Value-Free yet Policy-Relevant? The Normative Views of Climate Scientists and Their Bearing on Philosophy

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This article contributes to the philosophical debate on values in science by exploring how scientists themselves understand the proper role of moral, political, and social values in expert practice. I present findings from interviews with climate scientists who have participated as authors in the Intergovernmental Panel on Climate Change (IPCC). The climate scientists subscribe to the value-free ideal as a regulative ideal that applies both to the provision of knowledge to policymakers and how they engage with political issues in the public sphere. Yet their views on the moral responsibility of scientists and the aim of providing policy-relevant output challenge the value-free ideal. The article suggests ways in which their views can be relevant to the philosophical discussion.

Keywords: value-free ideal, expert role, IPCC, climate science-moral responsibility, policy relevance, interview study

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1. Introduction

The proper role of non-epistemic values such as moral, political, and social values in practices of justification of policy-relevant hypotheses has recently become one of the central questions in philosophy of science (Douglas 2000; Douglas 2009; Kitcher 2011; Betz 2013). This strand of research has yielded conceptual clarifications and significant insight into the complex and notoriously contentious issue of the proper relationship between science, non-epistemic values, and policymaking. A central part of this discussion revolves around whether scientists should aspire for the value-free ideal, according to which non-epistemic values are unacceptable in the justification of hypotheses. By so doing, scientists can contribute their much-demanded expertise without undermining the accuracy of their assertions and without having *disproportionate power* in a democratic society (de Melo-Martín and Intemann 2016, p. 503). In this study, I address the issue of the proper place of non-epistemic values in science by exploring scientists' normative views on this issue. The aim of the article is to provide a deeper understanding of the attitudes of scientists on the role of non-epistemic values in a way that can inform current philosophical discussions.

Much work in philosophy of science seeks to be empirically well informed. Accordingly, the philosophical discussion on values in science has been advanced by the extensive use of examples, illustrations, and cases from fields such as medical research, toxicology, and environmental science (Douglas 2000; Elliott 2011; Hicks 2014; Havstad and Brown 2017). Similar to how other parts of philosophy now employ social scientific methods as part of their inquiry (Knobe and Nichols 2008), a recent anthology launched the idea of an empirical philosophy of science, where qualitative methods such as open-ended interviewing and participant observation are employed to make advances in the field (Wagenknecht et al. 2015). So far, however, strikingly few attempts have been made in philosophy of science to study scientists' own normative understanding of the proper role of values in science (for some exceptions, see Knuuttila 2012; Steel et al. 2017, 2018). Moreover, in neighboring fields, such as the sociology of scientific knowledge and science and technology studies, many have looked into how social, cultural, and political factors influence the work of scientific researchers and policy advisers. However, few of these studies have explored the scientists' views on the proper role of such factors in expert practice. By directly investigating the normative views of scientists, this study thus fills a gap in the philosophy of science and science studies literature.

This exploratory study is based on semi-structured interviews with 11 climate scientists from the fields of physics, chemistry, meteorology, oceanography, applied mathematics, and geology, who have participated as authors in the Intergovernmental Panel on Climate Change

(IPCC).[1] Since its first report in 1990, the IPCC has remained the world's most significant expert panel on climate change. The interviewees contributed to Working Group 1 and Working Group 2 of the IPCC which assesses the natural science basis of climate science and effects and adaption respectively. For many, climate change is the greatest and most complex challenge of our time (Dryzek et al. 2011, p. 3) and has spurred numerous political and moral discussions (see for instance, Broome 2012). The relation of climate science to policymaking is perhaps currently the most important kind of interaction between scientific knowledge and politics and is a suitable case for examining science and non-epistemic values.

The article is structured as follows. Section 2 outlines how the value-free ideal is understood in philosophy of science and how it applies to the role of scientists as experts in policymaking and then presents the article's chosen methodological approach. In Section 3, I discuss the findings from the interview study. In Section 4, I suggest some lessons of potential use in the current philosophical discussion on science, values, and policymaking.

2. Background and Method

2.1 The Value-Free Ideal and the Role of Scientists as Experts

The value-free ideal is deeply entrenched in how we think about science and how it should properly relate to morality, policymaking, and public life. It has long played a central part in how scientists act, their self-understanding, and their rhetoric in the public sphere (for an historical account see Proctor 1991). The value-free ideal is also a key governing principle for the role of scientists as experts in public policymaking, and it is often assumed in public discussions on the reliability and trustworthiness of scientific experts. While the content of the ideal can be formulated in different ways, in this study, I shall use the way in which the ideal is understood in the current philosophy of science as a starting point: "The ideal of value-free science states that the justification of scientific findings should not be based on non-epistemic (e.g., moral or political) values" (Betz 2013, p. 207). The value-free ideal is based upon two central ideas, namely a distinction between kinds of values and a distinction between different stages of scientific inquiry. The standard way of classifying values is to distinguish between epistemic and

1. Climate science, as applied in this article, refers to an interdisciplinary field in the natural sciences (e.g., physics, chemistry, meteorology, and oceanography) that "… aims to explain and predict the workings of a global climate system—encompassing the atmosphere, oceans, land surface, ice sheets and more—and it makes extensive use of both theoretical knowledge and mathematical modeling" (Parker 2018).

non-epistemic values. Epistemic values refer to the desirable properties of scientific hypotheses and general theories, such as accuracy and consistency. These are shared normative commitments in the scientific community and are derived from the aim of inquiry to arrive at genuine knowledge about nature (Kuhn 1977, p. 362). Non-epistemic values encapsulate, in principle, all other human values, such as moral, political, and social values (McMullin 1982, p. 19). The value-free ideal prescribes that non-epistemic values can play a legitimate role in problem-selection and application as long as the stage of justification and acceptance of hypotheses remains value-free. In the presentation of the interviews, I will show how the scientists understood the value-free ideal and the extent to which it fits the current version found in philosophy of science.

This article does not address the role of values in science as such but rather in the role scientists have as experts in expert bodies, such as agencies, panels, boards, and committees (for a systematic account of the distinct nature of this role, see Gundersen 2018). The legitimacy of experts in policymaking is derived mainly from their ability to produce a basis for public policymaking knowledge by providing vital observations and measurements, causal knowledge, and a risk analysis of natural phenomena, technologies, and human activities. Accordingly, the main aim of the expert role of scientists is primarily to improve the epistemic basis of decision-making and not to produce new knowledge about nature. Let me here briefly lay out how the value-free ideal applies to the role of scientists as experts.

First, the value-free ideal prescribes that scientific experts should strive to minimize the influence of non-epistemic values when they provide knowledge to policymakers about a certain subject matter. Contrary to what has been common in the literature (for instance, in Rudner 1953), some scholars reasonably focus on what scientists *assert* rather than what they *accept* (see, for instance, John 2015b, p. 81; Lewens 2019, p. 20). Indeed, assertion captures the active contribution of scientists in informing policymakers and the public by providing empirical claims. Second, the value-free ideal prescribes that scientists should not make recommendations based on their own moral and political values about what policymakers should do. This does not entail, however, that scientists cannot make conditional recommendations on policy. By formulating technical norms (Niiniluoto 1993, p. 12), scientists can make recommendations that are conditioned on a predefined political goal of the form: Given that policymakers want to achieve the political goal A, and we find ourselves in situation S, policymakers ought to do P. Value judgments can thus be deferred to policymakers and the public (Havstad and Brown 2017). So understood, the value-free ideal implies a division of labor between policymakers, who

formulate political goals, and scientists, who describe the feasible ways of realizing those goals and provide descriptive premises for policymaking. In my analysis of the interviews, I will explore how the scientists assessed the proper role of non-epistemic values in what they assert in the IPCC reports, the normative status of making recommendations, and how they separated their role as scientists and the role of policymakers.

While some contemporary philosophers defend the value-free ideal (Lacey 1999; Mitchell 2004; Sober 2007; Betz 2013; Hudson 2016), many contributors to the discussions on science and values have challenged it and urged us to abandon it (Kourany 2008; Douglas 2009; Longino 1990; Elliott 2011; Kitcher 2011; Steele 2012; Hicks 2014; Steel 2014; de Melo-Martín and Intemann 2016). These authors do not represent any uniform position. They offer different kinds of objections to the value-free ideal and provide different kinds of constructive views on how the alternatives to the value-free ideal ought to be articulated. Yet, it is fair to say that they all share the view that the value-free ideal is problematic and must be replaced by a new view on the proper place of values in science. Such an alternative, which Daniel Hicks has coined transactionism (Hicks 2014, p. 3274), is the view that non-epistemic values are considered acceptable and legitimate at all stages of inquiry (Kourany 2008; Douglas 2009; Kitcher 2011; Steel 2014).[2] Transactionism is based upon both empirical and normative objections to the value-free ideal. According to one kind of empirical objection, which can be found in science studies and philosophy of science, the value-free ideal is based upon a flawed view of how science is actually done (Jasanoff 1990; Kourany 2008; Kitcher 2011). Scientific activity is unavoidably entangled with non-epistemic values and scientists cannot therefore be value-free in any realistic way. Demanding value-free behavior on the part of scientists is therefore unreasonable, according to this objection (Jasanoff 1990, p. 249; Kitcher 2011, p. 31). According to normative objections, the value-free ideal is not only difficult to realize in practice, scientists should not even aspire to be value-free. As Douglas argues, scientists cannot be exempted from their general moral responsibilities and must consider possible detrimental consequences of error when asserting empirical claims (Douglas 2000, 2009). A further normative argument for transactionism is that it can be pragmatically desirable that scientists make value judgments when deciding how to translate technical, complex,

2. Hicks even claims that the majority view now is that the value-free ideal is untenable: "Many philosophers of science, and perhaps most specialists in the role of values in science, now agree that even ethical and political values may play a substantial role in all aspects of scientific inquiry, including the evaluation and acceptance of hypotheses" (Hicks 2014, p. 3272).

and uncertain knowledge for the edification of policymakers (Steele 2012, John 2015a). I will show how the interviewed scientists held similar views that challenged the value-free ideal because of their sense of moral responsibility and the problems of achieving the aim of policy relevance in a value-free manner.

2.2 Method and Analysis

In this section I will motivate why an interview study of practicing scientists can be valuable to philosophy of science and present the design of the interview study. Since the aim of the study is to inform a philosophical debate, the study focuses on how the scientists understand the content and status of their normative views, how they justify their views, and central problems and objections they have towards aspiring to the value-free ideal and alternative ideals as a scientific expert. To assess the potential fruitfulness of the scientists' normative views raises a wide range of questions regarding the relationship between empirical studies of science and normative discussions of science as can be found in philosophy of science. Let me here clarify how I see the potential relevance of this study (and similar studies) to the philosophical discussion.

A study of scientists' normative views can add illustrative depth by providing us with thick descriptions of how they themselves understand the proper place of non-epistemic values in expert practice and how they justify their normative views. Scientists who have contributed as experts in policymaking are likely to have been confronted with questions of how to consider moral and political values when translating the findings of scientific research into applicable policy-relevant knowledge. While scientists do rarely engage in the rigorous treatment of normative questions as can be found in philosophy, we might reasonably expect that they have acquired rather clear normative views on this issue, partly stemming from their familiarity with internal and external normative expectations. For this reason, scientists might have detected potential views and challenges that philosophers have not emphasized much.

The extent to which philosophers who contribute to the ongoing discussion on the value-free ideal (or alternative standards) aim to develop concepts and views that could be relevant to actual practices of justification is often unclear. An important step in facilitating a fruitful interaction between philosophy of science and science is to distinguish between three central contexts in which a normative view on the proper role of values might occur, namely the philosophical discussion of the proper role of values in science, the views and attitudes of scientists, and formalized professional guidelines and mandates for scientists in policymaking. Philosophical views can, then, be relevant to developing standards that can

inform the formulation of guidelines and mandates for expert assignments, as well as the unformalized normative views of scientists. Conversely, the scientists' normative views and lines of reasoning can illustrate already existing views and concepts, provide new and neglected ideas, and potentially revise the philosophical discussion on the question of non-epistemic values in science. Moreover, by taking the normative views of scientists themselves into account, philosophy of science is likely to become more relevant to scientists. In sum, this study might provide philosophy with new ideas but also align philosophy of science more closely with the concrete challenges and tensions that scientific experts face.

Now, one potential resource for the discussion of the role of values in science is social scientific studies of science. Indeed, science studies scholars provide relevant investigations of how scientists can be influenced by non-epistemic values and external factors (for such studies in the case of climate science, see Van der Sluijs et al. 1998; Shackley et al. 1999, p. 447). However, studies that directly examine scientists' normative views are less common.[3] An interesting exception is the survey of Dennis Bray and Hans von Storch, who study the extent to which climate scientists adhere to CUDOS norms as articulated by Robert Merton[4] (Bray and von Storch 2017). A main finding in their study is that climate scientists subscribe to different norms to a varying degree. For instance, the norm of communism, according to which scientific knowledge is considered public property, something scientists should strive to share with others, is challenged. The surveyed climate scientists display "a tendency to withhold results until publication, [and] there is the intention of maintaining property rights" (Bray and von Storch 2017, p. 1365). Interestingly, however, they subscribed strongly to the norm of disinterestedness (Bray and von Storch 2017, p. 1360), which is arguably the norm most similar to the value-free ideal. Disinterestedness, as they understand it, involves the view that scientists should be "personally detached from truth claims, accept conclusions shaped only by evidence, and [that] scientists should not campaign for a particular point of view or outcome" (Bray and von Storch 2017, p. 1360). Survey studies of this kind can identify trends in scientists' normative orientations.

However, a challenge for survey studies is that concepts, such as objectivity, advocacy, and values, are open to interpretation. In a study on the normative attitudes of scientists, Steel et al. point out how the validity of

3. A few studies that examine scientists' normative views can be found, such as those by Steel et al. (2004) and Besley and Nisbet (2011). Tellmann (2016) shows how economists see their role as experts in accordance with the value-free ideal. What these studies have in common is that they are not connected to the philosophical discussions on values in science.

4. The CUDOS norms compromise communism, universalism, disinterestedness, and organized skepticism.

survey studies could easily be undermined if "respondents do not interpret or understand items on the questionnaire in the manner that the drafters intended. This concern is particularly relevant to surveys related to philosophical concepts, such as objectivity and value, which are abstract, complex and subject to multiple interpretations" (Steel et al. 2017, p. 28). Moreover, survey data do not capture the reasoning and justification underlying scientists' answers. Compared with survey studies, an interview study can obtain a more in-depth and accurate understanding of scientists' views.

The present study is based on semi-structured interviews with eleven Norwegian climate scientists who have contributed as authors to the IPCC.[5] The choice of interviewing climate scientists is motivated by the many interactions and entanglements between climate science and policymaking. A key assumption is that controversies over the accuracy, reliability, and credibility of the IPCC reports are likely to make the authors more aware of the normative underpinnings of their work than scientists working in areas of science where the political ramifications are more remote. The interviewees had to meet the following two criteria. First, they had to have a Ph.D. in a discipline in the natural sciences and have published research in leading peer-reviewed journals. Second, they all had to have contributed to at least one of the two last IPCC assessment reports, i.e. the fourth assessment report, published in 2007, and the fifth assessment report, published in 2013 and 2014, the latest IPCC assessment report to date. Some had contributed to both. All but two of the interviewees had been part of the Working Group 1 (WG1) of the IPCC, which reports on the physical science basis of climate change and consists of natural scientists. Two experts had contributed to the Working Group 2, which focuses on the impact of climate change on nature and societies and possible adaptations.[6]

The interviews followed an interview guide specifying the main topics and questions.[7] Questions were both descriptive and normative. Under the

5. The interviews lasted from one to three hours and took place in the period May to September 2014, and were taped and transcribed.

6. The interviewees were identified via the comprehensive lists of Norwegian IPCC authors on the web pages of the Norwegian Environment Agency, which serves as the IPCC's focal point in Norway. I contacted 16 potential interviewees via email. Five did not respond. The team of authors of the IPCC is organized in three main roles. The "coordinating lead authors" lead the writing groups of a given chapter in the report, the "lead authors," are members of the writing group, whereas the "contributing authors," have a more *ad hoc* and less formalised role in IPCC process. The interviewees covered all three roles. Their dicisplinary backgrounds varied, such as physics, chemistry, meteorology, oceanography, applied mathematics, and geology.

7. The guide comprised the following main headings: identity and tasks as scientists, expert practice in the IPCC and elsewhere, the role of consensus in science, science communication, aims and value of climate scientific research, and the criticism from climate sceptics.

first heading, where the scientists were asked to tell the story of how they ended up as climate scientists, I was particularly interested in sounding out their motivation for choosing climate science as a field, career opportunities, and their current line of work. These questions were mainly descriptive. This mapping of their scientific background, identity, and current practice provided a useful source of information for the later questions, which required normative answers in the form of evaluations, opinions, assessments and value judgments. It was also useful as a means of building rapport and a "basic sense of trust" between interviewee and interviewer (Spradley 2003, p. 44). In relation to the expert role, the scientists were asked to reflect on how they understood their role as experts and their experience of working for the IPCC. The interviews were first analyzed thematically (Fereday and Muir-Cochrane 2006). After the central themes were identified, parts of the transcribed interviews were interpreted further in detail, with a greater focus on tensions, nuances, and alternative views.

It is important to note that the scope of this study is limited to the normative self-understanding of scientists as experts. This has some important implications. First, this study focuses on the normative status of non-epistemic values in the role of scientists as experts in policymaking. The extent to which their views also applies to scientific research is beyond the scope of this article. Second, it does not purport to capture the scientists' practice as experts working for the IPCC or the degree of fit between what they say in the interviews and their normative reasoning in practice. Moreover, since the study has a rather small sample size as well as being limited to scientists practicing in Norway, ten out of eleven being male, we cannot draw any strong conclusions from this study about the normative views of climate scientists in general. Let me here briefly point to some features of the case of Norway, which might have bearing on the attitudes of the interviewed scientists views. First, compared to other countries such as the UK and US especially, the Norwegian climate debates are less polarized, and the reality and potential dangers of human-induced climate change are accepted by all political parties represented in parliament except one. Second, unlike most countries, almost all undergraduate students in Norway are required to take a course in philosophy, ethics and philosophy of science (Examen philosophicum) and most Ph.D. students in the natural sciences do courses in philosophy of science and ethics as a part of their degree. That being said, the international nature of climate research and the IPCC and the fact that almost all of the interviewed scientists had studied and worked abroad might diminish potential national biases.

Before presenting the findings from the interviews, let me briefly introduce the IPCC, which provides the institutional context of this study.

2.3 IPCC – An Expert Panel on Climate Change

The IPCC is arguably the most important expert panel on climate science. Established by the United Nations Environment Programme and the World's Meteorological Organization in 1988, its goal is to provide the world with expert assessments of the current state of scientific knowledge on climate change. Its first report was completed in 1990, and the IPCC has since produced four more Assessment Reports.[8] Each covers three main aspects of climate change, i.e., its physical science basis, its impact on nature and society, and mitigation of climate change. These themes are the focus of its three working groups. Working Group 1 (WG1) assesses the natural science basis, Working Group 2 (WG2) effects and adaption, and Working Group 3 (WG3) mitigation of climate change. Seen as a whole, the IPCC is a broad interdisciplinary panel of experts in the social sciences, humanities, engineering, as well as the natural sciences. My focus here is on the latter group, those who have contributed to WG1 and WG2. It is important to bear in mind the division of labor between the different disciplines within the IPCC, according to which the role of the natural scientists primarily is to provide knowledge about the detection of climate change, its causes and effects. WG3 focuses on policy alternatives for mitigation and is more directly relevant to the actual content of policymaking than the two other working groups.

Let me here briefly sketch out three central aspects of the IPCC as an expert panel. Firstly, expertise is the IPCC's main criterion for selecting its authors (IPCC 2013).[9] It should be noted, however, that the IPCC does include non-experts. Policymakers and stakeholders from governments and NGOs contribute to the process at different stages, for instance in defining the outline of the reports, reviewing the reports, and reviewing and finally approving the Summary for Policymakers. Secondly, as authors for the IPCC, the scientists do not perform new research but assess and synthesize the peer-reviewed research literature of relevance. The experts are not asked to provide a comprehensive account of all peer-reviewed literature on the topic in question, only those articles they find valid and well confirmed. Finally, the aim of the IPCC is to improve the epistemic basis for policymaking by providing "the world with a clear scientific view on

8. The IPCC has now started the process of producing a sixth assessment report, scheduled for completion in 2021 (the reports from the three working groups) and 2022 (the synthesis report).

9. The IPCC does mainly emphasize scientific merit when appointing authors but not exclusively. Representation from developing countries is among the criteria for selecting experts. The IPCC also seeks gender balance in its team of authors. Finally, the IPCC prioritizes experts which have not been a member of the IPCC before, as well as younger scientists (IPCC 2013).

the current state of knowledge in climate change and its potential environmental and socio-economic impacts" (IPCC 2019). It plays a formal role in international climate policymaking by supporting the annual climate negotiations under the United Nations Framework Convention on Climate Change (UNFCCC). In sum, to contribute as an author in the IPCC is a paradigmatic example of the role that scientists can play as experts in policymaking.

3. Climate Scientists on the Expert Role and Non-Epistemic Values

In this section, the key findings from the study are presented. The analysis is structured around three central themes, namely, i) the interviewed scientists' adherence to and justification of their value-free understanding of the expert role; ii) to what extent they see the expert role as distinct from the role of policymakers and their personal values; and iii) the nuances and tensions in their views which challenge the value-free ideal.

3.1 Adhering to the Value-Free Ideal: Providing Policymakers with an Epistemic Assessment

One thing the interviewees shared was their understanding of their role as experts as primarily based on carrying out a scientific task by providing policymakers with accurate knowledge. Some of the interviewees did note that contributing to the IPCC is different from ordinary scientific research. As I pointed out above, the experts of the IPCC do not conduct scientific research but rather summarize and synthesize the research literature. Their task is to provide what the IPCC refers to as an assessment of the current state of knowledge about climate change. One interviewee described the difference between making such an assessment and ordinary scientific research:

> Writing these climate reports is a tedious and difficult process, because everyone does it in addition to their usual job, don't they. And maybe the most difficult process for everyone there is to move on from thinking about it as overview of everything that has happened to an assessment. So an evaluation of: How well do we know this? – How well do we understand this? How much substance is there in one finding versus another finding? And to define likelihood. Everyone has to be taught this way of working, because it is not the usual way of working for climate researchers or any researcher. Usually you either write your own publication or you write a review paper where you go through a lot of things. (Interviewee 4)[10]

10. All the interviews were conducted in Norwegian. The quotes included in this article have been translated into English.

Assessments of the literature thus involve a particular kind of evaluative component. For instance, the experts must judge whether a given article is of sufficient scientific merit to serve as the basis for the assessment and whether a given result is consistent with the evidence provided in other articles. In other words, the experts understand the process of assessing the literature as requiring them to make expert judgments based on *epistemic* values such as empirical adequacy and external consistency.[11]

While recognizing knowledge assessment as an evaluative process, the interviewees were reluctant to see non-epistemic values as legitimate in that process. Political value judgments were generally taken to be misplaced and unacceptable. This became clear in relation to the interviewees' opinions of the governing principle of the work of the IPCC, to be 'policy-relevant and yet policy-neutral, never policy-prescriptive' (IPCC 2014). All interviewees were familiar with this principle, saying it had been an explicit part of the discussions in panel meetings. They took it to be a de facto governing principle for their own work for the IPCC and the team of authors with which they collaborated. It constrained the kinds of considerations they could make in the process of making the reports. When asked directly, all subscribed to it and saw it as a sound and reasonable ideal for the IPCC. As this interviewee saw it:

> Yes they say that the IPPC should be policy relevant but not policy prescriptive. So you should use research results and compare and synthesize research results that are relevant to politicians but not try to influence politically; rather, you should draft alternatives and highlight facts relevant to political decision making. That's how I understand our role here. (Interviewee 7)

Expressing a similar view, this interviewee found the governance of the IPCC to accord with his own understanding:

> The scientist's role is to try to seek an objective summary of the existing research, and in a way say this is it, and then it has to be up to politicians to evaluate what they do about it, in a way. I think it can be dangerous if you, as a scientist, start interfering too much with political views. (Interviewee 11)

11. As is evident in the Guidance Note of the IPCC for how its lead authors should communicate uncertainties, they are to evaluate the degree of confidence and uncertainty in the findings (Mastrandrea et al. 2010). The opening paragraph of the Guidance Note states that it defines "a common approach and calibrated language that can be used broadly for developing expert judgments and for evaluating and communicating the degree of certainty in findings of the assessment process" (p. 1).

In summary, in line with the value-free ideal, the interviewed experts saw non-epistemic values as an unacceptable element of the process of providing a knowledge assessment.

3.2 Justification and Motivation of the Value-Free Ideal

In order to get a good grasp of the climate scientists' value-free stance, it is useful to take a closer look at how they motivated and justified it. In this section, I will show how the climate scientists gave both epistemic and non-epistemic reasons for adhering to the value-free ideal.

Regarding non-epistemic justifications, the interviewees' saw the need to refrain from making moral and political value judgments due to a concern for the credibility and trustworthiness of science in the public eye. A recurrent theme in the interviews was that the public credibility of climate science and the IPCC depends on the perceived neutrality and impartiality of climate experts. In their view, to be identified with a particular ideology or be perceived to be promoting certain interests could harm their credibility. One interviewee underlined the importance of producing what he referred to as 'neutral, balanced and credible science' to avoid criticism by the public:

> Because if you don't do that, you will be justifiably criticized for having an agenda, for having a political agenda, for having this and that, which means no one will listen to you and then you've lost. (Interviewee 1)

He connected this consideration directly to the criticism of the IPCC after the release in 2007 of the fourth assessment report. After errors were found in that report and the so-called "Climategate" scandal, the IPPC was accused of pursuing an environmentalist agenda, especially by the so-called climate sceptics.[12] It is worth noting that this interviewee not only thinks that the importance of value-freedom is a matter of public perception. He explicitly argues that scientists who do not set political values aside in their role as experts are neither perceived as trustworthy nor should they be considered trustworthy.

The climate scientists also gave epistemic reasons for adhering to the value-free ideal. They saw their role as experts as primarily to provide policymakers with a robust and sound knowledge basis, a "platform," in the words of one the interviewees (1), on which policymakers could build their policies. One of the scientists gave a lively example of the epistemic

12. "Climategate" refers to hacking and subsequent publication of some 1000 emails from the Climate Research Unit at University of East Anglia University in November 2009.

justification for being value-free in the expert role. Some of the authors in his working group were biased by their personal environmentalist values in a way that influenced their assessment of the literature, he said. Due to what he described as a "hallelujah atmosphere" at some of the plenary working group meetings, he felt it necessary to play the role of the devil's advocate in order to maintain the scientific rigor of the working group:

> I had two colleagues [...] and they were very involved with this. And I think in a way that they were too involved with politics. And I felt like devil's advocate when I said they should stop. They had used a 17-year time series from somewhere in the world, and said that here you see the effect of human-induced climate change. And I got angry, really angry, and said get rid of this, this doesn't say anything about human-induced climate change at all. A 17-year time series, it's ridiculous. [...] There was a meeting, and I got quite involved. We were talking about just these things, and I sat there and I said: It's our bloody responsibility to be amoral in our role as scientists. Or we shoot ourselves in the foot, I said. (Interviewee 10)

On his view, political considerations are unacceptable in the role as a scientific expert. To downplay or exaggerate claims in the reports of the IPCC based on their political appeal is unacceptable. His main concern about the influence of non-epistemic values is that they undermine the accuracy and reliability of the reports. They impair the expert's judgment and distort the substance of the reports. The biases of some of the other authors, he said, did not influence the content of the final report, and he was quite satisfied with how discussions in the working group had minimized the impact of such bias.

3.3 Separation of Roles

Having shown the opinions and justifications of the climate scientists of their value-free stance, I turn now to their understanding of the expert role as distinct from the role of policymakers and their own role as private citizens. One of the interviewees adhered to the view that the sound use of experts in policymaking had to rely on a clear institutional and cognitive separation of science and politics. When asked whether he thought the IPCC should make recommendations, he said:

> In my opinion it's sort of a separate type of work. Because, as I said, you're wearing a different hat when you're doing that process. So in my opinion I think it's really important to keep those processes separate. That's my opinion. [...] If not, I don't think you can do the right science. (Interviewee 10)

He further elaborated that the distinct processes of making scientific assessments and offering policy recommendations should be reflected in the institutional design. Governmental institutions with dual mandates to furnish scientific assessments and make policy recommendations tended to undermine their own credibility and reliability. The dual role made it difficult to know, he claimed, whether statements were biased by political considerations or represented objective science.

Another interviewee (1) demonstrated the boundary between science and politics by saying that the IPCC's scientific experts hand over the baton to the policymakers, indicating a perception of the separate roles and boundaries between them as well as a succession in time: science first, then policy. The interviewees also saw a crucial difference between their professional role as scientific experts and their role as citizens. Whereas most expressed moderate environmentalist views, some were clearly very engaged in questions of climate policy and even considered taking a more activist role in the public. Due to their value-free stance, however, such values were not deemed to be relevant or acceptable in their work and they separated very clearly between their role as expert and that of policymakers. One interviewee saw the question of whether to focus on the longer or shorter-term consequences of greenhouse emissions as a question for policymakers and not for the experts. That is not to say that he did not have personal political opinions on whether one should put more emphasis on the shorter or longer-term effects of emissions. Indeed, in his personal opinion, the long-term effects were more important than the short-term effects:

> Of course I can have an opinion about this. [...] I can see that this influences my actions as a citizen informed of climate change. So, burning log fires is an example. Log fires are not great in the short term, but better in the long term because then it becomes almost carbon neutral. So when I choose to have a log fire in my own home, I have made a choice based on how much I value what happens in the long term rather than the short term. (Interviewee 8)

He drew a clear normative boundary between his professional role and his own personal values. He admitted, however, that it is not always easy to do this in practice:

> Yes, I don't harbor any illusions about the possibility of a complete separation. I think we are humans and [...] deep inside, there is always something lurking. (Interviewee 8)

In his view, the value-free ideal is difficult to realize completely. Nevertheless, he maintained the importance of distinguishing between his role as an expert and his personal values. Although drawing a neat distinction in practice

and, so to speak, bypassing one's value commitments are difficult, one should nevertheless try to distinguish as much as possible: ideals are there to be approximated even though they might be difficult to achieve fully. One might say that value-freedom is implied as a regulative ideal that he found meaningful to aspire for, although he might never be able to realize it fully.

In summary, the separation of roles was a central concern to the interviewees not only in the division of labor between experts and policymakers but also between their roles as IPCC experts and citizens. By drawing a clear normative boundary between the epistemic role of scientists and the non-epistemic role of policymakers, the interviewees expressed a value-free understanding of the expert role. So far, I have presented how the experts understood and justified the value-free ideal and that they took it to be constitutive of their role as experts. I will now turn to aspects of the scientists's views that challenge value-free ideal. The tensions, some of which they explicitly reflected upon and some of which were more implied and tacit, emerged mainly because of their sense of moral responsibility as scientists and the negative implications the value-free ideal can have for the relevance and applicability of experts' output to policymakers.

3.4 Challenges to the Value-Free Ideal: Moral Responsibility

The views of one of the interviewees illustrate the tension between obligations as a scientific expert and personal moral commitments. He strongly adhered to the value-free ideal. When describing his role in assessing the prospects of geoengineering, it is important, he said, that scientific experts investigate such uncertain and controversial issues.[13]

> It's really important that we, who don't have agendas, we, who are objective and neutral, at least as best we can be, research this. Otherwise there's a clear coast for all sorts of fanatics and for politicians with arguments that could be completely wrong, right. (Interviewee 6)

As opposed to policymakers and stakeholders in industry, scientists are not driven by any kind of political interest, agenda or the like, he argued. The role of scientists in such assessments consists of investigating a topic without taking its potential political implications into account. Scientific experts should try to approximate neutrality. At the same time, he felt that his knowledge about climate change gave him a huge moral responsibility.

> As a climate scientist I feel I have a very big responsibility. I almost have nightmares about what the next generation will say about us.

13. This work was not done as part of his role in the IPCC.

> You had all this knowledge and what did you do? Did you try to influence people? It doesn't look like it. What were you doing? I worry about this. (Interviewee 6)

His views on values, politics, and moral responsibility indicate that he thinks a tension exists between his professional standards and his perceptions of his personal moral responsibility. On the one hand, he adhered to very strong ideals of objectivity and to examine a measure without regard to its political feasibility. As a scientific expert, he felt constrained by scientific standards only. On the other hand, his sense of moral responsibility motivated him to take a more active role in influencing the rest of society. He seems to imply that climate scientists, due to their expertise on the particular kinds of risk posed by climate change, have a moral responsibility to make the public aware of those risks. If the strategies that have been adopted so far do not seem to be working in the sense of leading to political action, then other strategies should be deployed.[14] However, if he chooses to take his moral responsibility seriously by trying to persuade the public that anthropogenic climate change is happening and is dangerous, he does so at the risk of undermining the public credibility of climate science as well as the reliability of the findings. Although there is a tension between his personal values and the normative standards of his professional role, he did not seem to take this to be a reason to revise his value-free stance. A similar tension was expressed by another interviewee:

> And I think all scientist know in their bone marrow that we are not supposed to take sides. We're supposed to enhance scientific knowledge and then someone else has to make the decisions. And that's definitely how I am as well, but often I've also questioned this: Don't we believe the results? So, if we believe in the results on the first page of the IPCC that CO2 is a problem caused by humans that will have enormous consequences unless we do something about it—we have reached this conclusion some four or five times by now—then I think it is our social responsibility to take that into consideration. Otherwise there is no meaning in science if we don't believe in our own results. (Interviewee 4)

14. In the international climate scientific community there are scientists who have felt this responsibility so strongly that they have taken more activist paths. For instance, due to his felt responsibility towards future generations, James Hansen has taken a more activist approach in communicating climate scientific knowledge. He does not refrain from discussing policy implication and solutions. Hanson is not explicitly critical to what he refer to as the technical and scientific approach deployed by the IPCC, but points to that there are simpler, more effective ways to present the science to non-expert audiences (Hansen 2011, p. 41).

Like the other interviewees, this interviewee was reluctant to become an active campaigner. Activism was neither something an expert should do, nor was it an effective strategy to promote political solutions to climate change.

Another interviewee held a similar view. Sympathizing with environmentalist organizations and feeling disappointed with the political response to climate change in Norway and internationally, he considered taking a more active role in political debates. But being associated with certain political views he feared would harm his credibility as a scientist. Commenting on the public role of scientists and the prospect of expressing political viewpoints, the credibility of science is more important, he felt, than having an immediate political impact:

> I'd say that this is one of the most important things, to protect the trustworthiness and credibility of science. Science and scientific results should stand on their own. No matter the questions that come up you have to point to knowledge and there should be reproducible results. At the same time, if everyone thinks this way democracy will lose some voices. Because we know that there are lobbyists one the other sides, and they are far from idealists, well, maybe they see themselves as idealists. (Interviewee 2)

In his view, if scientists with detailed knowledge about the causes and impact of climate change refrained from participating in the political discourse, it left an opening for other interest groups. Nevertheless, the credibility of science was given more weight than the quality of democratic discourse, and he had so far refrained from taking part in political discussions. It is worth noting that this interviewee feared that taking a more active role in political discussions would negatively affect the public's perception of climate science. He does not seem to think that taking a more active role would have a negative impact on the reliability of his research or contribution as an expert. Thus, the interviewee's reason for not engaging more actively in political discussions in the public sphere was mainly a strategic decision of appearing credible rather than a substantial normative commitment to the principle that scientists ought to abstain from political discussion.

3.5 Relevance Undermined by the Value-Free Ideal

Another source of tension is tied to the aim of policy-relevance. As mentioned above, the IPCC states that the work of the panel must be policy-relevant. They do not explain or define, however, what they mean by relevance. Before presenting the tension between relevance and value-freedom, let me therefore first point to three ways in which the interviewees seemed to understand policy relevance: i) as public attention, ii) as realizable without properly

considering the interest and perspectives of external audiences, and iii) as the effective communication of knowledge.

First, some of the interviewees understood relevance in terms of attracting public and political attention. As one interviewee put it, climate science is rather unique in its ability to generate political debate. A new scientific finding in climate research can reach the headlines of mainstream media and the political community almost instantly:

> But in the case [of climate science] there is a direct relevance to society. That is quite special. And off course this can be found elsewhere, but here it's very direct. That's quite unique. We can't say that's how it usually is. Quite the opposite (laughs). What we do is quite like basic research and yet it can have a more or less direct connection to decision making. So it is quite fascinating and I think it's quite special. (Interviewee 2)

Second, the experts sometimes referred to relevance as more or less independent of the way in which they communicate their findings. In this view, relevance is construed as a function of the accuracy and reliability of knowledge and the thematic significance of the subject matter. As long as the knowledge that scientists convey to policymakers and the public is accurate and significant, scientists can be relevant. This view of relevance resonates with the linear model of science in policymaking (Pielke Jr. 2007, p. 13), according to which a *solid* scientific basis of some risk will lead to an adequate political response. However, many of the interviewees were pessimistic on this front. Some said they used to believe that sufficient knowledge would generate an adequate political response but that it was harder to bring about political change than they believed at first. The appeal of this view of the relevance of climate science to policymaking has been weakened after almost 25 years of IPCC reports and what many take to be meagre political progress.

> And I think when the IPCC was established, around 1990, at the end of the eighties, they had the naive belief that if we only gain more knowledge about this and communicate this knowledge to people, then they will all see sense and do something about it. But now I feel that it isn't quite so simple. (Interviewee 6)

Finally, the interviewees referred to policy relevance in terms of effective communication. In this view, relevance is a function of the ability to communicate scientific knowledge in a way that takes the perspectives of policymakers into account. Making relevant reports means that experts don't only have to focus on epistemic values such as accuracy and consistency but must also be sensitive to their audience, their level of scientific competence,

their interests, and values (Gundersen 2018, p. 58). This view of relevance was illustrated by the following interviewee, who felt the IPCC had had problems implementing its principle of policy-relevance:

> We're only supposed to supply the foundation, and then it's up to politicians to choose which direction to take. But we're supposed to supply the foundation. As I said, I don't think we're policy-relevant enough. We could be more relevant, if we'd been given more relevant questions. But, we're definitely not policy-prescriptive. I'm convinced. At least we try very hard not to be.
> Interviewer: And in your opinion, nor should you be?
> Interviewee: No, we shouldn't be. (Interviewee 4)

Thus, contrary to the frequent criticism of the IPCC for being agenda-driven and too closely engaged in policymaking, the IPCC had failed, in this interviewee's opinion, to observe its governing principle by not being policy-relevant enough. In this expert's opinion, the reports contained topics and levels of detail that were simply irrelevant to policymakers. This led the interviewee to conclude that the panel failed to present and communicate its reports effectively. Rather than writing massive scientific reports, the IPCC should now consider new approaches in order to gain relevance:

> So, I, and there are many with me on this, think that we should turn it upside down and start the whole report with a Frequently Asked Questions section. So, something understandable. Some questions that you know people are interested in, some that you know policymakers, stakeholders, everyone is interested in, and perhaps a few that only scientists are interested in. So, this means you'd begin with interdisciplinary questions, and work backwards towards the literature required to answer that question. Because then it's also not such a huge job. We who are in the Working Group should evaluate absolutely everything regarding this topic. Maybe this is meaningless, because there is so much which is of no interest beyond the specialty field. (Interviewee 4)

Another interviewee argued that the lengthy and detailed reports were produced in order to satisfy the scientists rather than the policymakers. In his opinion, the IPCC fails in its communication (Interviewee 5). For another interviewee, the Summary for Policymakers failed to answer the questions that interest policymakers or satisfy the scientists' need for detail (Interviewee 10).

The failure to be relevant, one of the experts argued, was directly linked to the principle of not making policy recommendations. The IPCC guideline,

he felt, had prevented the experts from pursuing potentially relevant leads, making them too cautious in their work:

> I did sometimes feel that you'd be quite careful not to be so-called policy-prescriptive. [...] It was not possible to make emission scenarios on the basis of having active policies in favor of reducing emissions. You could imagine saying: OK, let's see what we could achieve if we wish to reduce global warming and made an emission scenario and had international CO_2 fees for example or technology demands or phased out coal, these types of strict climate policies. If you actually calculated what kind of change this would cause in temperature, precipitation, and wind systems and so on. We weren't allowed to do this. It was deemed to be policy-prescriptive. Our hands were tied. (Interviewee 8)

When presenting different emissions scenarios and effects of climate change in the 2007 fourth assessment report, experts were not allowed to include the effects of new climate policies and international regulations. The policy of not writing prescriptively had the unfortunate effect of excluding potentially policy-relevant knowledge from the report. The experts interpreted the principle of non-prescriptive communication too rigidly, he felt, and it prevented them from including active climate policy scenarios in the report. One might even add here that to include also those scenarios that are based on a more radical climate policy would, as a matter of fact, be useful to a wider range of political ideologies.

4. Concluding Discussion: Relevance for Philosophy of Science

Having observed how the interviewees understood their role as experts and the proper role of non-epistemic values, I would like to suggest some ways in which the findings can be relevant to the philosophical discussion.[15] A rich philosophical literature on science and values is available, and the interviews do not reveal any completely new topics or ideas. However, I will argue that they do provide us with interesting and nuanced perspectives, as well as some reason to believe that several significant questions are underexplored. I will discuss interesting overlaps and differences between their understanding of the value-free ideal and that found in philosophy of

15. Steel et al. describe two other ways in which case studies can be used in philosophical discussions. Using Betz and Douglas as examples (Douglas 2009; Betz 2013), they show that case studies can be used to *support* a given philosophical view (Douglas) or show how a given view is *possible* (Betz) (D. Steel et al. 2017, p. 24). Douglas's case is used to support her version of transactionism, according to which values are constrained by only being allowed an indirect role. Betz used the guidelines of the IPCC to show that it is possible to be value-free and thus claims to refute the most important argument against the value-free ideal, the argument from inductive risk.

science, their emphasis on the credibility of science, their notion of policy relevance as an aim or value of expert practice, and, finally the complex and diverging normative expectations that the climate scientists face.

4.1 Narrow Versus Broad Versions of the Value-Free Ideal

As I have shown in Section 2, value-freedom is a narrow ideal in philosophy of science, as it only applies to practices of justification. The climate scientists interviewed adhered to the view that moral and political values have no proper place in the knowledge assessment they do as authors of the IPPC. In line with how philosophers tend to understand the value-free ideal, then, non-epistemic values were considered illegitimate factors in decisions on what to assert in the reports. Thus, by adhering to a view rather similar to the philosophical version, the interviews illustrate how the value-free ideal can be understood by the experts whose practice the ideal is designed to govern.

However, the interviewed scientists' version of the value-free ideal had a much broader scope than the philosophical version. The way in which they operationalized the ideal in practice involved a refined set of distinctions separating the expert, policymaker, and citizen roles. One of the interviewees felt that he had a moral responsibility for alerting the public about the risks of climate change. However, his adherence to the value-free ideal prevented him from taking a more active role in public. As another interviewee argued, the authors abstained from including emission scenarios based on more radical climate policies in the reports. The governing principle of the IPCC to avoid making policy recommendations thus had the effect of making the experts overly cautious. In my view, to include these emission scenarios would not really conflict with the narrow version of the value-free ideal, and, as far as I know, no one has explicitly defended such a restrictive version of the ideal in philosophy. Rather, it follows from a much stronger and broader view of value-freedom than that used in philosophy of science.[16] This broader version is also well illustrated by the fact that some of the interviewees emphasized the importance of refraining from voicing their personal values in public because of the risk of undermining the credibility of science. Indeed, to be a politically engaged citizen is not proscribed by the narrow version of the value-free ideal found in philosophy of science.

16. This view is similar to Rogers Pielke's criticism of value-freedom because of a mechanism of bias by neutrality. According to Pielke, one of the main problems with a value-free understanding of the expert role is that it tends to generate what he calls *stealth issue advocacy*, according to which experts who take a politically neutral stance risk being used for political purposes, knowingly or not (Pielke 2007, p. 7). Pielke claims that the IPCC is guilty of such a hidden advocacy by leaving out policy options and thus being biased in favor of the status quo (Pielke 2007, p. 141).

Scientists are not only involved in scientific research but also in the dissemination, popularization, teaching, and communication of science to an audience of non-scientists. Once we appreciate that scientists can take on different roles in virtue of being scientists, it becomes interesting to systematically examine whether there are normative differences between these roles. For instance, as scientists can make empirical claims in different contexts, such as climate scientific research, as experts in public policymaking, as well as in the public sphere, whether the value-free ideal applies equally to all three contexts is worth exploring. The interviews do generate questions that have not been discussed much in the philosophical literature. Does the value-free ideal apply to the assertions that scientists make when taking part in public debates (which they sometimes do)? Is it fair to expect that the public can distinguish between the role of climate scientists as researchers, as experts, and as engaged citizens? If not, what is the normative significance of this?

An interesting aspect of the scientists' understanding of the value-free ideal concerns the feasibility of the ideal. As I have shown in Section 2, some the interviewees argued that while being completely value free, neutral, or objective might be difficult, they found it important to try being value free as much as possible. In their view, the value-free ideal functions as a regulative ideal that scientists should *aspire for* and *strive to* realize. This raises the question of what it means to strive for value-freedom. A rather strong version of the value-free ideal qua regulative ideal can be discerned from Douglas' account of the value-free ideal in her formulation that scientists "are to be as free as humanly possible of all social and ethical values" (Douglas 2009, p. 45). This formulation makes the ideal very demanding. Imagine being a scientist sitting in your office, writing up a paper and trying to be as free as humanly possible from your value commitments. It requires more than we can reasonably expect of scientists. The interviewed scientists could be interpreted as adhering to a less-demanding and more feasible version of the value-free ideal qua regulative ideal—that scientists should strive to constrain, limit, or minimize the influence of non-epistemic values on practices of justification. In this view, value-freedom can be a professional ideal regulating the activities of scientists even if they cannot completely set aside all personal or institutional values in the stage of justification and acceptance (for similar views, see de Melo-Martín and Intemann 2016, p. 502; Bright 2018, p. 2244).

4.2 Credibility and Trust as Reasons for Adhering to the Value-Free Ideal

The interviewees justified the value-free ideal based on the value of the credibility of science. The concern for the credibility, trustworthiness, or authority of science can be observed in philosophy of science, science studies, and

public debates. Indeed, the scientists' concern for credibility resonates with rather widely held intuitions. We tend to trust a given group of scientists if we perceive them as independent, neutral, and impartial. Scientists with known close ties to certain political and commercial interests are therefore often distrusted. There is evidence suggesting that people tend to distrust a group of scientists who voice their value commitments (Elliott et al. 2017). Abundant examples can also be found in public climate debates in which value-freedom is often upheld as a condition for trust in the climate scientific community. A case in point, the so-called Climategate affair, which some took to indicate that climate scientists were biased toward environmentalism and therefore tried to exaggerate the scale of climate change, undermined the trust in the IPCC and in climate science, in general (Leiserowitz et al. 2013). Insofar as public trust is conditioned on scientists being perceived as value-free, those philosophers who urge us to abandon the value-free ideal should consider whether their own normative alternative depends on change and the reform of people's normative expectations of science. Moreover, there are few, if any, systematic and developed arguments for the value-free ideal that consider trust in science. The findings from the interviews should therefore work to expand the philosophical discussion of examining the relation between trust and the value-free ideal.

4.3 Carving Out Relevance

The literature on science and values have not focused much on how the notion of policy relevance ought to be understood or how scientists can be successful in realizing it. Important exceptions are John (2015a) and Steele (2012), who both argue, using the IPCC's way of reporting uncertainties as a case, that scientists cannot successfully translate knowledge for policymakers without making non-epistemic value judgments.[17] What I find potentially fruitful about the interviewees' views is that in order to be relevant to policymakers, they have to consider more the interests and powers of policymakers and the public. On this view, the provision of policy-relevant reports involves both a translator capacity to render complex science accessible to the non-expert audience, as well as giving insights into possible controversial issues, potential impacts, and risks.

Moreover, according to my analysis of the interviews, the way in which the scientists understand the value-free ideal makes producing relevant

17. As pointed out by an anonymous reviewer for this journal, Philips Kitcher's notion of significant truth is rather similar to the notion of policy relevance discussed here. Similar to how relevance cannot be achieved independent of experts' audience, significance is decided by the interests and values of a democratic society and not by scientists alone (Kitcher 2011, p. 88).

reports more difficult. Their strict adherence to the value-free ideal can undermine policymakers' perception of the relevance of experts' opinions. As one of the interviewees said, the value-free ideal can make experts take exaggerated epistemic caution, possibly undermining the relevance and applicability of the reports. Therefore, the IPCC's admonition to scientists to avoid making recommendations has the unfortunate effect of making it much more difficult for scientists to convince policymakers of the relevance of science. That there might be a tension between relevance and value-freedom is not mentioned in the IPCC guidelines, and the experts are thus given the inherently difficult task of producing relevant and neutral science. The views of the interviewed scientists point to an unsettled tension between minimizing the influence of values and maximizing the relevance of the reports.[18]

4.4 Complex and Diverging Expectations: Reframing the Debate?

Taken together, my findings indicate a significant normative tension between value-freedom, responsibility, and relevance in the interviewees' view of their role as experts: they must be responsive to epistemic constraints imposed by the value-free ideal, the goals and values of policymakers and the public, and their personal moral commitments and sense of responsibility. This could be seen as merely a kind of internal tension in the normative views of the individual scientists. However, this does not tell anything about the sources of these tensions. Rather, the scientists' line of reasoning suggests a rather intricate web of normative expectations to which the scientists must be responsive. For instance, the scientists' appeal to credibility indicates that their perception of the expert role is responsive to a wider set of external expectations. As they see it, the extent to which their work as experts could be understood as entangled with non-epistemic values and politics, even in the more superficial ways, could undermine their credibility. Their concern for their credibility seems to be based on a certain view of the normative expectations of policymakers and the public. To the extent that external audiences could perceive their work as value laden constrained the production of the reports (what they included), how they assessed the institutional design (clear separation of roles of scientists and policymakers), and their role in the public sphere (refusing to engage

18. One could argue that the IPCC would have undermined its policy relevance had it abandoned the value-free ideal. First, it might be argued that the IPCC has, as a matter of fact, been highly successful in providing governments with relevant information (e.g., by giving governments a fundamental empirical premise when arguing for specific climate policies). Second, to the extent that the IPCC is less relevant than it could have been, this might be explained by other factors (e.g., the lack of knowledge about the local climate). I am grateful to one of the reviewers of this journal for pointing out this issue.

in political discussions). To add further complexity, the external normative expectations can be unclear. For instance, the very mandate of the IPCC contains normative tensions, in the sense of the conflict between value-freedom and policy-relevance. In sum, the normative expectations scientists face in their public role as experts can therefore be identified at different levels. They have to be responsive to normative expectations of policymakers, the public, other members of the scientific community, and science studies scholars. By differentiating between these normative sources, we see how complex the web of expectations is.

As I showed in the section on background and method (Sec. 1), in the philosophy of science it is common to see the role of non-epistemic values as either unacceptable (the value-free ideal) or acceptable (transactionism). In other words, we have to decide whether to adhere to the value-free ideal or some brand of transactionism. However, the interviews provide reasons to use a different approach. Rather than deciding between the value-free ideal and transactionism, one way to assess the normative tensions is to take a more pragmatic and tempered view of the status of values in science.[19] On this view, the value-free ideal could be seen as a feasible regulative ideal for scientific experts but not the only one. Rather, the expert role requires scientists to balance a wider set of normative expectations. Instead of seeking to formulate one single general and categorical principle or distinction that prescribes what role non-epistemic values must play in the reasoning of scientific experts, one might consider whether a more promising approach is to lay out a set of principles that scientific experts must interpret and apply on a case-by-case basis in light of the other standards that they face. Indeed, one could argue, the governing principle of the IPCC to be relevant, yet neutral, in itself requires such balancing. To exclude political considerations completely from the practice of experts can lead to their assessments being considered as irrelevant and even irresponsible. The "hallelujah atmosphere of environmentalism" one expert found in his Working Group is an example of an unhelpful influence of non-epistemic values whereas it could be much more useful to set out the value premises informing emissions scenarios based on radical policy change. While the first kind of influence from non-epistemic values undermined the accuracy of the reports, the latter might improve the policy relevance of the reports.

Moreover, the fact that scientists must aim to be relevant does not entail that the value-free ideal cannot be a feasible and desirable regulative ideal.

19. This is not tied to the philosophical views under the umbrella of pragmatism or neo-pragmatism. It is pragmatic in the sense of being practical and considering more seriously the application of values, ideals, and standards of the kind we are considering here.

Despite criticisms that the IPCC has been less relevant than it could have been in certain respects, the IPCC has proven to be highly effective by providing both the international community and the world's governments with an epistemic basis that motivates and justifies their climate policy. To the extent that there have been backlashes, this is mainly tied to a lack of accuracy in the reports. In this sense, the interviewees' strong emphasis on the value of trustworthiness as a reason for both appearing and aspiring to be value free ought to be taken seriously by those philosophers who see the value-free ideal as an obstacle to scientific authority (e.g., Kitcher 2011, p. 40) or to responsible research and expert advice (Douglas 2009).

As a final note, let me briefly suggest how the findings presented here could be relevant to how scientists matter-of-factly relate to values in their practice as experts. The study explores how in the mind of the experts the value-free ideal ought to govern their practice. It lies beyond the scope of this study to probe whether their reflections actually correspond to actual practice. However, their views have an important relevance to how we understand actual practice. According to the experts, the value-free ideal does make a difference to how they understood and performed their role as experts in the IPCC. They provided accounts of the concrete ways in which the IPCC's principle of neutrality actually made a difference while they wrote their assessments. For instance, certain emission scenarios were omitted because they were based on assumptions about future climate policies. As some of the interviewed experts freely admitted, it is very difficult to eliminate one's own biases, prejudices and wishes when making expert judgments. Nevertheless, their views provide us with a route along which the value-free ideal can make a difference to practice by indicating how some non-epistemic value judgments can be minimized.

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