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Beyond consensus: reflections from a democratic perspective on the interaction between climate politics and science

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The international debate about the Intergovernmental Panel on Climate Change (IPCC) and climate science in the aftermath of 'Climategate' gives cause for reflection. While the main emphasis lies on evaluating the procedures of the IPCC during the production of the fourth assessment report, too little attention has been paid to the political role of the IPCC. This article reflects on that political role by distinguishing three strategies to deal with scientific uncertainties in interfacing science and policy: 1) quantify uncertainty, 2) building scientific consensus, and 3) openness about ignorance. Each strategy has strengths and weaknesses. The way the international community has set up the IPCC and its procedures has basically been guided by the consensus approach. The current emphasis on restoring faith in the IPCC by improving its procedures reinforces this strategy. Guaranteeing the scientific reliability of IPCC reports is indeed essential but it does not address the main weakness of the consensus approach: the underexposure of both scientific and political dissent. As a result of this weakness climate science has become politicized over the past decades. Moreover, as we illustrate for the Netherlands, the consensus approach has hindered a full-blown political climate debate. The third policy strategy that aims for more openness and attention for diversity and deep uncertainty in knowledge and views may inspire more democratic ways to organize the interface between climate politics and science.

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Introduction

The issue of anthropogenic climate change is surrounded by much public, political, and scientific debate. The laborious climate negotiations at COP15 in Copenhagen 2009 attest to this [1]. The emails hacked and made public (known in the media as 'Climategate') right before that climate summit and the unearthing of (alleged) faults in the fourth assessment report (AR4) [2–4] early 2010 have triggered vehement debate in science and society [5,6,7•,8,9•]. Questions have emerged with regard to the scientific quality and independence of the IPCC and the adequateness of the peer review process. Scientific institutions responded with independent evaluations of the contents of the hacked e-mails [10,11]. IPCC asked the InterAcademy Council (IAC) to evaluate their procedures. IAC's main advice is that IPCC should improve its communication and crisis management and should fundamentally reform its management structure and strengthen its procedures to better meet the challenges of increasingly complex climate assessments in a context of more intense public scrutiny of the scientific justifications for climate policies [12]. The political arena responded by demanding evaluation of the IPCC procedures during the production of AR4 [13,14••]. From a policy perspective, guaranteeing the scientific reliability of the IPCC report is indeed extremely important. However, to adequately respond to the present 'crisis' broader societal reflection on – and reform of – the political role of the IPCC is also urgently needed.

To this end, this paper explores the complex interaction between climate politics and science [15••,16•,17••,18••]. For our analysis we introduce three strategies to deal with scientific uncertainties and organize the relationship between politics and science. Next, we use this typology to interpret the role IPCC plays in the science–policy interface. We discuss the key function of IPCC as producer of 'certified' scientific and policy-oriented knowledge in motivating and legitimizing (inter)national climate policy. We assess strengths and weaknesses of the current way in which the IPCC deals with a diversity of voices and uncertainties within climate science, and how these are presented to (policy makers in) the outside world. We exemplify our diagnosis of problems in the present practice of interfacing climate science and climate policy using the case of the Netherlands. Finally, we look for ways to improve the interface between climate science and policy.

Three strategies to deal with scientific uncertainties in the science–policy interface

When the science–policy interface is confronted with complex issues that are characterized by many scientific uncertainties three coping strategies may be distinguished [19,20•,21•]. These strategies have their origin in the (implicit) model of interfacing science and policy

assumed by those who perform the interfacing activities [22,20•]. Note that the underlying models are exclusive but the practical strategies for managing uncertainties are not mutually exclusive, indeed the strategies are strongly complementary within the successive models.

Interfacing strategy 1: quantify uncertainties

In the 'Linear Model' of interfacing science and policy [22],[1] science informs policy by producing objective, valid, and reliable knowledge. To develop a policy is then a matter of scientists delivering the facts and then, in a second step, policy makers sorting out diverse values and preferences. In classical terms, the true entails the good; in modern terms, truth speaks to power. This interfacing model implicitly assumes that scientific facts linearly determine correct policy: good governance is getting the facts right and calculate the optimal policy. The belief is that being based on scientific facts, the power that is exercised is effective, legitimate, and based on unambiguous objectivity and indisputable rationality. This approach implicitly assumes that there are no limits to the progress of man's control over his environment, no limits to the capacity of science to know and understand, and no limits to the material and moral progress of mankind. This is the classic 'technocratic' view of governance dependent on an assumed perfection/perfectibility of science in theory and also (progressively) in practice. Within this Linear Model, scientific uncertainty is seen as a temporary shortcoming in knowledge. The related interfacing strategy is to quantify and push back the uncertainty by more research, for example, creating increasingly complex climate models and through perturbed physics ensemble modelling [23,24]. Calculation is seen as key to well-informed good governance. This approach is limited by the fact that not all uncertainties can be expressed quantitatively in a reliable way. What's more, in practice uncertainties do not become reduced with more research: the problem appears to become ever more complex [25•]. It further assumes that there is only one correct scientific description of the system that is analyzed: in other words it assumes that the system and problem are not complex. It thereby ignores that multiple – often conflicting – scientific interpretations of the same available knowledge are tenable. The drawback of this approach is that there is a semblance of certainty, for example, because the numbers coming from the increasingly complex models suggest that there is more knowledge and more certainty than is actually the case.

Interfacing strategy 2: build scientific consensus

In response to the phenomenon that science does not speak with one voice to policy but tends to speak many, often conflicting truths, to power, the emergence of a Consensus Model can be observed in an attempt to 'rescue' the Linear Model from conflicting certainties and multiple framings. Within this interfacing model uncertainty is primarily perceived as a problematic lack of unequivocalness. One scientist says this, the other says that. It is unclear who is right and which scientific viewpoint should guide the decision making. The solution has been a comparative and independent evaluation of research results, aimed at building scientific consensus via multidisciplinary expert panels. This approach is geared towards generating robust findings representing 'the best of our knowledge' that is used as a proxy for the scientific truth that is needed in the Linear Model. The drawbacks of this approach are that it leads to anchoring towards previously established consensus positions [26], it hides diversity of perspectives thereby unduly constraining decision-makers options [27], it underexposes issues over which there is no consensus whereas it is precisely this dissent that tends to be extremely relevant to policymaking [19].

Interfacing strategy 3: openness about ignorance

In the Consensus Model, the core activity of the Linear Model, the experts' (desire for) truth speaking to the politicians' (need for) power, is left unquestioned and unchanged. Confronted with complex issues with high decision stakes, uncertain facts and values in dispute, scientists may still aim to deliver truth, but often there are many competing interpretations of the same problem (conflicting truths), none of which can be refuted given the state of knowledge—so that a consensus can only be an enforced reduction of complexity into single 'best of our knowledge' claim. In case of such complex issues, both the Linear Model and the Consensus Model are not fit for the characteristics of the issue addressed, because the truth cannot be known at the moment the decision needs to be made, and can thus not be a substantial aspect of the issue. As Funtowicz and Ravetz [28] phrased it: ''*To be sure, good scientific work has a product, which should be intended by its makers to correspond to Nature as closely as possible, and also to be public knowledge. But the working judgements on the product are of its quality, and not of its logical truth.*'' Building on these notions, an alternative model of science and policy has been proposed: the Deliberative Model, in which the appreciation of a plurality of (often irreconcilable) perspectives is key. Within this interfacing model uncertainty is seen as something that unavoidably plays a permanent role in complex and politically sensitive topics. This approach [29••,20•,30•] recognizes that ignorance (lack of understanding of the complex climate system) and values play a central role. The search is for a robust policy, which is useful regardless of which of the diverging scientific interpretations of the knowledge is correct. The drawback of this approach is that uncertainty and minority interpretations are so much in the spotlight that we may forget the items that actually do enjoy broad scientific consensus (see [31,32,33••,34••] for accounts of the present scientific

[1] Note that Funtowicz [22] uses the term 'Modern Model', referring to the modern tradition of European Enlightenment.

Table 1

Overview of strengths and weaknesses of three policy strategies to deal with scientific uncertainties (modified from [19])

	Scientific uncertainty as ...	Interfacing strategy	Strength	Weakness
1	Lack of precision	Quantify uncertainty	Searching for scientific certainties	Creating illusionary certainty
2	Lack of unequivocalness	Build scientific consensus	Exposing consensus	Underexposing dissent
3	Fact of life	Openness about ignorance	Exposing dissent	Underexposing consensus

consensus and [35•,36•,37•,38,39•,40] for reviews of the state of knowledge).

Table 1 summarizes the strengths and weaknesses of these strategies.

Strength of the IPCC consensus approach

The way in which international politics framed the IPCC when it was established in 1988 was mainly guided by the second policy strategy of coping with scientific uncertainties. To guarantee the policy relevance of the IPCC, politicians at that time opted for a consensus approach when dealing with scientific uncertainties.[2] In that period many contradictory studies about causes, effects, and seriousness of the climate change problem existed. Policymakers realized that they needed a clear policy-oriented knowledge base, on which international climate policy could be based. To achieve that the IPCC was set up as an independent yet intergovernmental scientific panel by the United Nations Environment Programme (UNEP) together with the World Meteorological Organization (WMO) [41]. IPCC reports aim to identify the state of (chiefly peer-reviewed) knowledge while enjoying wide scientific support. This goal fosters developing consensus in the editorial teams. By mapping out scientific consensus, the IPCC fulfills a central political function in certifying robust knowledge that can serve as a foundation for climate policy.

Every 5 or 6 years the IPCC publishes a multi-volume assessment report presenting an overview of the state of knowledge. These reports consist of three partial reports. Partial report I covers the physical science basis (climate system and causes), report II discusses impacts, adaptation, and vulnerability, and report III looks at mitigation (possibilities to tackle the causes). Each volume has a summary for policymakers, while a synthesis report summarizes the findings of the whole report. Participating governments and scientists together determine the content of the policy summaries. Governments formally accept the reports of the IPCC. This procedure ensures that these reports can also count on wide support from governments and policymakers and are considered as an authoritative source [42].

From the start, the work of IPCC has been strongly framed by its political context. Its first assessment report (1990 [43]) served as the scientific basis under the UN Framework Convention on Climate Change (UNFCCC) that was signed in 1992. This put climate policy high on the national and international agenda. The main goal of UNFCCC – established in article 2 – is to stabilize concentrations of greenhouse gasses in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. This level must be reached within such a sufficient time frame that ecosystems are allowed to adapt naturally to climate change, the food production is not threatened, and the economy can develop in a sustainable manner (in other words: a balance should be found between the damage to ecology and food production if emission reduction is too slow and the disruption of socio-economic development by the high costs of reducing emissions too fast).

The current tendency in the aftermath of 'climate gate' and the unearthing of faults in AR4 is to improve IPCC procedures via external evaluations. This reinforces the consensus approach: people are looking for ways to continue with the existing practices and legitimize them politically. Although such a process is important, it is even more important to respond to the weaknesses of the consensus approach. In the following sections we reflect on its instrumental weaknesses and fundamental flaws.

Instrumental weakness of the IPCC consensus approach

The consensus approach deprives policy makers of a full view of the plurality of scientific opinions within and between the various scientific disciplines that study the climate problem. Partly, this results from the way in which scientific uncertainties are momentarily communicated. The IPCC's own guideline prescribes that any diverging scientific visions on certain aspects should be reported in the chapters that discuss those aspects. As far as we can oversee it, this does get done. Yet policymakers' summaries and synthesis reports do not provide insights into where in science is there dissent. Examples of such dissent are disputes over the role of man compared to the role of the sun in the observed and projected climate trends, the hockey stick controversy, contradicting recon-

[2] The recent IPCC reports also contain elements from the first and third approaches. In addition to reporting of quantified uncertainty ranges (approach 1) we increasingly find qualitative indications of the level of scientific understanding for several of the figures (approach 3), see also [60].

structions of CO_2 concentrations in the past, and the key-assumption that climate sensitivity is constant over time [14••]. To get a good picture of the various unresolved scientific disputes one has to read the entire AR4. The current IPCC consensus model also causes weak signals from the scientific community of potentially large impacts to get a less prominent spot in the reports than they may deserve based on their policy relevance (see also [20•]). This is the case with tipping points [44•]: they can lead to severe non-linear impacts, but given the state of knowledge and the many uncertainties, univocal scientific consensus about the severity and scope of many of these tipping points cannot yet be reached. Still, such dissent is policy-relevant: when designing a policy strategy you better have thought beforehand about extreme scenarios that cannot be ruled out but have an unknown chance of happening than be completely surprised if they occur unexpectedly at a later time while early warnings from dissenting scientists were not heard (see also [45••]).

Fundamental weakness of the IPCC consensus model: the case of the Netherlands [14••]

To exemplify our diagnosis of the more fundamental problems in the present practice of interfacing climate science and climate policy, we briefly elaborate the case of the Netherlands. For the Netherlands, the linear consensus model has 'worked' for a long time: it provided a long-lasting broad political consensus about climate policy. On the negative side, the focus on consensus hindered a full-blown political climate debate that in turn has politicized climate science. Paradoxically, the consensus approach was originally chosen in the hope that it would have depoliticized the science, but instead it created vulnerabilities in the science policy interface (such as the tendency of overselling certainty) that can easily be exploited.

Analysis of parliamentary debates over the past twenty years [14••] shows that IPCC reports are continuously used to keep the political debate within bounds. Questions have repeatedly been asked in the Dutch Parliament about scientific information and scientific uncertainties surrounding the climate issue. These questions come from the entire political spectrum. The government consistently answers that scientific uncertainties do exist, but that policies are based on the IPCC reports and the precautionary principle. Because the political arena has given the IPCC reports such a central role, the political conflict about climate change and the underlying ideological contradictions have penetrated deep into the field of climate science. In other words, political influence nowadays can be achieved most effectively via climate science. With the IPCC reports in hand, proponents of the climate debate claim a preferential position in the debate. Opponents try to reopen the political debate by magnifying uncertainties and imperfections in climate science [46–49].

In the post-Climategate discussion the linear model has been harshly attacked, yet also strongly defended and upheld [14••]. To clean up the blemished blazon of the IPCC – that is, to restore the linear interaction model between climate politics and science – the Dutch government defended the linear model and ordered an independent evaluation of errors in AR4 [13].In the United States where until recently the political climate debate was completely stuck the linear model has never worked [50]. More climate research and the consensus reports of the IPCC did not lead to less political conflict there. In the Netherlands the linear model has induced a scientification of the political climate debate because politics are dependent on scientific knowledge. In turn, science ends up at the heart of the political conflict, and when the stakes get high in political decisions, the scientific debate becomes politicized [51–54]. As a result, those who have vested interests regarding what is at stake deliberately start to deploy certain tactics to turn scientific results in their favor, to bring a favorable study to the fore, or to be rid of inconvenient knowledge [55–57,58••][3].

Since the early 1990s, the IPCC has played a central political role in the countries that implemented climate policies under the UNFCCC. The scientific knowledge gathered and processed by the IPCC legitimizes domestic and international policy aimed at reducing greenhouse-gas emissions. Moreover, the long-term policy goals of the Framework Convention have become leading for the financing, organization and any questions surrounding a large portion of climate science, in particular in the domains of climate mitigation, climate adaptation, and carbon sinks.

It is because of the central political role of the IPCC that precisely around the climate summit in Copenhagen (COP 15) the scientific debate flared up and became polarized. This political key role of science is the most important moving force behind politicization of policy-oriented climate science. This partly explains why faults in a three-year-old scientific report (i.e. 'Himalaya gate' in AR4) are front-page news these days.

Epilogue: towards a more democratic perspective

Given the intense criticism, repairing the Linear Model by evaluating the IPCC is a logical and good step to take. A good picture of the status of climate science is in fact an important precondition for prudent domestic and international climate policies.

Still, more is needed. To move beyond consensus the deliberative model offers a promising complementary

[3] Note that the fact that the references here discuss corporate strategies, does not mean that NGO's do not deploy these strategies too. It seems just less well documented in the literature.

approach to interface climate science and policy, based on openness about uncertainty and ignorance, systematic reflection, and argued choice. This remedies the basic weakness of the Linear Model that underexposes the scientific as well as the political dissent. It can fruitfully broaden the option space for decision making and enhance societies' capacity to deal with uncertainties surrounding knowledge production and knowledge use in the management of climate risks. To this end, both the scientific and the political climate debate need more space and attention for diversity and uncertainty in knowledge and views. Consequently, it is necessary to make climate science less political. This can be accomplished by offering room for dissent within climate science and communicating about it with policymakers. It should also be acknowledged that climate policies can be justified in moral terms without any need for recourse to abstract climate or economic models [59•]. An excessive mutual dependence between science and policy should also be prevented. The political climate debate would benefit from clarification of the political values and visions that are at play in climate change. The climate debate could be expanded by paying attention to socially attractive development perspectives. The growing focus on climate adaptation also has the power to highlight and expand the political climate debate.

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