some environmental NGOs found scientists to represent the environment per definition, at least one fisheries industry representative found that such links between scientists and environmental concerns compromised their legitimacy as scientists.

The two stakeholder groups were also different with regard to their strategic approaches to JNCC. With regard to the environmental NGOs, they put a major effort into stressing the legal requirements and arguing that JNCC were not lawful in their approach. In the case of the Dogger Bank SAC, this is where the environmental NGOs have some strength, because they have the possibility to take the UK to the European Court of Justice, and JNCC knows this. As part of the same strategy, they also stressed the need not to consider economic issues in the designation and to be precautionary where uncertainties are high – both issues which are highlighted in the Habitats Directive. With regard to the fisheries industry organisations, one of their strategic approaches was to stress the need to cooperate with fishers both because they had some insights for example about how vessels would act if they were displaced – something which they argued is important in order to consider the effects of protected areas for biodiversity protection. They further stressed the need to cooperate with fishers in order to enhance the legitimacy of the sites among

fishers and hence also their compliance with the regulations. They did not put any major effort into the need for JNCC to be exclusively scientific in their approach, which is not surprising as it would be in conflict with their request to JNCC about balancing environmental concerns against economic ones.

The differences between the two stakeholder groups illustrate the relation between stakes on the one hand and the claims to science on the other. Some of the differences have to do with their field of experience. The environmental NGOs I interviewed all had an academic background and hence did perhaps feel more familiar with science as a reference point. The fisheries industry representatives on the other hand referred to mismatches between the scientists' advice and the fishers' own experiences from fishing on the bank. Hence, the two stakeholder groups have rather different backgrounds to refer to. Other differences have to do with choosing the kind of arguments and strategies which best support their arguments. Finally, some of the differences have to do with how scientific results can be bent to the advantage of particular interests when there are high uncertainties. Common for both groups, however, was that science was accepted as an important reference point. And a range of their arguments – for the environmental NGOs the majority, for the fisheries industry organisations less – concerned what is scientific and what is not, referring to 'proper' science as a core authority. Hence, none of the groups questioned the authority of science – however, they did question whether the advice in question was indeed authoritative science.

The comparisons in this and the preceding chapter show that what it takes to scientifically justify a marine protected area on the Dogger Bank depends among other things on whom the site should be justified to and what is at stake for these groups. The different governments in Germany and the UK, the different ministries in government and the different stakeholder groups all pose very different criteria in their evaluation of the science. Moreover, the connections between the criteria they pose and the interests they defend are generally easy to identify. Hence, no general rules can account for what it takes for science to be perceived as proper justification for policy. This corresponds poorly with the image of science communicated in the Habitats Directive where "their [the Member States'] choice of sites is an exclusively scientific exercise undertaken using standard selection criteria specified in Annex III of the directive."

In chapter 3 I looked into the formulation of a regulatory research question in the history of the sandbank habitat type definition. In chapter 4 I accounted for the advisory processes of addressing this research question in the UK and Germany, and in this chapter I gave an example of the kind of review such advice subsequently is subject to by stakeholders with different stakes in the policy outcome. In the next chapter I set out to assemble the empirical stories in a discussion of the role of science when serving as justification

for policy.

Chapter 6 Concluding discussion: Slightly covered

Chapter 3 demonstrated the hybrid character of habitat type 1110, *sandbanks slightly covered by seawater all the time* - the object which scientific advisors in the two member states have been tasked with identifying in the North Sea. It is constituted through a complex network of, among other things, member states with national agendas, a concern for diving sea ducks along the German coast, a court decision in the UK extending the Habitats Directive to the offshore area and lawyers and marine scientists acting on behalf of particular member states. Chapter 4 showed how scientific advisors working for two different governments have worked to translate this definition – in scientific ways – to boundaries on their respective parts of the Dogger Bank. It showed how methodological choices about how to translate the definition were affected, among other things, by the agendas of the respective governments, by what is at stake on the respective parts of the Dogger Bank and by the scientific advisors' different reflections about their roles as statutory advisors and about how to properly underpin boundaries. It showed that given these conditions, which were different in the two member states, the boundaries ended up being different. Chapter 5 showed how two different stakeholder groups in the UK evaluated the scientific underpinning of the UK Dogger Bank pSAC very differently, depending on their stakes. How they had different notions about the role of science, what it takes for science to underpin particular policy decisions and how uncertainties should be produced and evaluated.

In this chapter I draw on the previous three chapters and discuss what they tell about the role of science for policy making. That is, what it does to science that it is produced in order to provide advice for policy making, which role science plays in such a process and what the implications of such roles are. First, I argue that what it takes to scientifically justify political decisions depends on what it is that it should justify and for which audience. Hence, what counts as scientific justification in Germany does not necessarily do so in the UK, and what justifies particular regulation to one stakeholder group does not necessarily justify it to another group. I then proceed to discuss how scientific uncertainty, too, is a product of and evaluated according to the particular applied setting – on the audience and on what is at stake.

I then argue that even though there is increasing acknowledgement that scientific advice cannot adhere to the Mertonian norms for science as detached from political goals and institutions, they characterise the rhetoric and expectations to science which we meet in the UK and German cases. I account for the boundary drawing languages and practices which characterise the process in different ways. Then follows a section about what the implications are when rhetoric about and expectations draw on boundary drawing

languages while the practices of scientific advice is hybrid and involves ethical as well as technical elements. Finally I argue that we need new ways of holding scientific advisors accountable and reflect briefly on where to go from here.

What it takes to justify depends on the audience

Let us start in London, an evening in Autumn 2010. The UK government has approved the final version of the proposed Dogger Bank SAC, and the public consultation has just started:

> *Clara was involved in the early stages of the process of producing SAC boundaries on the UK part of the Dogger Bank several years ago. We are talking informally on our way from one bar to the next. She may be a bit drunk, she says, as to excuse that she is talking so freely, but there are thousands of ways to draw boundaries on the Dogger Bank. The guy working for the Department for Energy and Climate Change suggested another methodology for defining boundaries and, she says, it makes perfectly sense! So does the approach actually taken, and so did some of the earlier versions of the boundaries. There are thousands of ways to do it. If they had just sat down from the start and drawn some boundaries on a map in whatever way, Clara jokes, it would have saved everybody a lot of money and time. (Excerpt from field notes, December 2010)*

Clara is not the only one who has been joking, or been puzzled, about the amount of resources put into defining SAC boundaries on the UK part of Dogger Bank. According to one of the UK scientific advisors the designation of marine protected areas is taking up the time of an enormous amount of staff in JNCC. So couldn't they just have drawn some lines and moved on?

No, they couldn't. As the former chapters show, neither the UK nor the German scientific advisors have just been producing lines on a map. They have been producing scientifically justified lines. As one of the UK scientific advisors told:

UK scientific advisor	It's quite tricky looking at how to… because for each one of those [nodding at the map on the table displaying the resulting Dogger Bank pSAC boundaries], you could draw a different line.
Interviewer	I guess it's wide open how you do it – you could make one choice, you could make another?
UK scientific advisor	It's to try and justify your choice.

Couldn't they, then, just have done things the same way as they did in Germany? The German scientific advisors made justified boundaries, too? No, they couldn't. In fact they tried at one point, but that version of the boundaries was rejected by the UK government. They wanted more data, and they wanted more biological data. The case studies demonstrate that what it took to justify the boundaries of a site on the German part of the Dogger Bank did not suffice for the SAC boundaries in the UK. And the UK case demonstrates that what it takes to justify the boundaries and harbour porpoise grading for environmental NGOs is different from what it takes to justify the site for fisheries industry organisations. They demonstrate that scientific justification is relational: It is justification *of* particular policy decisions and their particular implications, and it justifies decisions *for* particular audiences. Accordingly, the cases demonstrate that when the decisions have different implications and different audiences, different kinds of justification is required. In this way, the two cases confirm Funtowicz' and Ravetz' argument that when we are in the realm of post-normal science, scientific advisors cannot make decisions in ignorance of the implications of their advice.

Let us have a closer look at the two cases. In which ways do each of them fit with Funtowicz' and Ravetz' characterization of issues in post-normal science where "facts are uncertain, values in dispute, stakes high and decisions urgent" (Funtowicz, Ravetz 1993, p. 744)? With regard to the uncertainty of facts, comprehending and managing the issue of biodiversity loss involves assessing the magnitude and urgency of the problem and identifying main pressures including future ones related to climate change and human activities. The system is complex and the uncertainties are major and often indeterminate. More concretely in relation to protected areas on the Dogger Bank, the importance of the sandbank habitat on the Dogger Bank for biological diversity is disputed, and so is the role of the bank for harbour porpoise. The boundaries of the habitat on the Dogger Bank can be defined in multiple ways. The effects of marine protected areas are contested, and the kind and extent of environmental harm derived from the displacement of fishing activities is uncertain. More research will reduce only a few of these uncertainties as many of them are about projections into the future, about the effects of a protected area on marine life elsewhere and about interpreting the Habitats Directive.

Likewise the decision stakes are unclear and disputed. Some representatives from the fisheries industry, for example, had a hard time understanding the attempts to protect small benthic species in the upper layer of the sand at the cost of their own livelihoods. The fishers' interests are focused on a little handful of commercial species and their prey, and several of them do not see the value in diversity beyond that. Environmental NGOs, on the other hand, focus on the ecosystem as a whole and stressed the interdependencies of the different species. But even among environmental NGOs there is disagreement

about the degree to which biological diversity comes before anything else – for example whether it comes before Dogger Bank's contribution to UK's transfer to renewable energy. To the UK Department for Energy and Climate Change, biological diversity may or may not be important, but with regard to the Dogger Bank the main issue is the UK commitment to obtain 15 per cent of their total energy consumption from renewables by 2020 – and the potential of a wind farm on the Dogger Bank to provide 10 of these 15 per cent. To the German environmental ministry, what is important is to get a fast clearance of where the sites should be so wind farm developers can identify sites for wind farms.

There are, however, differences between the two cases. The main interests are concentrated on the UK part of the bank, among other things due to the size of the UK Dogger Bank area, due to the shallowness of this part and due to the core role the EEZ plays in the UK's future plans for renewable energy production. Hence, how JNCC conclude on the basis of scientific uncertainties will have greater implications than how BfN conclude. This has further had the effect that the scientific underpinning of JNCC's advice in relation to the Dogger Bank pSAC has been scrutinized in every detail – according to one of the scientific advisors more in this particular case than ever before. The German advice, on the other hand, was commented, but passed relatively fast and unrevised through the cabinet.

Looking at stakes and uncertainties, the UK case belongs to the realm of post-normal science in Funtowicz' and Ravetz' model. The German case, however, is closer to, if not within, the realm of professional consultancy as the stakes are not in dispute to the same degree: The social and economic issues are less critical than in the UK area, which made it easier to give priority to environmental concerns.

Does the respective placement of the cases in the model with regard to the two parameters of stakes and uncertainty also fit with the role Funtowicz and Ravetz defines for scientific advisors in the different situations? According to Funtowicz and Ravetz, scientists can in situations of post-normal science not proceed as their colleagues engaged in, for example, applied science, where decision stakes or systems uncertainties or both are low. First, when dealing with post-normal science issues the scientists' technical decisions are necessarily bound up with political ones. This seems to be confirmed by the cases. In the UK case, where both decision stakes and uncertainties are high, scientific and political decision making can be hard to differentiate. For example, basing the boundaries on TIN modelling may from a technical perspective seem to make just as much sense and be equally technically valid as basing them on biological communities. But from the perspective of the UK government, basing them on biological communities would make more sense and provide a better justification of the site as the objective is to conserve biological diversity. Moreover, the two methodologies lead to sites of different sizes, which may make a major difference in relation to wind farm development. Secondly, and as a consequence, Funtowicz and

Ravetz argue that when dealing with post-normal science scientific advisors need to be in dialogue with stakeholders about their methodologies. This, too, seems to be confirmed by the way the scientific advisors have been working in the two cases. In Germany, the scientific advisors have been making methodological decisions without extensive exchange with interest groups, and their advice was accepted without major debate. In the UK, the scientific advisors have had their work scrutinized first by government, which rejected it two or three times and requested different methodologies and different data, then by different stakeholder groups which were also very critical about their work. All the different groups had comments to the science qua their interests. The differences between the roles of scientific advisors fit well with their different positions in Funtowicz' and Ravetz' model: Germany is closer to, if not within, the area of professional consultancy. Here technical issues may be closely intertwined with values, but scientific advice does still not need to be subjected to an external peer review by those with stakes in the issue. UK, on the other hand, is within the area of post-normal science. Here scientists need to be in close negotiation with stakeholders, and they need to a higher degree to consider the potential implications in their work.

All in all, by fitting into each their place in Funtowicz' and Ravetz' model the two cases at first glance seem to confirm the model.

Science is constructed but scientific uncertainty is not?

The two Dogger Bank cases do, however, point to some important problems with Funtowicz' and Ravetz' model. In the model, a situation of scientific advice-giving is placed in one of the three categories based on the amount of systems uncertainties and the amount of stakes. Determining where we are in the model requires that both parameters are quantifiable and that their values can be more or less settled. The designation processes on the Dogger Bank, however, illustrate the difficulties in this. I start with the uncertainties:

First of all, the kind and amount of uncertainties are not given on beforehand. The German and UK scientific advisors have been given the same task, but the uncertainties are not the same, neither qualitatively nor quantitatively. This is because the scientific uncertainties they operate with do not pre-exist the research process. The German process, for example, illustrates how the choice between methods is also a strategic choice between uncertainties. The German scientific advisors were very aware of this when deciding whether they should base the boundaries primarily on an analysis of slope or an analysis of biological communities. A slope analysis requires data about the depth of the bank. Depth data can be collected by using an echo sounder following transects over the bank. An analysis of biological communities requires data about the marine life on the bank. Such data can be collected by making sediment samples, for example using a grab, while following transects over the bank. For each sample the scientific advisors

register the species represented. Data about biology can also be collected by making video tows, stills and dives along the bottom.

Where depth data using echo sounder is considerably cheaper and faster per sample and measurements for the same reason can be performed at high densities, that is, with little distance between them, it is very costly and time-consuming to collect data about biological communities. Furthermore, depth data for most areas in the North Sea already exists as it is used for producing navigational maps. Hence, a slope analysis will involve less uncertainty than an analysis of biological data with regard to what happens in the areas between the measurements on the map. When analysing the depth data, uncertainties in relation to the slope analysis can for example be related to the outcome of combining different existing data sets which differ for example with regard to the distance between transect lines. When analysing biological data, scientific advisors will end up with different maps showing the occurrences of different species along the bank. However, some species may occur roughly everywhere, some may be overlapping but still dominate in different areas and some may occur together. Decisions about how to group the samples in communities are not at all straight-forward, and the data can be highly ambiguous. Finally, a slope analysis is mathematical. It requires feeding a computer model with depth data and a set of rules about where to draw lines. An analysis of biological data requires a greater degree of personal judgment.

These considerations all form part of the background for the German scientific advisors' decision to base the SAC boundaries in the German EEZ on slope analysis: A slope analysis produces much less uncertainties and involves less personal judgment. Hence, they expected, it makes scientific advisors less vulnerable to criticism about bias and subjectivity, and it invites much less debate about the scientific quality of the outcome. Thus the German case illustrates that uncertainties do not simply preexist scientific enquiry, but are also an outcome of it. Moreover, there can be strategic reasons to produce one or another kind of uncertainties.

There can also be strategic reasons to maintain uncertainties. For example, lack of data is the main argument for not making harbour porpoise an added feature on the UK Dogger Bank pSAC. The government's decision not to fund the collection of more data gave rise to speculations among environmental NGOs: Was it because maintaining high levels of uncertainty was convenient? While there may not be such strategic considerations behind, the example shows how uncertainty can indeed be of strategic use in the defence of particular positions or decisions.

Secondly, the different actors do not necessarily agree about the quantitative and qualitative character of the scientific uncertainties, just as they may disagree about how the uncertainties should be interpreted

and in the end affect decision making. For example, the German scientific advisors chose the abiotic approach because, among other things, it would involve fewer uncertainties. In the UK, on the other hand, DECC associated the abiotic approach with major uncertainties about the extent to which the area enclosed by the boundaries hosted biological communities which differed from those inhabiting the surrounding areas. The difference between the two evaluations of the abiotic approach is the criteria against which the approach is evaluated. Scientific uncertainties in relation to what? In Germany, the amount of uncertainties were assessed in relation to the internal logic of the approach: If one accepted the logic of the TIN modelling approach (which they asked the government to do before they ran the model), the findings would follow. An analysis of biological communities would require judgment and hence be negotiable, also within the framework of its own logic. DECC, on the other hand, assessed the approaches on the background of the objective to protect biological diversity – they wanted more certainty about the degree to which the boundaries enclosed the relevant habitat. The TIN modelling approach told little, if anything, about this.

DECC's evaluation of the abiotic approach can have different backgrounds, all of which have to do with the stakes they have in the area. One reason could be that they hope that another approach, whatever it be, will result in a smaller site. In that case, their concerns are about the outcome (a very big site) and not about the logic of the approach. If the advisory agency had started out with an analysis of biological communities and DECC believed that an abiotic approach could reduce the site, they could perhaps even have said the opposite. Another reason for DECC's evaluation of the abiotic approach could be that given the potentially major implications for wind farm development and for the UK's strategy for renewables, DECC wanted at least to be sure that the site was necessary and served its objective. That is, that it did indeed enclose a habitat that required protection. A final reason could be that DECC was concerned about the public appeal of the scientific underpinning – they could be in need of a proper scientific explanation which made sense to stakeholders who would be affected by the decision. DECC could also be driven by a combination of all these backgrounds. Whatever the reason, however, their evaluation of and engagement in the statutory advisory agency's methodological approaches most likely have to do with their particular stakes on the Dogger Bank and their concerns for the potential implications of a large site.

In this way, there is no position from where one can define the 'real' kind and level of scientific uncertainty accompanying the abiotic TIN modelling approach and an analysis of biological communities respectively. It depends on who you ask, what the conservation objectives are and what is at stake. These points are much in line with Brian Wynne's reflections about scientific uncertainty. When analytic models of environmental systems are constructed, Wynne says, certain parameters are chosen at the cost of others, some variables

are chosen to represent a combination of parameters, and some are left out. These choices are made on different grounds, such that "externally defined significant end-points, or pragmatic considerations, such as what can actually be measured, frequently dictate the structure of the resulting knowledge." (Wynne 1992b, p. 113) In this way, such models artificially reduce uncertainty. Rather than embracing and pursuing uncertainties, "[…] scientific knowledge gives prominence to a restricted agenda of defined uncertainties – ones that are tractable – leaving invisible a range of other uncertainties […]." (Wynne 1992b, p. 115) In relation to the two designation processes on the Dogger Bank, one can say that where the German scientific advisors base their boundaries on one parameter alone, one can say that rather than reducing the amounts of uncertainties, they narrow considerably the amount of defined uncertainties, leaving multiple other possible parameters outside their analytic model. In the UK case, on the other hand, the government does not accept the omission of biological variables – in the light of the potential implications and the policy objectives.

This brings me to the third point: The amount and kind of stakes affect the weight and meaning given to scientific uncertainty in decision making. For example, looking at the UK case, two of the scientific advisors I interviewed argued that they had seldom experienced that the underpinning of their advice was scrutinized in such detail. Both associated the amount of controversy and attention to scientific uncertainties with the stakes on the site. Repeating a quote from earlier, one of the scientific advisors argued that "if you want to put forward an area where there are a lot of industry interests, you need a stronger justification. Whereas if there were no industry interests in an area, they'll have a look at it and see if they think you've applied the guidelines reasonably well, but generally don't have a problem with it." The attention given to the details of the scientific underpinning does not only come from industry interests, but also from environmental NGOs and from government. But whether motivated by environmental or economic issues or by governmental agendas, the enormous focus on scientific uncertainties associated with the UK Dogger Bank pSAC is motivated by stakes.

To sum up, scientific uncertainty cannot serve as an independent variable telling us whether a policy issue brings us to the realm of post-normal science or can be treated as a case of professional consultancy or even applied science. Who, anyway, is to define where we are in Funtowicz' and Ravetz' scheme? Is it the scientific advisors who can tell whether the uncertainties are so low that it is not relevant to be in dialogue with stakeholders about their methodological choices? Or is it the government? Or the stakeholders?

Also decision stakes cannot serve as an independent variable. They depend, as with uncertainties, on who you ask. And they depend on the amount of uncertainties. For example, the UK statutory advisory agency has not been granted funding from government to collect data about the relative importance of the Dogger

Bank to harbour porpoise. In the final SAC Selection Assessment Document, they refer among other things to lack of data as a background for not grading harbour porpoise as a qualifying species on the Dogger Bank. If they had collected data which showed that harbour porpoise were actually more present in particular other areas than they were on the Dogger Bank, perhaps environmental NGOs would not have had major stakes in their grading on the Dogger Bank. Likewise, if the statutory advisory agency had collected data showing the opposite, environmental NGOs would have had even more stakes in the grading of harbour porpoise on the Dogger Bank. Whether or not intended, when government chose not to grant the statutory advisory agency funding for collecting data about harbour porpoise, they were not only managing the uncertainties, but also the stakes. In this way, stakes and uncertainties can be closely intertwined, and managing uncertainties can be a means of managing decision stakes. Steven Yearley has posed a similar argument. Taking an outset in the debate over genetically modified organisms (GMOs) he argues that the degree to which GMO is perceived as a threat depends on how uncertain it is perceived to be that genetic material from GMO can travel between species and in this way have unintended effects (Yearley 2000, p. 110).

Scientific uncertainty and decision stakes, then, are not variables the value of which can be determined independently of each other. The production and assessment of scientific uncertainty is closely bound up with what is at stake and for whom, and the decision stakes depend, among other things, on the uncertainties. Furthermore, defining how many and which kind of uncertainties are involved in relation to a policy issue is an ethical just as much at it is a technical exercise.

Funtowicz and Ravetz do not claim that scientific uncertainty continues to be an independent variable when we deal with post-normal science issues. When dealing with post-normal issues, they argue, scientific uncertainty is not only technical and methodological, but also epistemological or ethical (FuntowIcz, Ravetz 1994). As an example of epistemological uncertainties, they refer to computer models where there are technical uncertainties about the data inputs and methodological uncertainties about the way the model responds to these inputs (two different models, for example, may arrive at different results when fed with the same data). However, the epistemological uncertainties about the resemblance between the model and the real world are insoluble. This kind of uncertainty borders with ignorance. As an example of ethical uncertainties Funtowicz and Ravetz mention the uncertainties about which mitigation measures are needed to prepare for future sea-level rises as a consequence of global warming. This kind of assessments, they argue, involve predicting the effects of a causal chain involving multiple variables, ending up with policy recommendations which may be implemented on a broad scale:

> At stake may be a significant fraction of the world's urban built environment (including most capital cities) and the settlement patterns of people; mass migrations from low-lying districts may be required at some time that cannot yet be predicted, with the consequent economic, social, and cultural upheaval. Such far-reaching social policies will be decided on the basis of scientific information that is inherently uncertain to an extreme degree; even more so because plans for mitigation must be started with a long lead time lest the rebuilding and relocation efforts start too late. A new form of legitimation crisis could emerge; for if governments try to base their appeal for sacrifice on the traditional certainties of applied science, or on the authority of professional consultancy, this will surely fail to carry conviction. Public agreement and participation, deriving essentially from value commitments, will be decisive for the assessment of issues, the setting of policy, and the acceptance of the costs. (FuntowIcz, Ravetz 1994, p. 1884)

This kind of uncertainty, though at a different scale, demonstrates well the intertwinement between technical and ethical issues which can also be observed in the Dogger Bank cases when uncertainties are assessed and weighed in relation to policy issues. These nuances, however, are not depicted in Funtowicz' and Ravetz' model. The model isolates scientific uncertainty and decision stakes as the independent variables defining whether we are in the realm of pure or applied science, professional consultancy or post-normal science. By using them as the variables determining whether we are in one or the other domain, they come to some extent to corrupt their own claim.

Funtowicz' and Ravetz' model is introduced to argue that science/policy boundaries are blurred in situations where uncertainties are high and much is at stake. However, by differentiating between situations where technical and ethical considerations intertwine and situations where they do not, they merely introduce a new boundary – this time between pure science and science enmeshed with politics. Part of the model's appeal is that it gives the impression of a recipe for decision makers and scientific advisors to decide whether it is relevant to include an extended peer community of stakeholders in the process of producing or evaluating scientific advice. But who should decide whether the scientific uncertainties or decision stakes are so high that we ought to involve stakeholders in the process? Should such evaluations of the ethical content of science and uncertainty lie in the hands of scientific advisors? Or of policy makers?

In this way, while intending to do the opposite, Funtowicz and Ravetz ends up re-installing the boundary drawing language they intended to dismount or soften.

When Funtowicz and Ravetz put effort into reserving a place for science proper, it may be out of fear for letting go of the boundaries altogether, which could leave us with relativism. Certainly we need to be able to argue that some statements about the world are better than others. So what is wrong with boundary drawing language and practice? How are the boundaries between science and politics managed in practice, which function does such management serve and what are the effects? Let us turn to the Dogger Bank to see it at work.

Managing science/policy boundaries on the Dogger Bank

Notwithstanding the need for scientific advisors to consider policy issues when they choose between methodologies, data, analytical approaches and ways of managing uncertainties, the expectations to and rhetoric about scientific advice in both cases rested heavily on traditional notions of science as ideally disinterested and detached from political issues and institutions.

As mentioned, the role of science in the designation process is defined already at the level of the Habitats Directive. It is most clearly spelled out in the commission's *Guidelines for the Natura 2000 network in the marine environment*:

> As regards areas to be protected under the Birds Directive, the Court of Justice has emphasised that the selection of sites and the delimitation of boundaries should be carried out on the basis of exclusively ornithological criteria. As regards the Habitats Directive, case law confirms that site selection by Member States should be exclusively based on the ecological criteria of Annex III of the directive. Therefore, future management challenges should not be a determining element in this process. (European Commission 2007, p. 21)

Six pages down, it is again stressed that "the site designation process is exclusively based on scientific criteria. Future management challenges (related to any future activity such as fisheries, energy generation or distribution…) should not be a determining element in this process." (European Commission 2007, p. 27) The purpose with obligating member states to base their designation entirely on science is to ensure that environmental concerns are considered before socio-economic ones. Much in line with Latour's Modern Constitution, science, hereunder ornithology and ecology, is aligned with Nature while future management challenges like fisheries and energy generation is left on the side of society. As to underline the constitutional element in Latour's great divide between Nature and Society, purification is simply a legal requirement. Reference is made to a series of cases at the European Court of Justice which have further settled the claim – cases where Natura 2000 sites according to the court unlawfully have been selected not entirely on the basis of science, but also in consideration of economic interests. The legal requirement of

purified site designations has made the claim a core reference point in the two processes – particularly in the UK process where 'future management challenges' are very pressing.

Common for the two designation processes is that the boundaries of science were an important reference point, both for the scientific advisors, government and other stakeholder groups. Purification processes – and criticism for the lack of such – marked the designation in multiple ways. However, they did so in very different ways in the two member states.

In this section I discuss and compare the ways science/policy boundaries were managed in the two cases between the statutory agencies and government, in the scientific decision making, in advisory reports, in the consultation process and among stakeholders.

Science boundary management between the statutory advisory agencies and government

First of all, where the power to define the boundaries of science in Germany to a large extent seemed to be in the hands of the statutory advisors, it was subject to continual negotiation between the government and the statutory advisors in the UK. The German statutory advisors I interviewed several times referred to the claim in the Habitats Directive to designate sites exclusively on scientific grounds. The advisors did involve government by requesting their approval of the rules defined for the TIN model before they ran it. However, by asking approval before the model was run and sites identified, government could respond to the logic of the model and not to the potential implications of eventual overlaps between Natura 2000 sites and economic activities. And when some ministries later commented on the sites on the basis of interests, they were told that such comments were not relevant at this stage of the process as the designation was supposed to be motivated by science alone. In the UK, on the other hand, there were multiple negotiations between the statutory advisors and different ministries – these negotiations were even institutionalised in the form of the Marine Biodiversity Policy Steering Group where representatives from relevant ministries on a regular basis were presented to their work. Uncertainties, difficulties related to the scientific decision making, ambiguities in datasets etc. are an integrated part of the scientific advisors' way of talking about the process. DECC's concerns about the potential implications and hence about the documentation for the site were according to one of the scientific advisors perceived as 'reasonable', and that kind of comments were indeed taken in. At first glance it could seem like both the UK statutory agency and the UK government were less occupied with science/policy boundary management than in the German case. On the contrary, however, when the statutory advisory agency was receptive to government, boundary management was one of the main objectives: As scientific and political decision making tended to be perceived as closely intertwined, transparency and, to some extent, receptiveness to government, was

among other things a means of ensuring that the statutory advisors did not interfere in politics. That is, of taking account of the ethical element in methodological decision making.

It was, however, not left to government to define the science/policy boundaries. The statutory agency put some effort into ensuring that they were only receptive with regard to the ethical element in their methodological decision making. For example, the statutory advisory agency did not want to trust the report produced by Hartley & Anderson because they were hired by DECC who obviously had interests in the outcome: "This is an area where it gets into slightly difficult relations […]. Because […] they were questioning the scientific justification […], but because of the department that that comes from, then it certainly would be seen as possibly taking socio-economic factors into account. […] You know why they're arguing about it." Hartley & Anderson's contractors, DECC, were expected to have interests in particular research outcomes – interests which could have affected the advisors' work. DECC's and Hartley & Anderson's comments were indeed considered, but the science boundaries were managed by letting two external peer reviewers evaluate the criticism before the boundaries were reconsidered. To further ensure the disinterestedness of the peer reviewers they were commissioned outside Europe.

Hence, where the science boundaries in the German process were managed among other things by reserving the decision making power for the statutory advisors, the UK statutory advisors did negotiate continually with government in acknowledgement of the political element in their work. Both statutory advisory agencies, then, managed the science/policy boundaries carefully. However, where the boundary in Germany roughly speaking was placed between scientific advice and political decision making, the boundary in the UK was placed somewhere between the ethical and technical elements in the methodological decision making during the production of scientific advice.

Science boundary management in advisory reports

The science boundaries were also managed differently in the reports accounting for the scientific basis for the designation. The German scientific underpinning was published in 2006, two years after the site was submitted to the European Commission, in the book *Progress in marine conservation in Europe: NATURA 2000 sites in German offshore waters* (Von Nordheim, Boedeker & Krause 2006). Where in the UK there is a SAC Selection Assessment report for each proposed site, the German report treats the offshore site designation in general. There are no detailed accounts of problems in datasets, of difficulties with different methodological approaches or of uncertainties. And only the final report is available. Reference is made to a number of published journal articles, but no process documents showing earlier versions or meeting documents are available. In this way all the negotiations, ambiguities in datasets, uncertainties and

disagreements are left out; the report displays the final product as a rather unproblematic scientific image of the location of habitats in the German offshore marine area.

The UK equivalent, the *Offshore Special Area of Conservation: Dogger Bank. SAC Selection Assessment Document* (for the final version see Joint Nature Conservation Council 26 August 2011), accounts for the particular scientific underpinning of the Dogger Bank SAC. After the introduction the section Document Version Control (see Figure 15) accounts for all previous versions of the document, and for each document a brief note lists the changes from the former version, just as the date of publication is indicated. The section reminds the reader that the document has a history, that there are almost seven years between the first and final version, that the site boundary has been amended several times and that harbour porpoise was initially graded differently. A supplementing document, JNCC Report No. 429, *Understanding the marine environment – seabed habitat investigations of the Dogger Bank* (Diesing et al. 2009), accounts for a number of different Dogger Bank surveys which underpins the site. In both documents uncertainties, problems with the datasets and difficulties with different methods are described in some detail.

The boundaries of science are managed carefully in the German as well as the UK reports, however in very different ways. In the German report the research process is described as simply following a set of pre-defined methodological logics and adding the relevant data, which finally led to the sites that were then proposed to government. If the site designation involved an element of personal judgment, for example because of problems with the datasets or other kinds of uncertainties, it is not accounted for in the report. The sites are simply displayed as an outcome of the methods: An approach that corresponds well with traditional understandings of science, where replicability (by following the same methods) is an important criterion for scientific validity. In this way the contingencies, ambiguities, negotiations and other tangible and messy elements in the process are black boxed, displaying the outcomes as fact-like products which follow mechanically from the methodology. In the UK reports, on the other hand, the scientific advisors have found it important to account for the personal judgments, the uncertainties and the ambiguities. But the motivation is the same: To maintain the boundaries between science and politics. By communicating uncertainties, the outcomes do not seem more solid than they necessarily are, leaving a space for political decision making where science does not provide solid answers. The following formulation in JNCC Report No. 429 is illustrative of this ambition:

> In the northeast corner, the seabed is essentially flat with slopes below 0.1°. In such a case, a straight line should be drawn connecting slopes above 0.1° […]. However, there is no information available where the closest slope above 0.1° is located (possibly on the Danish continental shelf). Therefore, an arbitrary straight line running from west to east was drawn, but should not be taken as definitive.

Document Version Control

Version and issue date	Amendments made	Issued to and date
DoggerBank_SelectionAssessment_v9_0.doc (26th August 2011)	- Site changed to candidate SAC throughout the document	European Commission, 26th August 2011
DoggerBank_SelectionAssessment_v8_0.doc (21st January 2011)	- Document updated following comments from Joint Committee MPA sub-group, UKMBPSG and UK MPA Policy Group Node 12 added to site boundary and site area re-calculated.	Defra, 21st January 2011
DoggerBank_SelectionAssessment_v7_0.doc (2nd December 2010)	- Document updated following comments from formal consultation.	Defra, MPA Sub-Group (13th December 2010)
DoggerBank_SelectionAssessment_v6_0.doc	- Site changed to possible SAC throughout the document	Public consultation (20 August 2010)
DoggerBank_SelectionAssessment_v5_0.doc	- Amended site boundary (v1.6) and regrading of harbour porpoise (Grade D) following reassessment of data in response to scientific questions on site justification	Defra, DAs 5 March 2010
DoggerBank_SelectionAssessment_4.0.doc	- Amended site boundary (v 1.5) based on new survey data from April 08 - Harbour porpoise graded as qualifying feature of the site (grade C) - Site centroid and boundary co-ordinates changed to degrees, minutes and seconds - Site map changed to incorporate 50m sand - Text description of 50m sand incorporated - Map of European SACs changed to GEBCO bathymetry - Text changed in all sections to incorporate April 2008 survey data	Defra, DAs & OGDs 28 October 2008
DoggerBank_SelectionAssessment_3.5.doc	- Text on Harbour Porpoise amended	Defra, DAs & OGDs 18 June 08
DoggerBank_SelectionAssessment_3.4.doc	- Revised site boundary (v 1.3) based on slope analysis and updated scientific data; - Text on marine mammals amended; - Draft Conservation Objectives and Advice on Operations presented in separate document	Defra 3 June 08
DoggerBankDossier_2.0_Draft.doc (26th August 2006)	- Draft Conservation Objectives and (revised) Advice on Operations added. - Map layout revised (v 1.1)	Defra, Devolved Administrations, and other Govt. departments (25 September 2006)
DoggerBank_ProformaForJNCC.doc (15 December 2004)		Defra (15 December 2004)
Dogger Bank Proforma: JNCC 04 P23 (December 2004)		JNCC Committee (December 2004)

Figure 15: Document version control. (Joint Nature Conservation Council 26 August 2011, p. 3-4)

> This highlights the problems introduced when nationally delineating a seabed feature that straddles international boundaries. (Diesing et al. 2009, p. 97)

By underlining that the line is arbitrary, that is, not entirely defined by scientific method, policy makers are informed that it "should not be taken as definitive". In this way, transparency is a means of ensuring that scientific advisors do not overstep the science/policy boundary and make decisions outside the range of scientific methodology.

During my fieldwork, however, I did experience some concern for managing which details about the process were communicated to the public. I was asked not to publish maps with the peer reviewers' proposed boundaries, and I was asked not to go into detail about their comments. The concern was that pieces in a sequence of communication could be misinterpreted if seen out of context. Hence, while the statutory agency strived for openness, there was some concern about how the information would be interpreted.

In this way, German and UK scientific advisors alike were occupied with maintaining the boundaries between science and policy. German scientific advisors did so by striving for applying methods which were, using their own term, inter-subjectively verifiable. They strive to present outcomes without their tangible history, leaving the evaluation of scientific quality to the scientific advisors and mainly providing decision makers, stakeholders and others with outcomes. The division of power is clear: Scientific advisors provide advice, politicians make decisions. There is some common land, for example in terms of the need for scientific advisors to be pragmatic and accept societal constraints in terms of deadlines, resources available etc. However, the overlap is narrow, and methodological choices are made in ways that minimize the room for negotiation. UK scientific advisors, on the other hand, strive for transparency, allowing decision makers, stakeholders and others to evaluate the conclusions on the basis of the ambiguities and uncertainties in the science underpinning them. The logic could seem to have been that the more transparency, the more strict boundary management, that is, the less the chance that advisors overstep their authority on the side of science. However, there is still some concern about how the information is interpreted and some attempts to manage which details from the process are communicated.

Elements of the process, however, are left out of both German and UK reports about the scientific underpinning of the sites. The reports account for scientific methodology and data. They do not account for the political negotiations and considerations which have been part of the process and have affected the boundaries in both member states. There are no accounts of the way national agendas and socio-economic considerations have been weighed against the obligation to conserve the habitat types in Annex I in the

Habitats Directive. In Germany, for example, there are no accounts of whether the short time frame, motivated by the environmental ministers' plans about wind farms, affected the methodological choices. And there are no accounts of the decision to exclude an area from the SAC on Sylt Outer Reef – an area which according to the TIN model is part of the habitat – because a wind farm was projected here. There are no accounts of the logic behind this exclusion: That they could leave this area out of the SAC because they had already designated 60 percent of what was considered to be the national population of harbour porpoise. In this way, the boundaries are only accounted for to the extent that they are methodologically defined. Boundaries affected by other considerations, like future wind farm development, are not accounted for.

Likewise in the UK. For example, the decision to change the conservation status of harbour porpoise, making them a non-qualifying species, is explained with reference to the lack of data, the unlikeliness that highly migrating species can benefit from site-based conservation measures and the logic that harbour porpoise should be more dependent of a site than of other areas in order to be a graded as a qualifying species. There are no accounts of the extent to which these considerations are weighed against the importance of the Dogger Bank to UK's transition to renewable energy.

As such considerations, both in the German and UK example, are about 'future management challenges', and as such are not legitimate during site designation within the framework of the Habitats Directive, it is no surprise that they are left out. Transparency not only about methodological considerations, data and uncertainties but also about political agendas and about processes of weighing uncertainty against stakes could bring both member states into problems. Much in line with the Modern Constitution the SAC boundaries, however hybrid, are explained by Science and Nature, leaving behind the multiple processes of mediation which are also part of their history.

Science boundary management in the consultation process

With regard to the consultation process, the role defined for science in the Habitats Directive had the consequence that stakeholders were only invited to comment on the scientific basis for the designation. Comments related to their interests would only be considered relevant for the next step of developing management plans. This is a legal claim for purification. It requires the statutory agencies to classify consultation responses according to whether they concern the science or interests. And it requires stakeholders to focus on the science in their comments in order to be heard. The two statutory agencies, however, managed the science boundaries very differently when they decided which stakeholder responses belonged on the side of science and which on the side of politics.

The German scientific advisors showed me two fat binders filled with consultation responses. Very few of these were considered at all, one of them told me, because they were not about the science. They were about how the sites collided with interests, and such concerns will be considered in the second phase. Only two of the consultation responses were about the science, the scientific advisor told. It is, however, not entirely clear how science was defined in this filtering process. For example, an advisor told that the fishers came up with the same argument about displacement as fishers in the UK process – that closing an area would potentially displace fisheries to other areas where they could perhaps have a higher environmental impact. According to the advisor, "this is not a scientific argument on the quality of the site". It is not completely clear how the Modern Constitution is at work here – if it is. Considerations about potential unwanted side-effects from a protected area in the form of pressures on the environment elsewhere might by some be placed on the side of Nature and science. When they didn't in this situation, it could perhaps be because it was a comment not just on the assessments themselves but also on the very premises for site designation: That the design of the site should be based not only on assessments of whether the protected features were present but also on considerations about the potential environmental effects and side-effects of closure. Or it could be because it concerned human activities, assessments of which were perceived as belonging on the side of society and humans and not on the side of science and nature. Or it could be because the comment was believed to be motivated by economic interests. Notwithstanding, some kind of purification process took place when the consultation responses were filtered according to whether they were about the science or not.

From the evaluation of consultation responses it is also not entirely clear how the statutory advisors perceived their own role as scientific advisors. For example, an advisor told that environmental NGOs had questioned why they had only designated 60% of the total area of habitat in German waters and not 100%. Again, the advisor said, "this is not a real scientific argument; it's rather the, let's say, the liberty of the agency or of the ministry to decide if they go, as I explained to you earlier, for the 60%." So considerations about how big a percentage of the overall area of the habitat in the EEZ should be designated was not considered scientific. Still, such decisions were made by the statutory advisors and not by government. Well aware of the possibility of a political veto though; "we would not have survived a 100% goal politically". German scientific advisors, then, were very outspoken about the need to filter consultation responses according to their scientific content, and very few comments were accepted as scientific. However, what kind of mandate the statutory advisors were given in relation to issues which they found to be political did not seem to be really clear.

Turning to the UK, the statutory advisory agency invited comments on their scientific justification for the SAC selection as well as on their assessment of potential economic impacts of the designation. In the formal consultation letter, however, it was stressed that only comments on the scientific underpinning would be taken into account in relation to the site designation. Information about socio-economic impacts would be considered in the next phase of developing management plans.

After the consultation process, a report was produced which accounted for the stakeholder comments and for the statutory advisory agency's responses (Defra Marine Biodiversity Policy, Joint Nature Conservation Committee 12 July 2010). No comments were explicitly dismissed as irrelevant due to their lack of scientific relevance. The science/policy boundary was managed, among other things, by differentiating between comments related to the scientific underpinning of the site designation, which were included in the main report, and comments about the potential economic impact, which were placed in Annex IV. But a considerable amount of comments were included in the main report and treated one by one. The agency's responses were kept in a technical language, referring both to biological arguments (e.g. the wide distribution of sandeels, which harbour porpoise feed on, in the UK part of the North Sea), the legal framework (e.g. the need to use the particular sandbank definition in the Habitats Directive) and practical issues (e.g. the need to draw on existing data). Some comments were taken into consideration and had led to amendments of the final report – however, none of the comments impacted the boundaries.

Unlike the German consultation, then, quite a lot of comments were accepted as relevant to the consideration of the scientific underpinning of the site. For example, also complaints about the lack of acceptance of fishermen's knowledge as scientific were taken up, and the statutory advisory agency replied that they "do consider certain data available from fishermen as scientific knowledge, and have used such data in site recommendations where it can be provided, is location-specific, and relevant to the characterization, location or condition of a habitat (for example, data on cold water coral records and trawl tracks from Scottish Fishermen's Federation provided for NW Rockall Bank cSAC in 2010)." Still, however, the science/policy boundaries were managed carefully – among other things by placing some comments in the main report and others in the Annexes. Moreover, the answers were brief and kept in a technical language, leaving out the ethical elements of the designation process. For example, one comment was a "Concern that non-scientific factors may be influencing the grading of harbour porpoise at the site." The statutory advisory agency's reply was brief: It had "only taken scientific evidence into account when considering whether harbour porpoise should be a qualifying feature for the Dogger Bank. Socio-economic factors have not been taken into account." There were no details, for example about the negotiations with government on the issue.

Hence, the German as well as the UK statutory advisory agencies managed the science/policy boundaries carefully when considering the consultation responses – however, where very few comments in the German case were considered to be about the science, quite a lot were considered relevant in the UK case. In neither case, however, did the comments change the boundaries.

In the UK case, however, an important part of the consultation process took place before the formal consultation opened. The main stakeholder was the UK government, particularly DECC. As mentioned, their comments did change the SAC boundaries – still, however, the science/policy boundary was managed by hiring external peer reviewers to consider DECC's as well as the statutory advisory agency's boundaries.

Science boundary management among stakeholders

The science boundary management at the level of the Habitats Directive and the statutory advisory organisations also affected the ways in which stakeholders organised their responses. As stakeholder responses would only be taken into consideration in an eventual revision of the site boundaries and added features, including the grading of harbour porpoise, stakeholder consultation responses related to this were generally also focused on the science. However, as we saw in the previous chapter there was a considerable difference between the ways environmental NGOs and fisheries industry organisations related to the science and to the science/policy boundary. In this section I focus on the UK case as I have not looked into the stakeholder responses related to the German site designation.

As we have seen, science functioned as a lever for the interests of the environmental NGOs in the UK case. As science functioned as Nature's representative, the member states' obligation to designate sites exclusively on the basis of science was a strong strategic card. And given the amount of interests on the Dogger Bank, this particular process functioned as an almost iconic case for stressing the obligation to keep the designation process focused on the science. Hence, concerns about the eventual influence of interests on the designation and hints about the possibility of infraction if the UK did not comply with the Habitats Directive took up much space in the environmental NGOs' consultation responses. As described in the previous chapter, the environmental NGOs' suspicion built on several factors: The close communication between JNCC and DECC; that the boundaries shrunk during the process and that harbour porpoise was initially made a qualifying feature and later not; that JNCC's approach to harbour porpoise was different from the neighbouring member states on the Dogger Bank; and that uncertainty was used as an argument for not regulating rather than an argument for precautionary measures.

Fisheries industry organisations, on the other hand, were mostly frustrated about the claim in the Habitats Directive. While the legal obligation was used by environmental NGOs as a lever for their interests, it gave

rise to frustrations and questions about the legitimacy of the site among fisheries industry organisations. They had difficulties accepting that the effect of a site on their livelihoods was not considered a relevant consideration in the designation. They found the claim to be out of step with modern thinking about stakeholder involvement and transparency, and that the traditionalist thinking about science did not draw on newer insights into the qualities of experience-based knowledge. In their stakeholder responses some reminded that the Habitats Directive did give some room for manoeuvre, even if the designation had to scientific, and they argued that their interests should be taken into consideration when the scientific advisors chose between possible options. Hence, their approach to the science/policy boundary seemed to be that being scientific does not preclude showing regard for economic interests. That is, proper science can be carried out in different ways.

Outside the consultation process the fisheries industry representatives also argued that interests should be a legitimate consideration to have. And in their consultation responses they argued that the strict scientific approach, by being non-democratic, would not enhance the perceived legitimacy of and compliance with future regulations on the site among fishers.

The legal obligation to designate science exclusively on the basis of science, then, had very different effects on the two different stakeholder groups and affected their consultation responses as well as their attitudes towards the process.

Summary

Management of the boundary between science and policy, then, took place throughout the processes in Germany as well as the UK. The strategies were different in the two member states, but the objective to manage the boundary was the same. In Germany, statutory advisors defined the boundary to be placed outside the process of developing advice, making the designation process an entirely technical exercise in the hand of the scientific advisors. In the UK, the boundary was placed somewhere in the process of developing advice, making the negotiation of the science/policy boundary an integrated part of the methodological decision making. In Germany, statutory advisors chose the methodologies which reduced the degree of subjective and eventually biased decision making, hence keeping their work on the scientific side of the boundary. In the UK, statutory advisors put emphasis on transparency, accounted carefully for eventual uncertainties and ambiguities and made their methodological decisions in dialogue with government in acknowledgement of the eventual ethical element of such decision making. In Germany, then, the statutory advisors managed the boundary by working to ensure that there were no loopholes for ethical content in the scientific process. In the UK, on the other hand, statutory advisors and government worked to ensure that the ethical content, which they found necessarily would be part of the process, was

negotiated with political decision makers, while the technical content was managed by scientific advisors. However different the strategies are, the careful attention to managing boundaries between science and politics is the same.

By making strict science/policy boundary management a legal obligation, the Habitats Directive has had an immense impact all the way through both processes. In Germany, the claim was used as a reference point by scientific advisors when insisting on their core role as scientists. In the UK, the claim was something scientific advisors have had to navigate in relation to when faced with challenges related to the interests on the Dogger Bank. In both member states, it was an important principle for the statutory advisors to keep in mind when communicating with government and when organising the public consultation process. And in the UK, the claim affected the strategies of stakeholders in their consultation responses.

Important to note, the science/policy boundary management characterising the designation processes in the two member states cannot be explained by the claim in the Habitats Directive alone. As a wide range of case studies have shown, Mertonian norms organise scientific advisory processes also where they are not explicitly formulated as a legal obligation (Jasanoff 1994, Nielsen 2008, Hilgartner 2000, Shackley, Wynne 1996). Similar processes most likely would have taken place even if it had not been formulated as a requirement in the Habitats Directive. Still, however, the legal obligation has had an important effect on the process.

Boundaries in the practices of scientific advice

The expectations to and rhetoric about scientific advice in both cases, then, rested heavily on traditional notions about science as ideally disinterested and detached from political issues and institutions. And the role defined for science in the Habitats Directive was an important reference point for most involved actors. However, the applied context, made it extremely difficult to keep out of what advisors or other actors define as politics.

First of all, the research question – where does sandbank habitat type 1110 start on the Dogger Bank – is in itself composed of legal, interest-driven and contingent elements. The definition which the advisors are to translate to boundaries on the bank is an outcome of negotiations between member states represented by scientists, lawyers and officials, environmental NGO representatives, independent scientists, representatives from the European Commission. And the negotiations were led with reference to biological diversity, the extent to which particular criteria were measurable, whether particular formulations went further than clarifying the current definition and hence imposed new obligations on member states, and the need to maintain “the scientific margin of discretion left to member states” (mail to the working group

coordinator from a Danish representative). Hence, the research question itself is based on assumptions about the existence of a particular habitat type which has been composed of a whole range of elements which are not all traditionally considered to belong on the side of science and nature, but also on the side of society, politics, interests and law. Secondly, the boundaries of such a habitat type on the Dogger Bank are indeterminate in the sense that they do not pre-exist scientific enquiry. The Dogger Bank itself does not provide any clear-cut guidance on where to find them. Rather, the boundaries are defined as the scientific advisors decide which methods they should use to identify it and how they should interpret the data. Hence, the scientific advisors' decisions cannot rest simply on considerations about the scientific validity of different approaches.

Thirdly, given these indeterminacies the stakes in the outcomes are difficult to disregard. Particularly on the UK part of the bank, where a major site – the underpinning of which is highly negotiable – potentially could have wide-ranging consequences. Fourthly, scientific advisors in both member states work for governments, and while on the one hand the site designation is to be an exclusively scientific exercise left to statutory advisors, their proposed sites on the other hand have to approved by government. German scientific advisors ask the relevant ministries to choose between two different methodologies and approval of the definition they use in their TIN model before they run it. UK scientific advisors consult a group of representatives from the relevant ministries throughout the process. Furthermore, in the UK several proposed sites are rejected by DECC and Crown Estate. In this way, the statutory advisors need to make decisions in awareness of what government will accept.

In this way the practices involved in producing scientific advice are in multiple ways bound up with political agendas, law and stakes – not necessarily because scientific advisors are biased towards particular political goals (they may be), but first of all because such distinction between science and politics simply does not make sense in the particular applied contexts. Scientific advisors have had to provide advice within a politically defined framework and with some degree of sensitivity to the policy issues and stakes, and their technical decision making has – to varying degrees – been closely bound up with political and ethical considerations.

Mismatches between practice, rhetoric and expectations

One thing, then, is the rhetoric about and the expectations to the role of science. Another is the practices involved in the development of scientific advice. The mismatch between the two in the SAC designation process has a number of consequences: It means that actors have to give the impression that it is all about technical issues also when it is not. It means that advisors are not held accountable for all their practices, but only for those which are technical. It means that the advisory practice is neither accounted for properly

nor debated in the public. And the gap between rhetoric and practice can have the effect that when outsiders get a hunch of 'what is actually going on', it can seem suspicious and illegal. Let me go through some of the issues that follows from the mismatch between rhetoric about and expectations to science on the one hand and advisory practice on the other:

The need to play the game

First of all, the legal requirement to keep science and future management implications apart in the designation process forces the involved actors to pretend that the designation is all about science. Starting with the statutory advisors they have to play the game in order not to be taken to court. The UK scientific advisors are a bit more outspoken about the ways in which they have been negotiating their methodological approaches and logics with government, however, advisors in both member states have had to display boundary drawing practices and rhetoric. That is, they need to ensure that their decision making appears to be technical. And where they have failed to do so, they are vulnerable to their critics. JNCC have run into problems by being relatively open about their negotiations with government. For example, a JNCC minutes of meeting, which was provided to environmental NGOs upon request, shows how government agendas have been part of their considerations about harbour porpoise grading. Environmental NGOs told me that they found that the document would be useful documentation in an eventual court case, and as shown above they made sure to quote it in their consultation response. The German statutory advisors have tried to prevent this form of criticism by keeping their communication technical. For example, they did not mention in their scientific underpinning of the offshore sites that their decision to exclude an area on Sylt Outer Reef had to do with a projected wind farm on the site.

All in all, the claim in the Habitats Directive meant that it was core to the statutory advisors to display strict boundary management in their designation. However, for the German statutory advisors the claim was not so much an obstacle as a strong strategic card helping them to keep the discretionary power on the side of the agency. It was with reference to the claim in the Habitats Directive that they rejected all but about two consultation responses and tell various ministries that their concerns would have to wait till the second phase.

Likewise the governments had to focus on the science in their negotiations with the statutory advisors. For example DECC in the UK did not directly ask for a smaller site because of the importance of wind farms – rather, they requested more documentation for the need for such a big site, just as they requested data on biology in order to see whether it confirmed the site or could justify a smaller site. If DECC were to affect the designation, their arguments would need to be about the science and not about wind farms, incomes, climate change and UK obligations to EU. Finally stakeholders also needed to formulate their comments in

scientific and legal terms if they wanted to be heard. And with regard to the environmental NGOs in the UK, the legal claim for an exclusively scientific process was a strong strategic card by which they could put pressure on the statutory agency.

Hence, most involved actors accepted the rules of the game and managed their involvement in the process accordingly. This further reinforced the power of the traditional notion of disinterested science and the need for all of the involved to use boundary-drawing language and keep their inputs on the side of science.

Holding advisors accountable for their judgments

While scientific advisors have to deny the judgment element in their work – that is, the need to combine political and technical considerations – they are not made accountable for it. The SAC Selection Assessment Document, for example, which went out for consultation, only accounts for the scientific elements behind the site and protected features. If concerns about eventual obstacles for wind farm development meant anything to the weight given to scientific uncertainties about the importance of Dogger Bank to harbour porpoise, it is not mentioned here. In this way, stakeholders and others can only guess – and they do! – about the political elements of the process. Furthermore, traditional expectations to science as ideally detached from political interests and institutions means that when scientific advisors are sensitive to the wider societal issues and the potential implications of their conclusions, it is considered to be covert and suspicious.

Escaping public scrutiny and debate

Furthermore, the need for all actors to focus on the science hinders any kind of public debate about issues related to the designation. For example, should the precautionary approach be applied in the favour of renewable energy or harbour porpoise conservation? Can we replace fuel energy sources by renewable sources as fast as we need without compromising other environmental conservation goals? Or the other way around, should the transition to renewables clear all other agendas? What will climate change mean for biodiversity? And – something the environmental NGOs were unsure about – is it possible to combine wind farm development and harbour porpoise conservation, for example by using mitigation measures? If applying mitigation measures, will it at all be economically viable to develop wind farms on the Dogger Bank? Which other possibilities than wind farms on the Dogger Bank does the UK have for an efficient transition to renewables? Such questions popped up in my discussions with environmental NGOs, and some of them may also have been debated internally in DECC when considering the scientific underpinning of the site and harbour porpoise grading. Likewise, scientific advisors may have been considering them when deciding what to conclude on the basis of the uncertainties and indeterminacies in their assessment. They may even have been discussing them with DECC. However, such issues and discussions did not pop up

in the SAC Selection Assessment Document, they were not mentioned in the consultation responses and they were not publicly debated as part of the discussion about the Dogger Bank SAC designation. The debates, the consultation responses and the SAC Selection Assessment Document all concerned the validity of the science and the interpretation of the Habitats Directive. In this way, because such considerations cannot legally affect the sites, crucial issues about the ethic and normative elements in the decision making are made technical and escapes public scrutiny and debate.

Summary

The mismatches between expectations to and rhetoric about science on the one hand and the advisory practice on the other, then, means that issues we normally treat in public debate are disguised as technical and treated outside the democratic institutional setup. It means that even those who have stakes in the issue formulate their concerns in a technical language. And it means that scientific advisors on the one hand are tasked with treating issues which involve technical as well as ethical elements; on the other hand they have to organise purification processes which transform their hybrid activities to technical products. For example they have to translate an agreed definition to a demarcated piece of Nature. And they have to transform methodological considerations about how to best justify regulation to technical and purely scientific exercises in a report.

Need for new roles for scientific advice

Science plays an important role for policy making, particularly in relation to risk assessment and environmental issues. And often the policy issues science is meant to inform involve major stakes. Climate change is the most outspoken example – other examples are issues related to chemical substances in the environment, nuclear power and waste disposal and bio- and nanotechnology. In such cases, the ethical elements of scientific decision making in advisory processes are not trivial. However, when made technical through purification processes in boundary work, they escape democratic control. If we follow Jasanoff in her statement that the scientific advisors have gained so much influence that they have become the fifth branch of government, the question about how to hold them accountable, also for this element in their decision making, is pressing. As Jasanoff formulates it,

> […] the picture that emerges from a close scrutiny of the advisory process does not look wholly reassuring from either a technocratic or a democratic standpoint. […] In fact, the experts themselves seem at times painfully aware that what they are doing is not “science” in any ordinary sense, but a hybrid activity that combines elements of scientific evidence and reasoning with large doses of social and political judgment. But if science is missing or obscured in the advisory process, scientists in the

> aggregate wield influence, and they do so, moreover, through proceedings that lack many of the safeguards of classic administrative decisionmaking. (Jasanoff 1994, p. 229)

Following an increased acknowledgement of the ethical element in scientific advice, though, different practices are being advocated and applied in scientific advisory practices with the aim of holding scientific advisors accountable for their influential role. Let us have a brief look at three of them here, namely peer review, transparency and stakeholder involvement. Starting with peer review, its function is to make scientists accountable by further enforcing the boundaries between science and politics and ensure that their decisions really are technical and not ethical. We saw this in the UK case where JNCC hired external peer reviewers because they were concerned about the influence of economic and otherwise political interests on DECC's review of the science. Peer review does not bring ethical issues to the forefront of the debate, but removes them by reassuring that the resulting advice is indeed purely technical and lives up to the internal disciplinary standards for scientific validity. Hence, peer review is a practice that belongs to the repertoire of purification.

Transparency makes scientific advisors accountable by granting public access to more or less information about the background for the advice. In this sense, is it not what we are looking for? Open processes where the details of the decisions, complications, uncertainties, negotiations and disagreements are made accessible for public scrutiny and debate? Let us have a look at JNCC where transparency is an important principle. As mentioned earlier, transparency was for JNCC a means of managing the boundaries between science and politics. By being explicit about uncertainties and ambiguities in datasets and analyses they strived to make visible to government where the range of their scientific methods ended in order to leave the rest to political decision makers. But it was also a means of making themselves accountable towards the wider public. Throughout the process – except during the period of 'radio silence' – JNCC made meeting documents, different versions of boundaries, process reports etc. available on their website. And their writing style left no doubt that much of their work had involved judgments and eventually could have been different. However, one thing that was left out of the reports was the ethical elements involved in their work. For example, there were no formulations explaining how the stakes on the bank had affected the weight given to scientific uncertainty in considerations about harbour porpoise grading. While it is very unlikely that the authors have sought to 'hide' something when writing this up, they may not have found such considerations relevant in a report about the scientific underpinning. Moreover, JNCC have most likely been debating their methodology, uncertainties and conclusions with DECC in a technical language and made sure that they did not accept any amendments which they could not defend technically. In this way they have been drawing on different purification practices to ensure that the resulting boundaries are

scientific and hence – from the perspective of the Modern Constitution – making ethical considerations irrelevant to the report. Finally given the role defined for science in the Habitats Directive there were legal reasons for not including such considerations in the report.

Douglas Clyde Wilson has pointed to similar issues in relation to transparency. Based on a case study of the International Council for the Exploration of the Sea (ICES), he lists different kinds of transparency induced opaqueness, which he calls paradoxes of transparency (Wilson 2010). One of them is the surveillance paradox, which arises when being observed by outsiders makes the participants hide or disclose information in their internal negotiations, hence reducing internal as well as external transparency. While we do not know whether JNCC had acted differently if they had not had a principle about making as many documents as possible accessible to the public, they have indeed been aware that for example their negotiations with DECC would have to be held in a technical language in order to display their boundary management. If the transparency induced opaqueness stemming from the surveillance paradox is to be reduced, at least with regard to the ethical elements of advisory processes, we need a new arena for scientific advice in which such elements are welcomed and do not per definition compromise scientific credibility. The role given to science in the Habitats Directive certainly does not contribute to the development of such an arena.

Transparency is an important first step in order to make scientific advisors accountable. However, if we are to make scientific advisors accountable also for the ethical content of their work, transparency needs to embrace the hybrid character of the process and not only the technical part of it. Moreover, aiming for transparency does not in itself require scientific advisors to consider the ethical content and implications of their decision making, and it does not require them to be involved in the kind of debates which political decision makers need to be involved in. Let us have a look, then, at the third practice for holding scientific advisors accountable for the ethical content of their work: Stakeholder involvement. Among other things as a response to the increasing acknowledgement of the blurred boundaries between science and politics in scientific advice, and a means of tackling issues of public scepticism towards scientifically informed policy making, public participation in science and technology development is being advocated in different arenas. In fact, Horst et al. mention the UK and EU as examples of arenas where different initiatives are taken to include the public in science issues:

> The UK has moved from its previous reliance on expert committees to some experimentation with public debate and engagement (notably, in the context of genetically modified foods but increasingly also in the area of nanotechnology) (Stilgoe et al. 2006). The European Commission has adopted a

> ‘Science and Society action plan’ (CEC 2002) in which issues of public support and engagement are given substantial prominence. (Horst et al. 2007, p. 6)

Even so, as Horst et al. also point to, such initiatives have received some criticism for mostly being rhetoric lip service with little substance (Horst et al. 2007).

However, my discussion of public participation in science advice takes an outset in the more theoretical issues following the previous discussions of post-normal science. I focus here on what Funtowicz and Ravetz calls extended peer review:

Funtowicz and Ravetz suggest that we involve stakeholders in the evaluation of quality. With reference to the traditional peer review that is used for quality assessment of core science, Funtowicz and Ravetz use the term extended peer review. Traditional criteria for proper scientific method are internal and disciplinary, and quality assessment tends to be performed by scientific peers. However, Funtowicz and Ravetz argue, in assessing the quality of science for policy issues like the extinction of species or sea level rise as a result of climate change such criteria are not useful. Quality assessment must take account of the wider setting and policy issues and involve not only the product, but also the process, persons and purposes of the research (Funtowicz, Ravetz 1993, p. 744). Hence, apart from scientific peers qualifying from their technical expertise, quality assessment must also be performed by an extended peer community consisting of all stakeholders in the issue. Not merely in order to ensure a democratic and involving process, but also because stakeholders may be able to contribute in important ways to the quality of the scientific process. They may have specific knowledge from their daily experiences. Their alertness qua their interests might be productive. They may have extended facts to bring to the table, for example local anecdotes, leaked information or press cuttings.

Looking at the designation processes on the Dogger Bank, Funtowicz and Ravetz’ claims about the relevance of inputs from an extended peer community seem highly relevant. Important to mention, direct involvement of an extended peer community has indeed been limited. While both governments were involved to varying degrees in the two member states, the boundaries were largely defined before environmental NGOs and the fisheries industry were invited to comment on the proposed sites. Notwithstanding the varied degrees of involvement, looking at the UK case the interested parties – environmental NGOs, the fisheries industry, the Department for Energy and Climate Change etc. – did have inputs to the scientific decision making. And the inputs were given *qua* their stakes. DECC, for example, were concerned about the potential implications of a protected area for the prospects for wind farm development on the Dogger Bank and hence UK’s strategy to fulfil their 20-20-20 obligations. Qua these

concerns they wanted to know whether it was really necessary to have such a big site? Not just when looking at the slopes but also when looking at the biology, keeping the objective of biological diversity conservation in mind? It would be a pity to hinder UK's fast transfer to renewables if there is nothing of importance to protect out there! And qua these concerns they wanted to know if Dogger Bank is really important to harbour porpoise? Considering it is a highly migrating species? It would be a pity if it ended up not being economically viable having a wind farm out there because of costly mitigation measures if it really didn't mean much to harbour porpoise! All such concerns are indeed technical. They are about methodological approaches, rationales behind analyses, the kinds of data used and how to manage uncertainty. But they are also political. They are about wind farms, the UK strategy for renewables, economic viability and the importance of biodiversity conservation compared to that of CO2 reduction.

While technical and political considerations in examples like this are impossible to separate, scientific advisors cannot make methodological decisions without insights in the wider societal framework and the stakes – and, perhaps, without being in dialogue with those who have stakes and know most about the potential implications of one or another scenario. In that way, the UK case is illustrative of Funtowicz and Ravetz' claim about the value of stakeholders as extended peer reviewers: "Those whose lives and livelihood depend on the solution of the problems will have a keen awareness of how the general principles are realized in their 'back yards'." (Funtowicz, Ravetz 1993, p. 753) We need, however, to extend stakes from being about lives and livelihoods to include other kinds of involvement with the issue, too. Dogger Bank is not only fishers' and harbour porpoises', but also DECC's 'back yard'.

Important to mention, stakeholder inputs to science do not per definition contribute to scientific quality. DECC, for example, may put the transition to renewables over harbour porpoise conservation and hence be indifferent about whether the Dogger Bank is indeed important for harbour porpoise. In that way, their critical questions to JNCC may be a form of extended peer review, but the evaluation criteria are not necessarily only about scientific quality; they can also be about wanting a conclusion that would be less harmful to their energy strategy. Nonetheless, when uncertainties and stakes are extensive some form of formalised extended peer review may be able to hold scientific advisors up on the need to consider the ethical elements of their decision making.

However, formalised extended peer review processes will not necessarily reduce controversy. As the stakeholder comments from fisheries industry organisations, environmental NGOs and DECC show, the claims they had to scientific validity in the case of the UK Dogger Bank pSAC were closely bound up with their interests. Being in dialogue with an extended peer community on the scientific methodology, analysis and resulting advice involves, as with any other democratic process, navigating among different interests.

Here at the end of my analysis, two important questions remain. The first is: Should we forget about boundary work? Definitely no. The central role scientific advice plays for risk assessment and environmental policy – and for a whole range of other fields – is not accidental. The issues we increasingly face with global warming, biodiversity loss, chemical substances in the environment etc. need to be represented in some way in order for us to grasp and act on them. And indeed we need to maintain the notion that some ways of representing them are better than others. The central role scientific advice has come to play here is a natural part of this development. However, we cannot expect science to talk truth to power. Instead we need science to provide advice which is useful, relevant in the particular policy setting and produced in consideration of what is at stake. Where the future of the planet is at stake, we might want scientific advisors to take precaution. Where the scientific advice will either favour biological diversity conservation at the cost of UK's fast transition to renewables and the future of a huge fisheries economy or the other way around, we might want to involve the affected parties and the wider public in the debate. Much along the same line Jasanoff argues in her book The Fifth Branch that what we should hope for from scientific advice is "[…] a serviceable truth: a state of knowledge that satisfies tests of scientific acceptability and supports reasoned decisionmaking, but also assures those exposed to risk that their interests have not been sacrificed on the altar of an impossible scientific certainty." (Jasanoff 1994, p. 250)

In this thesis I have explored the effects of the Mertonian mandate given to science in the Habitats Directive: To provide be an exclusively scientific basis for site designation. I have argued that in the case of site designation on the Dogger Bank, such a mandate – which is in no way particular to the Habitats Directive – has led to a process where the ethical issues, as the title of this thesis hints, have been slightly covered all the time. This leads us to the second question: Which mandate should we give to science instead? Which kind of arena will facilitate a serviceable truth?

On a number of points the UK case actually provides an example of a setup which leaves room for the hybrid character of scientific advice. The scientific advisors negotiated with government throughout the process, and the methodological choices were made in consideration of some of the wider implications. Such negotiation is even institutionalised in the form of the UK Marine Biodiversity Policy Steering Group consisting of representatives from ministries with stakes in marine management. But which kind of boundary management strategies took place at these meetings? Were the discussions held in technical terms and the ethical issues again kept slightly under cover? I have not had access to these meetings, neither directly or in the form of meeting documents. However, the accounts I have received from interviews give the impression that the debates have been focused on technical issues. Moreover, the formalised extended peer review – let us call it that – is limited to government. In relation to other

stakeholders and the wider public the consultation was limited, the dialogue only concerned technical issues, and the report on the underpinning of the site still only concerns the technical part of it. In order to give scientific advisors an alternative mandate in order for them to have the best conditions to produce a serviceable truth, the hybrid character of their work would have to be welcomed, expected, accounted for in reports, formalised and, most importantly, debated.

In the Habitats Directive the mandate given to science is that of providing an 'exclusively scientific' basis for site selection. What could we call a new mandate aiming at providing serviceable truths? An alternative mandate could be that of providing scientific justification. As the case studies show, providing scientific justification for policy is conditional. Justification requires an object (justification of what?) and an audience (justification for whom?), and both conditions what it takes to produce justification. Justification requires that the decisions involved in the production of scientific advice, both with regard to the weight given to uncertainties and the placement of the burden of proof, choice of methodology and parameters, amount of resources put into the process and extent of dialogue with stakeholders are made in consideration of the policy objectives, potential implications and stakes.

But as with transparency, scientific justification also comes in a version belonging to the repertoire of purification. In the German case, for example, providing scientific justification came to mean providing objective and value-free, inter-subjectively verifiable advice in the order to prevent eventual criticism about subjective or biased decisions. Moreover, if we expect political decisions to be scientifically justified, we do not leave room for those decisions which are effectively outside the range of science. For example, we cannot expect science to provide scientifically justified advice for whether we should give conservation of biological diversity priority over CO2 reduction or the other way around. Such decisions will have to be justified in other ways, for example through democratic and explicitly political debate.

Hence the best I can suggest is first, that science is not left alone with justifying political decision making as is the case in the Habitats Directive. Secondly, that scientific justification openly to embraces technical as well as ethical issues. Hence, a new mandate cannot be formulated for science alone, but needs to be shared with policy making, and it requires continual processing of the boundaries. I suggest that decision making is both *politically and scientifically justified* – the latter in a version that does not belong to the repertoire of purification. Serviceable truths are more likely to result from scientific advisory processes where neither the ethical nor the technical elements are slightly covered.

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